GMES has come a long way, but there is still so much to do!

This past year has undoubtedly seen an impressive amount of progress in and around the Global Monitoring for Environment and Security initiative. Looking back at the history of this flagship initiative of the EU, it seems, in fact, that never has so much been achieved in so little time. There are two reasons for this. Firstly GMES has reached a level of maturity that brings it closer, by the day, to full-scale operational deployment. In addition, the political and institutional momentum of the initiative has dramatically accelerated, as a result of efforts by the fathers of GMES, the European Commission and the European Space Agency, as well as extra political impetus from the French Presidency of the EU in the second semester of 2008.

This issue of *Window on GMES* testifies how very busy and fruitful the past year has been for GMES:

- The Lille *GMES Forum 2008* demonstrated that the initiative has indeed – and on many counts – moved out of the Research & Development universe into pre-operational status, as demonstrated by real-life examples of products and services already being used, albeit sometimes on a pilot basis, by real-life users;
- The institutional framework upon which the GMES *initiative* will evolve into a full European *programme* has been sketched in more detail than ever before by the European Commission and the Member States;
- The political visibility of GMES has reached an unprecedented level and awareness of the initiative is growing;
- The financing of the required satellite and ground infrastructure has been cast in stone by the 5th European Space Council;
- The first GMES operational budgets have been released by the EC, through the award of contracts for production of the Urban Atlas and for preparation of the implementation of Emergency Response services;
- In all five of the thematic areas addressed by GMES new projects supported by the EC,have been launched (for Land, Emergency Response and Security) or will be launched in the near future (for Ocean and Atmosphere). These will pave the way for GMES to reach the goal of full-scale, operational and sustainable, user-driven service delivery.

While progress is unquestionable, there is still a lot to be accomplished:

- We now have an identikit showing us what GMES should look like after reaching maturity. But the picture remains sketchy and does not yet guarantee that the child born eleven years ago in Baveno will be a good-looking and healthy adult;
- Operational budget lines still need to be allocated for the actual implementation of GMES services;
- Industry is still awaiting assurance that it will eventually recover its ten years of investment in R&D and achieve the economic prosperity promise underpinning GMES;
- Increased involvement and support from Member States is desirable, particularly from some of the New Member States;
- The awareness of Europeans about this initiative must be further developed so that the benefits of GMES for Europe and its citizens become self-evident.

The Czech Presidency of the EU will certainly offer new opportunities, in particular to demonstrate the relevance of GMES to New Member States and Associated Countries, while the entire GMES community, including the partners of *BOSS4GMES*, continues to work hard to make the dream come true.

The members of the *BOSS4GMES* consortium

B4G Building Operational Sustainable Services for GMES

GMES demystified *

GMES: GLOBAL MONITORING FOR ENVIRONMENT AND SECURITY – ONLY FOUR LETTERS ARE REQUIRED TO ENCAPSULATE THE ESSENCE OF AN IDEA, BORN ELEVEN YEARS AGO IN THE MIND OF A FEW PIONEERS. THESE VISIONARIES, AWARE OF THE FUTURE CHALLENGES TO BE MET IN EUROPE IN ORDER TO PRESERVE OUR ENVIRONMENT AND GUARANTEE THE SECURITY OF ALL ITS CITIZENS, WERE ALSO AWARE OF THE NEED TO ACT AT THE PAN-EUROPEAN LEVEL.

NECESSITY KNOWS NO LAW. GMES gathers, in order to share it, all the countless pieces of data about our environment and security, accumulated from all European countries and born from years of fruitful research, that have enabled our common technological developments to reach maturity.

Born from years of fruitful research

So, GMES was designed. A huge and ambitious programme of monitoring, for the use of all players – both public and private – in charge of ensuring the preservation of the environment and the security of European citizens.

The "G" of "Global" encompasses both the global dimension and the diversity of the data to be taken into account.
The "M" of "Monitoring" includes the observation activities required for monitoring.
The "E" of "Environment" and the "S" of "Security" are precisely the two important fields benefiting from the GMES initiative.

Today, this civilian project has taken shape. GMES is led by the European Commission (EC) and the European Space Agency (ESA) with the support of the Member States of the European Union, who will be its beneficiaries.

GMES aims to coordinate the use of Earth Observation technologies with existing and future data collection systems.

One of its biggest challenges is to compile the vast number of very different data sets, collected from the ground, from altitude by balloons or aircraft, from the depths of the seas or from the surface of the oceans, by networks of probes and sensors, as well as from Space for the observation of the Earth.
These data resources are then made compatible with statistical data including, particularly, socioeconomic data gathered for Europe, its Member States and the Regions.

The other great challenge is to be able to deliver the data and information to those decision makers, public authorities, and private companies who are assigned the task to implement the policies or solve the crisis situations and who need such information at the right time.

Enable decision makers and users to access a myriad of information

From a concept, this vision is evolving into a reality. In accordance with an overall implementation plan, innovative, cost effective and sustainable services are progressively being set up, step by step.

The first GMES services are already pre-operational. They will enable decision makers and end users – institutional as well as those from the private sector – to access a myriad of information, such as: the occupation and condition of our soils; the quality of the water we drink and the air we breathe, as well as the nature and degree of the pollution affecting them; the direction of marine currents and level of the ocean surface; the movement of animal populations and variations of the flora; the migration of airborne particles and the extent of the ozone hole; and, the monitoring of glaciers and polar ice cover. All of this is GMES.

Ensure that operators are prepared and equipped

Such information will enable users to:
- organise city and regional planning, with management plans that are more attuned to our natural resources;
- control in a reasoned way our agricultural production and our fish resources;
- monitor, more accurately, the factors of pandemic disasters and their evolution and to minimise, more effectively, the consequences of natural disasters and even to anticipate their occurrence and implement the necessary mitigation steps.

In the field, GMES services will ensure that operators are better prepared and equipped to act during floods, forest fires and landslides, as well marine pollution events and illegal dumping, and to provide more effective support for humanitarian missions responding to, for example, the impacts of earthquakes, volcanic eruptions, tsunamis and famine.

These services will allow political decision makers and all of those whose mission is to be at the service of the citizen's security, to have at their disposal the necessary data during international negotiations. At the national, regional or even local levels, these data will also be most useful to enable decision makers to fulfil their obligations more efficiently, and to improve the precision of their budget planning.

Other GMES services will be added over time, based on scientific or technological evolution and the provisioning of necessary budgets. They will be developed at the European level to answer the collective needs of institutional agents and also at the national, regional and local levels, to meet the more specific demands of end users.

Help give Europe a leading role in the monitoring of our environment

GMES will become an essential tool in the fight against the consequences of climate change that affect our entire planet, without exception. It will help give Europe a leading role in the monitoring of our environment.

GMES is a tool of international cooperation, following the example set by meteorological services and constitutes the contribution of the European Union to the creation of a vast and worldwide system of observation systems, the GEOSS (Global Earth Observation System of Systems).

B4G Building Operational Sustainable Services for GMES

** a* BOSS4GMES *contribution to the presentation of GMES*

37 partners for a decisive project: BOSS4GMES

CO-FINANCED BY THE EUROPEAN COMMISSION (DG ENTERPRISE AND INDUSTRY) AND THE MEMBERS OF OUR CONSORTIUM, THE *BOSS4GMES* PROJECT (*BUILDING OPERATIONAL SUSTAINABLE SERVICES FOR GMES*) STARTED IN DECEMBER 2006, WITH A PLANNED DURATION OF 30 MONTHS. ITS AIM IS TO CONCENTRATE ON SUSTAINABILITY AND THE OPERATIONAL DIMENSION OF GMES SERVICES. THIS PUBLICATION, *WINDOW ON GMES*, IS A MAJOR COMMUNICATION INITIATIVE TO BE CREDITED TO BOSS4GMES.

THE GMES idea was born eleven years ago. Its concept has progressively evolved as scientific and technological advances have reached sufficient maturity to start making the most of the potential they offer. Institutional, political and industrial players are now able to initiate the decisive transition towards bringing GMES to an operational level. Three thematic areas have been selected as a priority for operational implementation; these so-called *Fast Track Services* (FTS) are the forerunners of a wider GMES service:

- Ocean for the monitoring and management of the marine environment
- Land for the monitoring and management of the terrestrial environment
- Emergencies for the management of emergencies in case of disasters.

However, from this operational beginning, the wider GMES service will build upon the services and products resulting from these forerunner projects. The assessment of the synergies and interoperabilities within GMES is the very mission of *BOSS4GMES*; it is finally giving life to GMES.

BOSS4GMES is a pioneer

CO-FINANCED BY THE EUROPEAN COMMISSION (DG Enterprise and Industry), the *BOSS4GMES* project (*Building Operational Sustainable Services for GMES*) started in December 2006, with a planned duration of 30 months. In bringing together 37 committed industrial and institutional partners, the *BOSS4GMES* consortium constitutes an impressive array of players operating in the GMES community.

Unique in the GMES world, *BOSS4GMES* is also a pioneer:

- on one side because it brings together players and thematic areas that, until now, worked largely independently of each other. *BOSS4GMES* enables the development of synergies with other projects financed by the European institutions in order to rationalise and coordinate actions and efforts undertaken by the entire GMES community;
- on the other side because it fully integrates, as partners, specialists of communication strategy and implementation; a decisive discipline at this stage of GMES development.

GMES intrinsically takes on a prospective nature

These coordinated efforts will enable *BOSS4GMES* to lay the technical, economic and contractual, as well as communication foundations for GMES:

- technology, to improve and validate the operational dimension of existing services;
- economics, to define the criteria for sustainability and the operational models applicable to GMES;
- communications, to increase the awareness of GMES among end users and political decision makers, as well as to develop its user base.

Furthermore, GMES intrinsically takes on a prospective nature. Beyond the *Fast Track Services*, *BOSS4GMES* participates in the definition of new services, especially in the frame of pilot projects related to thematic areas focusing on both security and atmosphere/air quality.

THE AMBITION behind the introduction of these various services is to develop a GMES European public service for the observation of our environment. *BOSS4GMES* is paving the way for the sustainability of such a public service, for the benefit of Europe and of its citizens. The aim is to reach a point where GMES services become, as meteorological services already are today, permanently accessible, in real time and without discontinuity.

Potentialities and prospects offered by GMES should be acknowledged by its potential users. *BOSS4GMES* is designed to publicise how and why GMES will be a precious tool at the service of those who, in the exercise of their duties or political mandate, have to forecast, anticipate, act or react on the basis of the constraints weighing on the environment and security of European citizens.

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The Czech EU Presidency: a gateway to GMES for users from Central and Eastern Europe

by Jan Kolar and Ondrej Mirovsky EU2009.CZ

THE CZECH REPUBLIC IS WELL AWARE OF THE STRATEGIC IMPORTANCE OF GLOBAL MONITORING FOR ENVIRONMENT AND SECURITY (GMES) FOR THE EUROPEAN UNION AS A WHOLE AND FOR ITS MONITORING NEEDS. THERE IS STRONG SUPPORT FOR ALL THE IMPORTANT STEPS THAT HAVE BEEN MADE OVER THE LAST FEW YEARS BY THE EUROPEAN COMMISSION TOGETHER WITH THE EU PRESIDENCIES, THE FRENCH PRESIDENCY IN PARTICULAR. A UNIQUE OPPORTUNITY NOW ARISES FOR THE CZECH REPUBLIC TO PRESENT THE POTENTIAL OF GMES TO USERS FROM CENTRAL AND EASTERN EUROPE, FOR WHOM GMES CAN BE A VERY IMPORTANT TOOL TO PREVENT OR MITIGATE MANY ENVIRONMENTAL AND SECURITY-RELATED SITUATIONS.

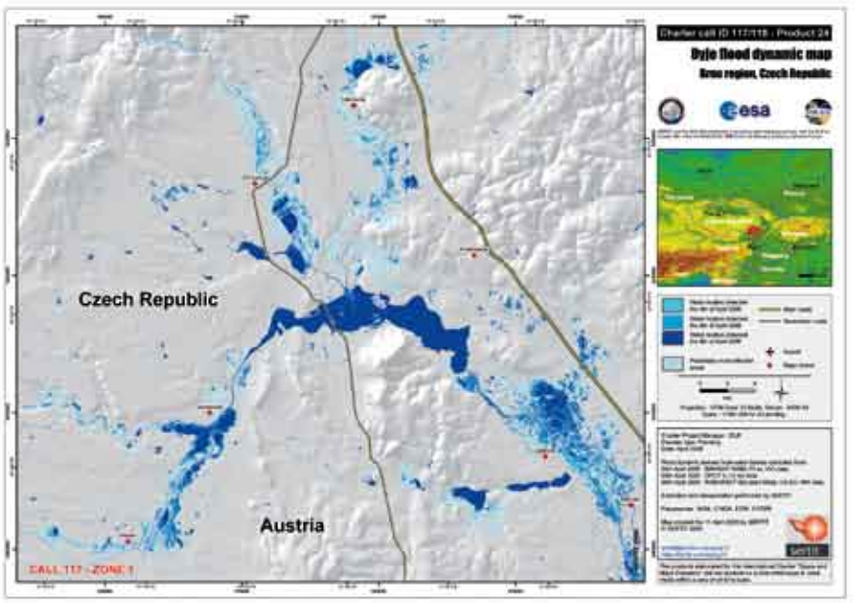
GMES as a public good

Europe stands among the world leaders in Earth Observation (EO) and the provision of information uniquely useful for the management of the consequences of human activities on the surface of our planet. The European Space Agency (ESA) and its respective Member States, together with the European Union and other European organisations, have invested substantially in order to develop a GMES infrastructure and pre-operational services. Earth Observation encompasses a powerful set of advanced technologies which in combination with *in situ* (ground-based, airborne etc.) measurements provides products and services supporting solutions to international challenges such as security threats, environmental degradation and climate change.

The GMES initiative reflects the European decision to develop its own, independent observation capabilities. The objective is to provide, on a sustainable basis, reliable and timely services relating to environment and security issues in support of policy needs.

"GMES outputs will support EU environmental and security policy development"

GMES has been announced as a European Union flagship initiative. GMES outputs will support EU environmental and security policy development, monitoring and implementation at local, regional, EU and global levels. The beneficiaries of the services can be EU institutions and bodies, as well as local, regional and global institutions involved in research, monitoring and implementation. GMES will be developed in steps as an EU-led initiative through the introduction of pilot services, starting with three so-called *Fast Track Services* (Land Monitoring, Ocean and Emergency Response services) as of 2008. The



Dynamic flood map produced by GMES Emergency Response services during the 2006 floods in the Czech Republic (Credits: Images CNES/Spot Image, RADARSAT, ESA/ENVISAT, processing SERTIT).

latter have already had pratical applications in the Czech Republic as illustrated by the map above. Moreover, GMES is the EU's main contribution to the Global Earth Observation System of Systems (GEOSS) 10-year Implementation Plan.

An operational phase for GMES

After ten years of research activities, GMES has now entered its pre-operational phase: a set of research projects supported by the EU, ESA and Member States budgets aimed at developing services and infrastructure. The services are being developed to meet the needs of a wide range of users who rely on accurate environmental and security data and information. Operational, continuous and sustainable delivery of information has not yet been achieved. Further investment is therefore necessary, in Space infrastructure in particular, in order to fill the remaining gaps in GMES services and to guarantee their long-term sustainability and reliability. In addition, a common approach between the various partners involved in the development of GMES needs to be further enhanced, to avoid the possibility of a duplication of efforts.

GMES is also creating opportunities for increased private sector usage of new information sources. It will trigger partnerships between research and service providers, many of them small and medium enterprises. Thus, while not likely in the short to medium term, the development of market opportunities could eventually determine the proportion of public investment. In any event, GMES is designed primarily as a public-driven programme.

"The GMES initiative needs to be transformed into a GMES *programme*"

Moving into the operational phase requires sustainability for the GMES services being developed. To achieve this goal, the GMES initiative needs to be transformed into a GMES *programme*.

This move will bring efficient management into the programme, including financing, and will build user and industry confidence in GMES. It is priority task for the near future to prepare the necessary proposals and plans to establish the programmatic environment of GMES.
An important factor is the governance structure applicable to both the overall system and its infrastructure and service components. It seems only natural that the governance should fall under the umbrella of the European Union which will also be an important user of future GMES core services. ESA, the second main European contributor to the construction of GMES, has a key coordination role for the Space component, and it has been investing heavily into the development of GMES services for several years. At the same time, ESA's mandate is normally limited to the development of R&D activities, and it usually transfers mature technologies to other bodies for permanent operation. Until the implementation of a fully-fledged GMES programme, the interim GMES governance should involve the European Commission and Member States for decision and commitment purposes.

The EU's financial resources for GMES are currently taken from research funds in the 7th Framework Programme, which runs until 2013. Building the GMES programme requires more sustainable financing of service delivery as well as enhanced contributions to infrastructure development and operations beyond research. Therefore the willingness of the European Commission to propose the formal launch of a GMES programme is an important first step, irrespective of future financial decisions. Ideally, a Community programme will be proposed to bridge the gap between the end of the preparatory phase (in 2011) and 2014, when the new Financial Framework is expected to be in place.

"A unique opportunity to bring GMES closer to the needs of users from EU New Member States"

New challenges and new fields of intervention for GMES

As mentioned above, many horizontal issues within GMES need to be resolved in the forthcoming years – in particular governance and financing. In addition,

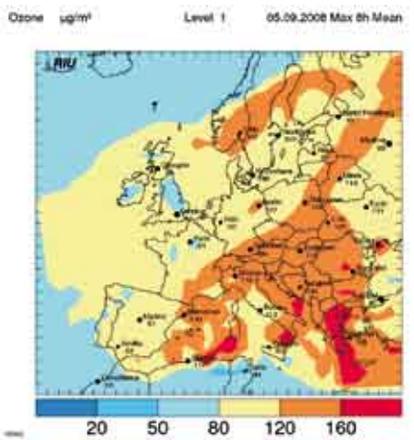
After previous catastrophic flooding episodes in 1997 and 2002, the 2006 floods resulted in 18 dead in the Prague region, and costs are said to have been in the order of two billion euros. (Credits: Petr Novák, Wikipedia).

*During the Czech Presidency of the EU a GMES event is being organised within the conference "*Towards eEnvironment*" from March 25th to 27th, 2009. One of the objectives of the conference is to demonstrate synergies between EU environmental programmes and GMES (Credits: Ricardo Liberato).*

there are many other topics that the Czech Presidency of the European Union has the ambition to examine in greater detail. The Czech Republic, together with many new EU member countries, is being presented with a unique opportunity to bring GMES closer to the needs of users from EU New Member States, while also identifying new challenges and fields of intervention which could not have been discovered in Western EU countries. In New Member States, there are dozens of new environmental challenges and GMES can learn a lot in order to be in a position to deliver the most appropriate services for the entire EU in the future.

GMES meets New Member States – the Prague conference of March 2009

During the Czech Presidency of the EU a GMES event is being organised within the conference "*Towards eEnvironment*" from March 25th to 27th, 2009. The overall objective of the conference is to show synergies between such EU programmes as SEIS (Shared Environmental Information Systems), SISE (Single Information Space in Europe for the Environment), INSPIRE (Infrastructure for Spatial Information in Europe) and GMES.
The GMES segment of the conference, starting in the afternoon of the 25th, has the main goal of bringing concentrated information about GMES to the largest possible audience of potential users and



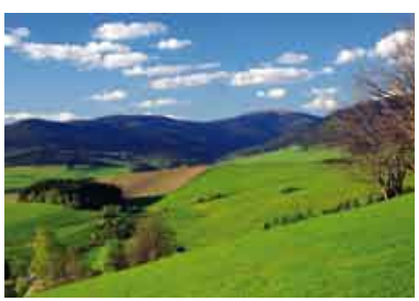
The economic transition in Central and Eastern Europe creates new risks in terms of environment, such as growth of greenhouse gases emissions, nitrogen oxide (NO_x), ozone and particulate matter (PM). A forecast of surface ozone levels from September 2008 (Credits: Rhenish Institute for Environmental Research, University of Cologne).

European 'wall-to-wall' image. GMES services are of great use to EU Member States but also for all 38 member countries of the European Environment Agency's EIONET group (European Environmental Information and Observation Network). This picture shows a 'virtual mosaic' of SPOT-4&5 and IRS-P6 LISS-III 'quicklooks' from the years 2006 ± 1 year (Credits: ESA, DLR/IMF, includes material © CNES/ Spot Image, © ANTRIX Corporation Ltd./Euromap GmbH).

service providers from EU New Member States. In addition, the aim is also to demonstrate future user opportunities in the fields of GMES Atmosphere and Land services.

Atmosphere and Land services for New EU member countries

For many Central and Eastern European countries these two issues are top priorities in terms of environmental or security concerns. Economic transition exposes the region to new risks, in terms both of environment (such as the growth of greenhouse gases emissions, nitrogen oxide (NO_x), ozone, and particulate matter (PM) from increasing transport) and security (including floods, forest fires and chemical accidents). Therefore, during the second day of the conference on March 26th, the possible benefits of Atmosphere and Land services will be presented, through examples of successful GMES projects. Another important topic will be Climate Change, for which the European Commission will present its view on how GMES can contribute to climate change monitoring, along with a presentation of Czech capacities in this field.



Economic transition in new Member States could increase pressure on the environment. The Králický Sněžnik hills in the Czech Republic (Credits: Marek Stránský).

One of the presentations will focus on satellite-based monitoring of particulate matter, a major issue for air quality, particularly in urban areas. We believe that this example can be a starting point for possible downstream GMES services for the cities in the region.

Similarly, discussion of the potential use of GMES Land services for urban planning in Prague will reveal possible opportunities for many other cities around the region to implement GMES based services for everyday decision-making within urban administrations.

Conclusions

The Czech Presidency of the EU strongly supports the path paved by the French Presidency and the European Commission in 2008. In the upcoming months it is essential to agree a financial plan for transition to a fully operational and sustainable GMES programme. This can be done only in close cooperation with Member States, particularly with some of the EU New Member States, in which overall awareness of GMES is still quite weak. Let us hope that the Czech EU Presidency will also help to bring GMES closer to political leaders and users, most particularly in these countries.

We hope that during this period more end users from all around Europe will find inspiration in already operational GMES services, some of which are especially relevant for EU New Member States, as they provide fast and reliable tools to monitor many environmental and security risks.

Jan KOLAR, with a Ph.D. in Space Physics (1978), is currently the director of the Czech Space Office and represents the Czech Republic at the European Space-related bodies in both EU and ESA. He has been involved in various fields of space activities from the beginning of his professional career. In the last 15 years, he has been taking part in building the Czech Space infrastructure. His professional background is in Earth Observation. He founded a geo-information company and leads research projects, while giving lectures on remote sensing at Charles University in Prague.

Ondrej MIROVSKY graduated in 2004 from Charles University in Prague and holds a degree in Environmental Protection. In 2005 he earned a degree in Environmental Management from the Amsterdam Business School. In 2006, he worked in Brussels on structural funds projects. The same year he started to work for the Czech Space Office as a GMES coordinator for the Czech Republic. Since 2008, he has also been working for the Technological Centre of the Academy of Sciences as a National Contact Person for FP7 – Space. He is also active in local and regional politics as a town representative in Prague.

A Ukrainian Perspective on GMES

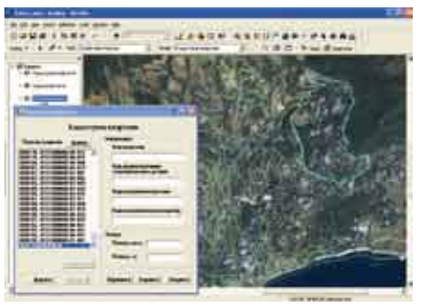
Working hard for the transparency, integrity and reality of the national infrastructure for Geospatial Information of Ukraine

by Oleksandr Kolodyazhnyy, Jacek Studencki and Robert Lach

UKRAINE HAS BEEN USING SATELLITE IMAGERY FOR CADASTRE PURPOSES SINCE 2005, WITH SUPPORT FROM POLAND, ITS EU NEIGHBOUR AND A GMES PARTICIPANT. WORK STARTED IN CRIMEA, ON THE BLACK SEA, WHERE LAND TRADING IS BRISK AND SO MAINTAINING A DEPENDABLE CADASTRE REGISTRATION AND TRANSACTION TRACKING SYSTEM WILL PROVE KEY TO THE REGION'S ECONOMIC DEVELOPMENT. INITIAL WORK REVEALS THAT GMES MAY HELP TO UNLOCK THE ECONOMIC POTENTIAL OF SOME OF UKRAINE'S "SLEEPING" ASSETS. IT MAY ALSO BE PAVING THE WAY FOR INNOVATIVE SOLUTIONS FOR FUTURE FUNDING OF GMES SERVICES.

Activities involving the combination of Ukrainian cadastral *in situ* data with Very High Resolution imagery provided by the Polish Satellite Centre of Regional Operations (SCOR) started in 2005. Thanks to the support of the National Security and Defence Council of Ukraine, specifically its Institute of National Security, as well as the Ukrainian Land and Resource Management Centre (ULRMC), an inventory of the southern sea shore area of Crimea has been launched, using ortho-rectified imagery from the IKONOS satellite. This project has received initial funding from the State Committee on Land Resources of Ukraine, and is managed by the Crimean Republican Committee on Land Resources.

The integration of satellite imagery with cadastral (graphical and textual) records has been completed very quickly. This has involved the successfull integration of data coming from twelve different local coordinate systems despite the fact that 'conversion formulas' for the coordinates used were still classified as 'secret'. Success was such that during its meeting of February 17th, 2006, the Scientific-Technical Council of the State Committee on Land Resources of Ukraine decided to *"extend the experiment of the Crimean project to the territory of other regions of Ukraine"*.



Results of the joint project to produce integrated cadastral records from Crimea (Credits: ULRMC and SCOR).

Efficient cadastre can unlock economic assets

Transparency of land transactions is crucial both for domestic security and for the international reputation of Ukraine. "Black market" real estate transactions in Crimea were unofficially estimated by a Ukrainian official to be close to € 2 billion in 2007. The Autonomous Republic of Crimea is only one of 25 Ukrainian "Oblasts" (autonomous Regions), but a very important one, for both business and security reasons. For instance, the Black Sea Fleet of the Russian Federation is stationed on the peninsula, and there are also issues with minorities living in the area.

We live in a time when the majority of decisions taken by administrations worldwide concern a very specific geographic area. In this context, the use of geospatial information and/or cadastral registers is a key asset to help manage issues such as global warming and crisis management after catastrophes, or effective land management for State or local administrations.

The per capita GDP of a country shows a strong correlation with the legal framework set up by governments to manage real estate and Intellectual Property Rights[1]. Countries protecting private real estate property thanks to efficient cadastral and mortgage systems as well as state-of-the-art geospatial information infrastructure have a per capita GDP two to four times higher than countries not benefiting from similar assets and infrastructure. Norway – the country with the highest per capita GDP in the world – spends US$ 1 billion annually on such infrastructure. Poland spent over € 630 million between 1999 and 2005 to develop its cadastral system and geospatial information infrastructure[2]. This amount remains, however, very low compared to investments undertaken by more affluent EU Member States.

The beautiful coastline of Crimea. There is tremendous potential for land and tourism development, provided an adequate and transparent cadastre and a state-of-the-art land use monitoring system are put in place (Credits: Lyncis).

The context that has recently developed as a consequence of the global economic crisis gives the following strategic principle more relevance than ever: *"Use your existing static resources"*. One of Ukraine's so-called fixed assets, one that is vastly under-used at present, is its real estate - an economic resource. According to international estimates, "frozen" land resources that could be put back on to the official market are valued at between US$ 50 and 150 billion[3]. The re-incorporation of such assets into Ukraine's normal market dynamics needs to be managed wisely, so as to avoid any hasty decisions that could potentially degenerate into unrest, particularly when it comes to agricultural land. If, however, we assume that Ukraine will adopt a wise approach to this issue, that approach could be based on existing and available methods and technologies so as to

significantly enhance and accelerate the process. The development of a modern National Infrastructure of Geospatial Information in Ukraine, compliant with EU and NATO standards, could cost about € 1 billion over a five-year period, and would be an unprecedented undertaking in Europe, if not world-wide. A financier would probably anticipate a Return on Investment of between 50:1 and 150:1.

The inter-governmental project for Polish-Ukrainian know-how transfer has two major components. Firstly closer cooperation between the cadastral authorities of both countries (the Heads of General Surveys of Ukraine and Poland are thus members of the Group) and, secondly, the transfer of Polish know-how in the use of Very High Resolution imagery. Such imagery is applicable to security, defence and public administration, including, but not limited to: land parcel identification (with the International Association of Classification Societies; IACS/LPIS); water protection (with the Centre for Water Resource Studies and the European Commission's Joint Research Centre); protection of threatened natural habitats (NATURA 2000); land use and land cover surveys (Land Use/Land Cover Area Frame Survey LUCAS); PECS, NATO compliant military map updating, and MGCP (Multi-national Geospatial Co-production Programme of the US National Geospatial Intelligence Agency). From 2009 onwards this transfer of experience will strengthen Ukraine's capacities and efficiency, while implementing the Ukraine/NATO action plans.

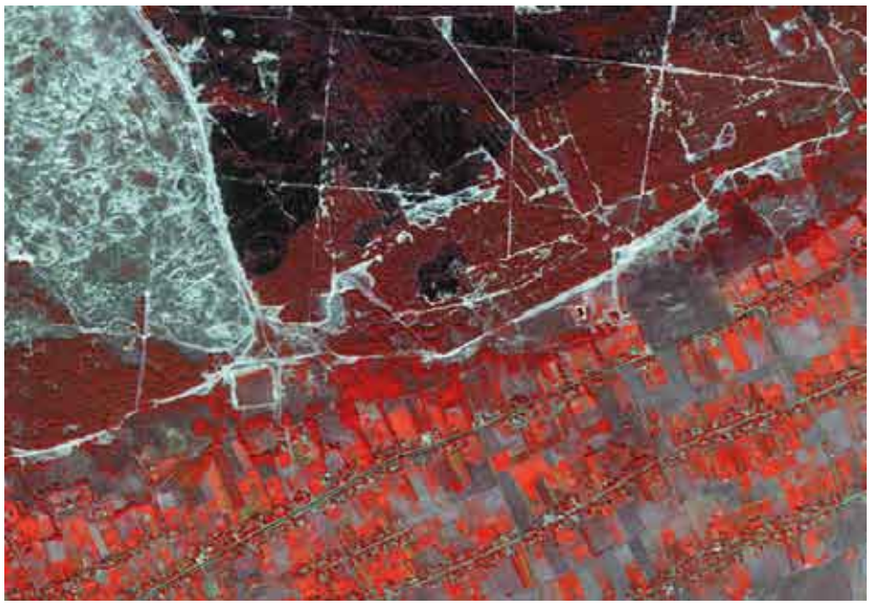
Ukrainian-Polish cooperation does not starts from scratch! A current World Bank Project in Ukraine devoted to the registration of property rights for land parcels is yielding good results. We are of the opinion, however, that a new impulse aimed at accelerating, and giving a new quality dimension to these projects, is desperately needed – along the lines of the help the European Union extended to Poland during its Solidarność Revolution in the 1980's. GMES is a precious asset that can yield a lot of good fruit not only for Europe, but for Ukraine as well. Conversely, Ukraine can also be "a breath of fresh air" for the EU, since the eventual extension of GMES to the territory of Ukraine will automatically bring a community of hundreds of institutional users of GMES services – if an appropriate political framework, institutional arrangements and in consequence joint financial activities are built. Ukraine's efforts deserve such attention and care.

The SCOR ground station at Komorowo in north-east Poland. SCOR, a Polish public-private partnership, has been working with Ukraine on cadastre-related Earth Observation missions (Credits: SCOR).

Calling for new legislation

A change in the legislation currently in force in Ukraine must accompany this process if it is to bring the country closer to its citizens, and make it more efficient and better understood abroad. Given that the "*acquis communataire*" of the European Union – i.e. the corpus of legally binding European Union documents – is about 120,000 pages, some of the acquis should be implemented in Ukraine regardless of whether it joins the European Union. If Ukraine is to attract foreign investment, if an average citizen is to have the right to take a mortgage loan at a "decent" real rate of interest, i.e. not 14-18%, then one has got to roll up one's sleeves and seriously get to work.

The selection of fundamental legislation to be adopted in Ukraine should take place soon, with the support of both the Polish government (through the Polish side of the Interstate Group on Geospatial Information) and the European Commission. To begin with, the Ukrainian legislation can be devised taking into account the INSPIRE European Directive (Infrastructure for Spatial Information in Europe). The *"Ukraine INSPIRE State of Play"* report could be drafted in the first quarter of 2009, with the support of the International Cooperation Programme of the Ministry of Foreign Affairs of Poland and the Spatial Data Infrastructure unit of the EC's Joint Research Centre.



The SCOR regional ground station in Poland has been working with Ukraine and international partners to process satellite data for fire fighting and post-fire assessment missions for Ukraine.
This multi-spectral image delivered by the IKONOS satellite was captured on August 22nd, 2007. It shows the impact of a wildfire that destroyed about 2,000ha of forests in the region of Kherson in southern Ukraine. Areas showing in black are burnt forests, and zones in dark red and red indicate healthy vegetation of trees and other plants (Credits: IKONOS for the imagery and value added products, SCOR SA for the processing).

After a three-year preparatory phase, the *"Development of National Infrastructure of Geospatial Information of Ukraine"* project is finally moving into its implementation phase. This project is officially supported by the governments of Ukraine and Poland as well as by the European Commission. Pursuant to the provisions of the agreements enacted by the Poland-Ukraine Commission on Economic Cooperation, the project activities will be compliant with the INSPIRE Directive and become part of the GMES initiative of the European Union as well as of the GEOSS (Global Earth Observation System of Systems) worldwide initiative of the GEO (Group on Earth Observation). These activities are being carried out by the Poland/Ukraine Interstate Group on Geospatial Information. The strategic importance of this joint undertaking is demonstrated by the fact that the Interstate Group is co-chaired by Messrs Hryhoriy Nemyria and Waldemar Pawlak – Deputy Prime Ministers of Ukraine and Poland.

Socio-economic benefits above € 140 billion

According to a report by PricewaterhouseCoopers commissioned by the EC, the GMES initiative should generate estimated socio-economic benefits of € 140 billion across the EU market, and GALILEO another € 200 billion. In this context, it seems highly interesting to assess what benefits Ukraine can expect from an active involvement in INSPIRE, GMES, GEOSS and GALILEO. This work is currently being started.

Representatives of INSPIRE and GEO have already visited Kiev. In June 2008, Mr. Alessandro Annoni, head of the INSPIRE programme, Mr. José Achache, Director of the Secretariat of GEO, and Mr. Hryhoriy Nemyria, Vice Prime Minister of Ukraine, agreed to implement a coherent roadmap. After several months of activities from the delegations of the Ukrainian and Polish governments, in cooperation with the European Commission, the first results have become visible. The main issue is now to ensure mid-term funding for the project. Funds could originate from governments, from private companies (public-private partnerships), from the instruments of the EC's Eastern Partnership initiative, from funds of the Polish and Ukrainian National Banks, as well as from international financial institutions. The Interstate Group has first to identify its needs and estimate costs, and to forward this information to governments and financial institutions in order to set up an *ad hoc* financing mechanism.

Good laws may muster new financing sources

Today it is impossible to assess the overall cost of implementation of such a project. If, however, one estimates the expenditures of Poland to develop a cadastre and infrastructure of geospatial information at approximately € 630 million (1999-2005), then the indicative cost for Ukraine (which is twice as large as Poland) should certainly be higher. If, however, the Government of Ukraine were to:

- adopt a new geospatial law paving the way for implementation of the INSPIRE Directive standards;
- favour the development of cadastral and mortgage systems (thus securing private land ownership);
- integrate on-going activities of the World Bank on land registration with the newly defined Polish-Ukraine geospatial project;
- develop relationships with the GMES Bureau of the European Commission and;
- in parallel guarantee additional financing and know-how transfer from Poland,

there would be a fair chance that all these factors could lead to the "unfreezing' of financial assets worth US$ 50 – 150 billion and therefore create favourable ground for economic growth.

"Perhaps it is time to consider including the host cities of the EURO 2012 football championship into the Urban Atlas"

There is one more obvious idea: the EURO 2012 football championship, to be hosted jointly by Poland and Ukraine. Approximately 1.2 billion people will be watching this event. EURO 2012 cities need new, updated land development plans sooner than later. This championship will require support for their security component, national planning needs new updated versions of CORINE-like land cover/land use information, visitors will expect multilingual geo-navigation, 3-D models of cities etc. Perhaps it is time to consider including the Ukrainian cities that will host EURO 2012 into the European Urban Atlas project.

For these writers, it is obvious that our respective geospatial infrastructures ought to reach a higher level of integration. A few years back we had a dream of structuring geo-spatial information relationships between our two countries. Today, our governments have become supportive of this vision. INSPIRE, GMES and GEO can become the backbones for such a joint undertaking. We hope that the upcoming e-Environment conference, to be held in Prague in March 2009, will be the first of several meetings where this dream starts to come true. How can we start the romance between Ukraine and GMES? Think about it, please…

1 Hernando De Soto: "The Mystery of Capital – Why capitalism triumphs in the West and fails everywhere else"

2 SCOR and ULRMC, and Mr Ryszard Preuss, former Deputy Head of the General Survey of Poland (GUGiK)

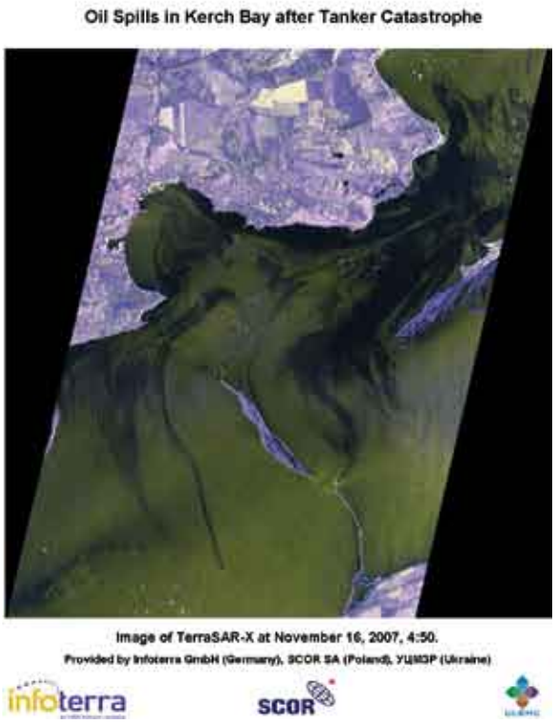
3 Policy Paper No.13, "Institutional aspects of agricultural land markets in Ukraine", Institute for Economic Research and Policy Consulting, German – Ukrainian Agricultural Dialogue, p. 2.

APPLICATIONS OF GMES SERVICES TO EMERGENCIES IN UKRAINE

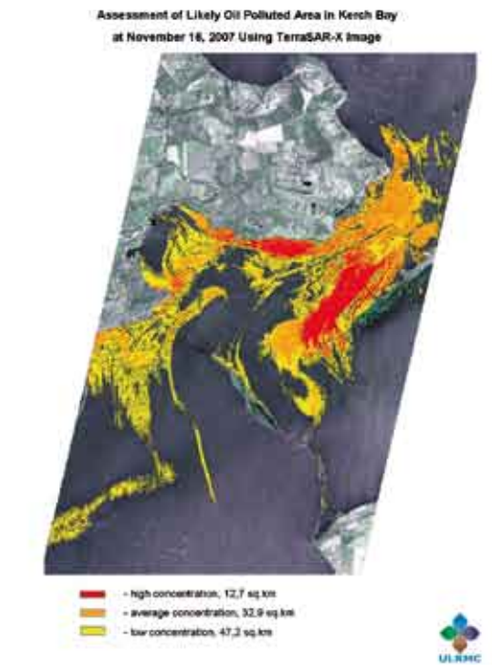
KERCH CATASTROPHE, NOVEMBER 2007

In November 2007 the Ukrainian government requested assistance when a major storm hit the Kerch strait, between the Black Sea and its northern appendix, the Sea of Azov.

On November 16th, a traditional aerial reconnaissance campaign was supposed to provide data on the area, but the AN-30 pilots refused to fly, due to very heavy cloud cover at an altitude of around 400 metres and difficult overall atmospheric conditions. That same night, a radar image from the TerraSAR-X satellite was acquired by Infoterra GmbH, downloaded to Friedrichshafen in Germany, and transferred to Ukraine over the internet to reach the teams in charge of image acquisition and processing – the SCOR regional ground station operator and the Ukrainian Land and Resources



The first TerraSAR-X imagery, acquired on November 16th at around 4.50 am, created a shock. It revealed unsuspected oil spills.
The urgent need for data was transmitted to all in-field crisis teams. However, Very High Resolution optical images could not be collected due to the weather conditions over the zone of the catastrophe. Meteosat-8 optical imagery, which was accessible every 15 minutes, showed consistent full cloud coverage over the area (at 400 metres above sea level), and a strong storm (7-8 on the Beaufort scale) which made usage of optical satellites completely impossible. In such circumstances, Very High Resolution radar satellite imagery was the only possible option. Radar imagery from the TerraSAR-X satellite proved critically informative throughout the crisis.
As an aside it is interesting that the number of ships and vessels visible on images of the scene did not match the number of the ships and vessels officially reported as coming in and out of Russian and Ukrainian ports. The message is simple: this type of imagery can also be applied to anti-fraud activities (Credits: Infoterra GmbH for image delivery, ULRMC for image processing).

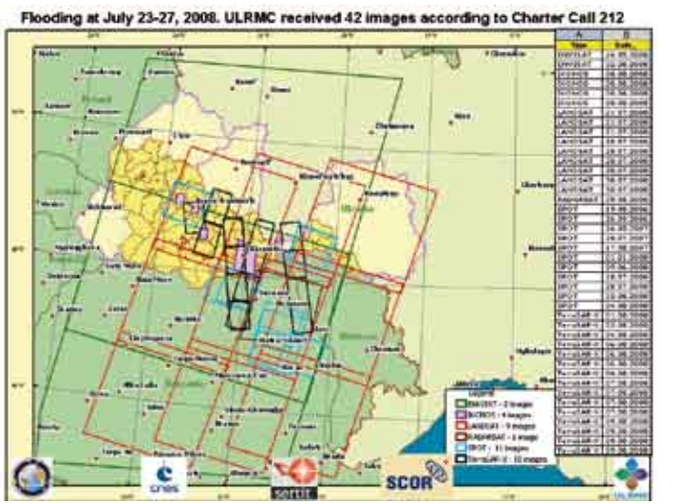


TerraSAR-X images of November 16th enabled photogrammetric interpretation from quantitative calculations, indicating locations of areas with high, average and low oil spill concentration (Credits: Infoterra GmbH for image delivery, ULRMC for image processing).

Management Centre's office (ULRMC) in Kiev.
The same morning, the picture was printed in A0 size and immediately delivered to the Vice Prime Minister in charge of coordinating the relief activities. He was shocked with the situation visible on the satellite image, since traditional information sources seemed not to report accurate information. Indeed, the satellite imagery suggested that oil spills had occurred as a result of the storm. It was therefore decided to acquire more TerraSAR-X images. The staff of ULRMC performed initial image classification to determine the intensity of the oil slicks observed in specific affected territories on November 16th, 22nd, 27th and 30th. Images were transferred from Germany to Kiev over the internet, where they were interpreted, printed and delivered to the Crisis Board, the Ministry of the Environment and the Council of Ministers of Ukraine.

FLOODS IN WESTERN UKRAINE AND ROMANIA, JULY 2008

In July 2008 floods caused by torrential rains in Ukraine and Romania claimed 17 lives and flooded 20,000 homes.
One of the first alerts came from a phone call by a friend's grandmother from western Ukraine. She had to walk a few extra kilometres to make the call, since the level of water rose so high that the bridge she was used to taking on her way home was closed. The problem seemed far away from us, but we tried to capture images of the small city of Galych in western Ukraine, from either the IKONOS or QuickBird satellites. On July 31st, 2008, while on a visit to DG JRC at the European Commission, we



Map and statistics of imagery supporting flood monitoring received under the International Charter "Space and Major Disasters". During the catastrophic flood events, ULMRC received 42 satellite images from 5 different satellites (ENVISAT, IKONOS, Landsat, SPOT, and TerraSAR-X) (Credits: ULMRC).

learned that the President of Ukraine had signed a special decree declaring six regions as affected by the flood of the Dnister river. There were indications that 30,000 homes might be flooded. The Ukrainian Government turned to the GEO (Group on Earth Observations) Secretariat in Geneva, which asked for the International Charter on Major Disasters to be activated on the same day (more about the Charter on page 39). The Minister of the Environment for Ukraine appointed the Ukrainian Land and Resource Management Centre (ULRMC) as the lead institution for co-operation with CNES, the French Space Agency, which had activated the Charter for the same floods, but at the request of the Romanian government. Images from several Space agencies from around the world started to reach ULRMC almost immediately. It was then a round-the-clock mission for ULRMC to integrate all data sources and *in situ* information coming from the Crisis Board.

Floods in Ukraine, July 23rd-27th, 2007. Map showing affected residences, as a result of integrated analysis of visible flood extent as seen by the Landsat satellite, against a background layer (QuickBird image) (Credits: Landsat, QuickBird, Digital Globe for the imagery, ULMRC for the processing).

Dr. Oleksandr KOLODYAZHNYY is the General Director of Ukrainian Land and Resource Management Centre (ULRMC), and a Secretary of the Ukrainian Inter-Ministerial delegation to the Ukraine/Poland Interstate Working Group on Geospatial Information. He is an expert on information requirements analysis, systems analysis, and system design and development using state-of-the-art remote sensing, database management, GIS, and web technologies. He has headed a number of environment-related international projects and grants. Prior to his tenure with ULRMC, he was the Head of "System Analysis of Remote Sensing" at the Space Research Institute of the National Academy of Sciences of Ukraine and the National Space Agency of Ukraine (NSAU). He represented NSAU in the Working Group on Information Systems and Services (WGISS) of the Committee on Earth Observation Satellites (CEOS) (1997-2004).

Jacek STUDENCKI is CEO of TECHMEX SA and SCOR SA (Satellite Centre of Regional Operations). He studied at Silesian Technical University's Department of Chemistry and graduated with a Master's degree in Engineering (1971-1977). He founded TECHMEX SA in 1995 and has been its CEO. He took the company public on the Warsaw Stock Exchange, he received a NOAA License to operate a Multi Source Ground Surveillance Ground Station and activated the Satellite Centre of Regional Operations in 2004, when it first received IKONOS imagery. His accomplishments include the signature of a contract with GEOEYE (former Space imaging), allowing the company to grow in the GIS Sector, as well as the realization of a large number of geospatial projects, including production of orthophotomaps from IKONOS satellite imagery for IACS-LPIS in Poland, NATURA 2000, LUCAS, CwRS, and for PECS proposals with ESA. He's made the firm one of the recent suppliers for MGCP – Multinational Geospatial Co-production Program of NGA. He has been involved in the project UKR04D, an in the construction of Ukraine's Geospatial Information Infrastructure. He is a member of the Interstate Ukraine/Poland Group on Geospatial Information.

Robert LACH studied architecture and urban planning in Gliwice, Poland, earned a scholarship at Harvard University's Graduate School of Design, then went on to practice in Barcelona (1985-1991). He was plenipotentiary of the Mayor of Gdansk for EUROCITIES, and was involved in the relocation of the Secretariat of VASAB 2010 (Visions and Strategies Around the Baltic Sea) from Stockholm to Gdansk, Poland (1995). He was one of the founders and the CEO of the Baltic Centre of GIS. He developed a joint investment plan on VHR imagery applications with TECHMEX in 2001. He advised Jacek Studencki, CEO of TECHMEX, during the preparation of the company for its IPO on the Warsaw Stock Exchange, he managed the design and monitored the implementation of SCOR's Satellite Ground Station in 2003-2004, and he prepared the PECS proposals of TECHMEX for the Warsaw Metropolitan Area and for the URBAN MONITOR PL PECS Project (2005-2008), aimed at improving the specifications of the European Urban Atlas, with Infoterra GmbH and GeoVille. In 2005-2009, he has spent half his time in Kiev. He is a member of the Interstate Ukraine/Poland Group on Geospatial Information.

IPCC counts on GMES to contribute to climate change research

GMES, BY COMBINING IN SITU AND SATELLITE OBSERVATIONS, WILL CONTRIBUTE TO INCREASING THE SCIENTISTS' UNDERSTANDING OF THE CAUSES, MAGNITUDE AND EFFECTS OF CLIMATE CHANGE. JEAN-PASCAL VAN YPERSELE, VICE-CHAIR OF IPCC HAS KINDLY AGREED TO PROVIDE *WINDOW ON GMES* READERS WITH AN INSIGHT ON WHAT COULD BE THE CONTRIBUTION OF GMES TO CLIMATE CHANGE RESEARCH.

Jean-Pascal van Ypersele (Credits: Frédéric Deleuze/UCL).

"Future changes in the Greenland and the Antarctic ice sheet mass, caused in particular by changes in ice flow, are a major source of uncertainty that could increase sea level rise projections. Uncertainty on the penetration of heat into the oceans also contributes to uncertainty as to the future Sea level rise.
Large-scale change in ocean circulation beyond the 21st century cannot be reliably assessed because of uncertainties over the supply of melt water from the Greenland ice sheet and over model responses to global warming.
Projections of climate change and its impacts beyond about 2050 are strongly scenario- and model- dependent, and improved projections would require improved understanding of the current sources of uncertainty, along with enhancements in systematic observation networks such as GMES, while maintaining the existing, mission-critical, ground-based observation networks.
Climate scientists typically define climate as an average of weather over a 30-year period, combined with relevant information over the same period of time. If satellites operate only for five years, and if there is no strict procedure to ensure continuity of measurements from one satellite to the next, then we will have very big difficulties getting useful information from satellites for climate studies.
Satellite Earth Observation is important and useful in understanding the causes and effects of climate change, but it is useful only if combined with in situ, *surface measurements, as is the case with GMES".*

Jean-Pascal van Ypersele is Vice-Chair of the IPCC (Intergovernmental Panel on Climate Change) and professor at the Université catholique de Louvain (Louvain-la-Neuve, Belgium)

THE IPCC

The IPCC (Intergovernmental Panel on Climate Change) is a scientific intergovernmental body tasked with evaluating the risk of climate change caused by human activity. The Panel was established in 1988 by the World Meteorological Organisation (WMO) and the United Nations Environment Programme (UNEP). The IPCC shared the 2007 Nobel Peace Prize with Al Gore.

GMES AND CLIMATE CHANGE

The contribution of GMES to the understanding, monitoring and mitigation of climate change will be provided by three of the so-called "Core Services": Land, Marine and Atmosphere. All three will seek to provide added value on the essential climate variables (ECV) as identified by GCOS (Global Climate Observation System). Furthermore, GMES will ensure the optimal integration of *in situ* data with Space-based observations. One of the core ideas behind GMES is also the continued and long-term availability of the required satellite infrastructure.
GMES services will provide information and data to climate change research through continuous, systematic, consistent and accurate observations. It will also enable the generation of long time series of consistent observation datasets and reanalyses of past observational data.
GMES will contribute to climate change research in the following areas:
Marine Core Service:

- Ocean monitoring and modelling (currents, temperature, salinity etc.) on the surface and sub-surface,
- Sea Level Rise monitoring,
- Ice-sheet monitoring, (extent, concentration, thickness, motion).

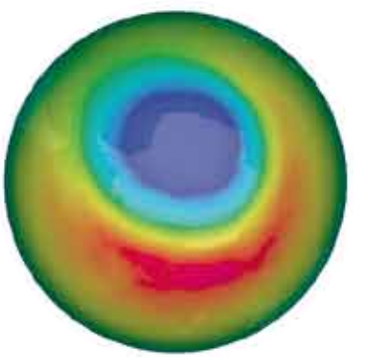
Atmosphere services:

- Monitoring of greenhouse gases and source/sink estimation,
- Stratospheric ozone monitoring (the "ozone hole"),
- Aerosol monitoring, source/sink estimation and climate forcing.

Land Monitoring:

- Geo-biophysical parametres on global and continental level (i.e. land related ECVs),
- Continental land cover and land cover change,
- Consequences of climate change on land use,
- Exposure to climate-related risks (e.g. more severe and more frequent storms, draught, fires, floods etc.),
- Monitoring of global carbon fluxes,
- Monitoring of glaciers and ice caps,
- Sustainable management of Africa.

Furthermore, Security and Emergency Response services will help to mitigate the effects of climate change ("climate refugees", floods and wildfires etc.)



Product example: GMES will provide a global-scale, long-term (1979-present), consistent record of total ozone column distributions, using data from multiple satellites and, where required, data assimilation techniques. Ground-based ozone observations will be used to validate and improve the quality of the data record. Monthly mean ozone for October 2007 (Credits: ESA/KNMI).

The MEDSUN GMES service helps prevent skin cancer by delivering personalised information about UV exposure straight to users' cell phones

AMONG FAIR-SKINNED POPULATIONS, SKIN CANCER OCCURRENCES ARE FORESEEN TO DOUBLE BETWEEN 2000 AND 2015. IT IS SAID THAT MORE THAN ONE PERSON IN TWO OVER THE AGE OF 65 WILL BE MARRED BY SKIN CANCER MORE THAN ONCE IN THE COURSE OF THEIR LIVES. OVER-EXPOSURE TO THE SUN AND UV-RADIATION IS THE OVERRIDING CAUSE BEHIND THIS DISEASE. YET NEARLY 90% OF SKIN CANCER CAN BE AVOIDED BY SIMPLE PROTECTION FROM ULTRA-VIOLET RADIATION.

ARPAT
Agenzia regionale per la protezione ambientale della Toscana

Sonia Cantoni

"The exposure to solar ultraviolet radiation is a very important topic amongst Environment and Health issues. *Solar UV is ubiquitous and nobody can reasonably avoid it. If sunlight is necessary to promote the production of vitamin D, overexposure can cause adverse health effects. ARPAT has supervised the deployment of the MEDSUN service over Tuscany during recent summers, both verifying its compliance with international standards and evaluating the appropriate functionality of the service.*
ARPAT has also contributed to the setting-up and validation of the service by providing the measurements of some terrain albedo* *(used to calculate the effective UV radiation reaching the user) and verifying good agreement between the satellite-derived UV indices and the ones measured* in situ. *During these years, the MEDSUN GMES service has proved to be a very useful tool for citizens, raising solar UV exposure risk-awareness and offering an instrument to help plan more conscious outdoor behaviour: a better environmental communication for an even healthier life!"*

Sonia Cantoni
General Manager of the Environmental Protection Agency of Tuscany Region – ARPAT

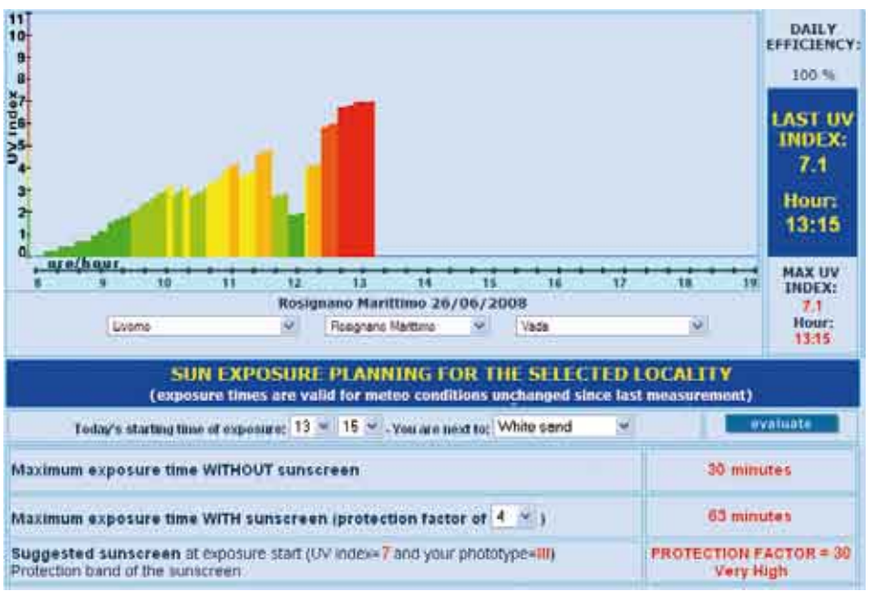
The Environmental Protection Agency of Tuscany Region (ARPAT) has a key role in environmental and citizen protection as well as in providing support to other public bodies in environment and health themes.
Since 2005, ARPAT has been an end user of the MEDSUN GMES service, intended to provide public information about local solar UV levels in order to avoid overexposure, increase awareness and develop good practices.

This user portrait was prepared with the kind assistance of Eleni Paliouras (DLR, PROMOTE).

THE MEDSUN SERVICE

Developed within the *PROMOTE* project, an ESA GMES Service Element, MEDSUN provides near-real time estimates of sunburn time in several regions around the Mediterranean. MEDSUN estimates the UV index by exploiting Meteosat-II images to evaluate cloudiness every 15 minutes and combines the information with stratospheric ozone concentrations, altitude, seasonal models of aerosol concentrations, and the wide area albedo* to account for sky-surface interaction. The UV index is then combined with a determination of the user phototype and minimum erythemal dose (via a clinically tested questionnaire) and with the sunscreen protection factor to yield a personalised sunburn time. The service is provided by Flyby and is available to the user via the internet and can even be delivered directly to the user's mobile phone via SMS (UV index, sunburn time). (www.medsun.it)

MEDSUN UV information can be sent directly to individual user's mobile phones by SMS (Credits: Flyby).



MEDSUN information panel on the web: exposure planning for a selected locality (Credits: Flyby).

** The albedo of an object or surface is the extent to which it diffusely reflects light from the Sun.*

Experiment demonstrates the potential of GMES Security services to contribute to the fight against drug trafficking in the Caribbean

THE CARIBBEAN BASIN IS A VORTEX FOR DRUG SMUGGLING BY SHIP BETWEEN PRODUCTION ZONES IN SOUTH AMERICA AND DESTINATION MARKETS OF EUROPE AND NORTH AMERICA. *LIMES*, A GMES PROJECT, HAS TESTED NEW MONITORING SERVICES TO SUPPORT NAVAL AND LAW ENFORCEMENT ACTIVITIES IN THE AREA.

Lieutenant Commander Benoît-Xavier Huet

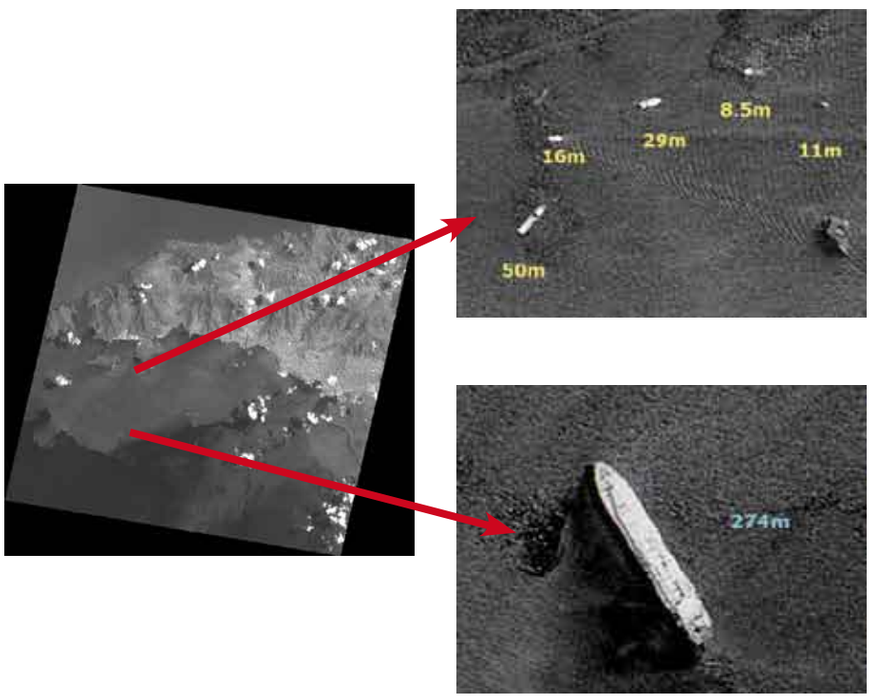
"Sea surveillance of ships suspected of drug smuggling poses specific sets of challenges. In the Caribbean zone, located far from France's main coastline, France has no permanent surveillance equipment such as signal stations, and some portions of the sea expanses are hard to monitor because of their sheer size. In addition, drug traffickers use a broad range of ship types – from slow ships of varied materials ranging from wood to resin, all the way to « go fast » boats as we call them.
We were pleasantly surprised with the information we received from GMES service providers through LIMES. *Only two hours after the satellite overpass, we would be handed pre-processed imagery from which we could work.*
Of course nothing replaces the human eye and there are limitations. For the time being, some of the satellites come around only every 48 hours, while optical sensors will never see through clouds. On certain sets of images ships less than 30 metres long are not visible and, finally, the 2-hour delay required for processing and transmission can be significant if you need to locate a ship in order to prepare an immediate intervention at sea.
That being said, GMES products are very promising tools, as they are well suited for large oceanic areas with little ship traffic. They also allow for the sort of low-profile surveillance that such operations require. Finally, performance is likely to get even better as:

- *GMES imagery gets integrated with data from other sources,*
- *Processing techniques further progress to allow detection of ships under ten metres, while processing time is brought under half an hour,*
- *More optical and radar satellites become available, allowing at least a daily coverage of the area."*

Lieutenant Commander Benoît-Xavier Huet,
Head of the Maritime Intelligence Coordination Cell,
West Indies Maritime Area Command, French Navy

THE *LIMES* CARIBBEAN EXPERIMENT

Within *LIMES* (a GMES Security project), a 30-day long experiment in the Carribean was conducted in June 2008. Its purpose was to provide satellite imagery (optical and radar) of boat traffic in distant maritime areas. It focused on two main requirements specific to the job at hand: sorting through a broad range of observation targets, and quickly processing and delivering information.
The end user was the French Navy (COMAR Fort de France, in the French *département* of Martinique) which participates in the anti-smuggling operations for the benefit of OCRTIS (the French anti-drug law enforcement unit). The *LIMES* partners operated out of four locations on both sides of the Atlantic: in Cayenne, French Guyana (EADS Astrium, Spot Image and Nevantropic), in Fort-de-France where the European Union Satellite Centre (EUSC) had positioned a GMES image analyst to assist the user throughout the experiment, in Ispra (Italy) at the European Commission's Joint Research Centre, and in Spain at EUSC's facilities.
As many as five satellites were used. Imagery was of two types – very high resolution for coastal and island zones, and high resolution for larger, high sea areas.



Ship detection from a wide-area satellite picture enabling determination of ship size and direction (Credits: LIMES*).*

GMES Marine services will help track polar "Monster Waves"

A REPORT ASSESSES THE CONTRIBUTION GMES COULD HAVE MADE IF IT HAD BEEN DEPLOYED WHEN A MONSTER WAVE HIT THE ISLAND OF LA RÉUNION. FROM MAY 12th TO MAY 14th, 2007, AN EPISODE OF SWELL HIT THE SOUTH COAST OF LA RÉUNION OFF THE COAST OF MADAGASCAR IN THE INDIAN OCEAN. SWELLS, A LONG, OFTEN MASSIVE AND CRESTLESS WAVE OR SUCCESSION OF WAVES TYPICAL OF THE SOUTHERN HEMISPHERE, OCCUR, ON AVERAGE, SEVENTEEN TIMES A YEAR AT LA RÉUNION, MORE SO DURING WINTER FROM JUNE TO SEPTEMBER. WHAT MADE THIS PARTICULAR EPISODE UNUSUAL IS THE 11.3 METRE-HIGH FLOOD WAVE OBSERVED AT 10PM ON MAY 12th, 2007. TWO FISHERMEN LOST THEIR LIVES. THE "MONSTER WAVE" ALSO REACHED MAURITIUS, WHERE IT CLAIMED MORE LIVES.

A report drawn up after the event for France's Ministry of Ecology, Energy, Sustainable Development and Land Planning by the "Conseil des Ponts et Chaussées", a French consultative body, made the following recommendations:

"• *Greater involvement by Météo France, particularly to improve forecasting, so that the authorities can receive useful information prior to the expected event with enough accuracy and anticipation. For that purpose, the data from the wave recorders installed at La Réunion should be collected in real time, in order to enable accurate monitoring of events.*
• *Météo France should work with the research institutions dealing with Space-based swell observation, in order to incorporate their findings into its operational practices."*

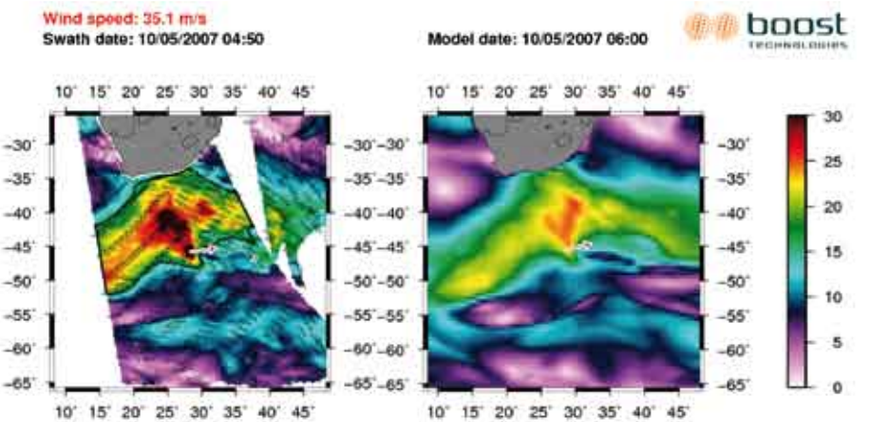
The report continues:
"This episode does not only emphasise the need to improve forecasting tools, it also demonstrates the importance of working from real-time in situ observation data, without which forecasters cannot confirm or invalidate [alert] bulletins related to such phenomena, as these currently cannot be observed in real time by satellites. Such capacity is essential in alert periods, to [evaluate] the validity of forecasts. At present, the wave recorder data from Saint-Pierre can only be retrieved manually once every hour. Real-time collection of wave recorder and tide gauge data (for tidal storms and tsunamis) is thus a capability that must be put in place rapidly […]

Interestingly, the enormous waves that hit La Réunion on May 12th, 2007, were monitored retrospectively using the measurements from ENVISAT, the European satellite, which followed the waves since they started to take shape, on May 8th, that is to say four days prior to the event."

Source: CONSEIL GENERAL DES PONTS ET CHAUSSEES, Report on La Réunion polar swell (n° 005222 of December 1st, 2007).

THE OFFICIAL REPORT EXPLAINS HOW GMES COULD HAVE IMPROVED THE FORECASTING OF THE EVENT

"The analysis performed by the models uses available satellite data, in particular from altimetry satellites (Jason, ERS etc) and SAR radars (ENVISAT), as well as from wind scatterometers (Metop).
The problem with these measurements is that ENVISAT is an experimental satellite […], hence the understandable reluctance of operational personnel to use them. […]
In the framework of the European Union's GMES programme, the Space component will include a series of operational Sentinel satellites dedicated to oceanography. From their deployment, it is realistic to expect improvements in the monitoring of the polar swells that regularly hit La Réunion's coastline."



Satellite observation of the storm winds that caused the huge waves that devastated the coast of La Réunion Island. The left panel shows the satellite-measured wind speed in colour, and the right panel shows the corresponding atmospheric model wind speed at the same time and location (Credits: ECMWF, NASA Quikscat. Source: ESA).

On May 12th, 2007, a monster wave over 11 metres high hit the French overseas province of La Réunion, claiming two lives (Credits: Faisal Affejee, www.photofaisal.com).

The aftermath of Hurricane Klaus in France or one week in the life of GMES Emergency Response services

by *Window on GMES* staff writers

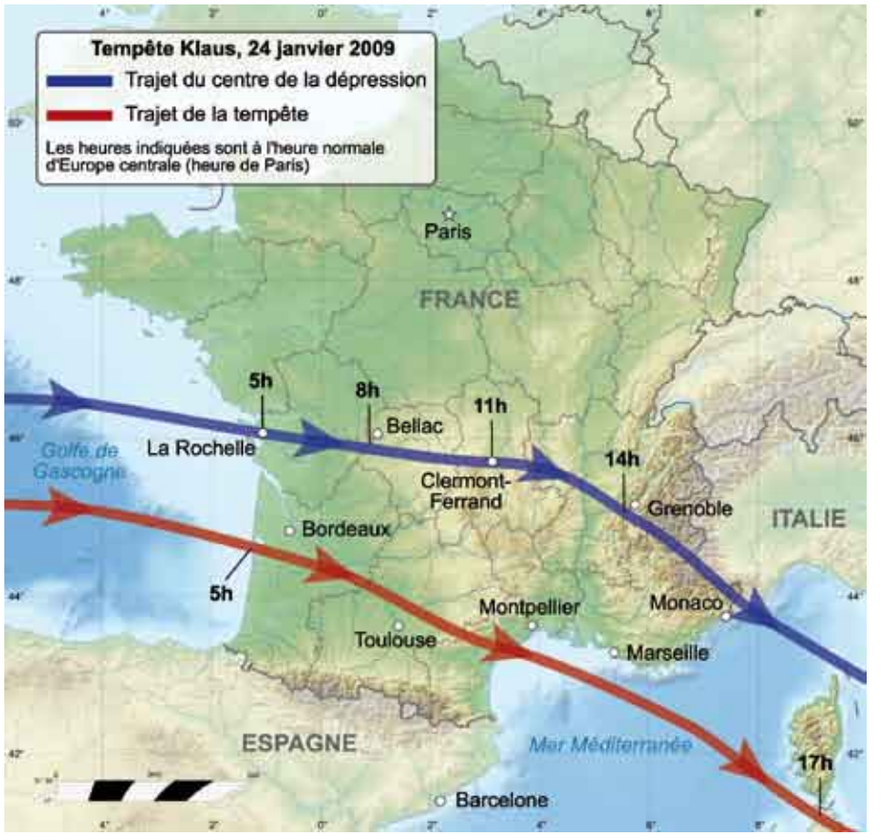
ON SATURDAY JANUARY 24th, 2009, HURRICANE KLAUS PLOUGHED WEST TO EAST THROUGH SOUTH-WEST FRANCE WITH GUSTS REACHING 198 KM/H AND SUSTAINED WINDS OVER 170 KM/H., ACCOMPANIED BY TORRENTIAL RAIN. THE STORM IS CONSIDERED TO BE THE MOST DESTRUCTIVE OVER FRANCE SINCE THE 1999 STORMS. ACCORDING TO ESTIMATES, IN THE MOST AFFECTED AREAS OF *LANDES*, HOME TO WESTERN EUROPE'S LARGEST FOREST, WINDFALL DAMAGE RANGES UP TO 60% OF THE FOREST COVER, INVOLVING APPROXIMATELY 40 MILLION CUBIC METRES OF WOOD, WHICH IS EQUIVALENT TO OVER SIX YEARS' WORTH OF ANNUAL HARVESTING. IN 1999 A PREVIOUS STORM HAD DESTROYED NEARLY 50% OF THE SAME FOREST.

Water courses burst their banks in a number of *départements*. The electrical distribution network was badly hit blacking out households and companies; 1.7 million homes lost power. On the 26th at noon, over half a million homes still had not regained power. Apart from the injured, 31 people lost their lives to the storm, 15 of them in France. A state of natural disaster was later declared for nine *départements* by the French Government.

Hurricane Klaus provided GMES Emergency Response services with a further opportunity to demonstrate their added value following catastrophic events

The red alert was transmitted by Météo France in the evening of January 23rd. Teams at SERTIT in Strasbourg were placed on stand-by duty after receiving calls from the Headquarters of the South-West Civil Defence Zone, and from the ATGeRi (a grouping of public institutions such as the Aquitaine Region, the departmental Fire and Rescue services, the French National Forestry Office etc.) responsible for forest-related emergency response in the area. Very early on, specialists started to get ready to identify the high risk areas, to prepare reference maps, to develop a satellite tasking plan (selecting the most appropriate satellites, among those available within the Charter mechanism

"Vigilance Map" issued by Météo France on Saturday, January 24th, at 08:10am (Credits: Météo France).



The trajectory of Hurricane Klaus over France (Credits: Wikipedia).

– refer to box p. 39 – according to their orbit type and timing, to their sensor types and their applicability to a hurricane and floods scenario etc.).

At around 5:00am on the 24th, the hurricane made land on the coast of France, south of Bordeaux and the disaster started to unfold.

As of the very early morning of the 24th, Météo France was delivering updated so-called "Vigilance Maps" every two hours. In the afternoon, the Vigilance Maps started forecasting floods that could follow in the wake of the hurricane.

On Sunday February 24th at 20:32 UTC, the French Civil Protection triggered an activation of the International Charter "Space and Major Disasters" (refer to box below) in order to gain access to the required satellite and image processing resources. Initially, satellite imagery was requested for the entire south-western third of France. In the afternoon of January 25th, anticipating the floods announced by Météo France, the French Civil Protection requested a second activation of the Charter, limiting the area of interest to a zone from Bordeaux to the Pyrénées mountains, where the most severe floods could be expected, based on the meteorological

SERTIT

SERTIT is a remote sensing and image processing service provider. It was created in 1987 and is hosted by the Strasbourg University.
SERTIT is specialised in Emergency Response remote sensing applications. It is financially supported by the European Space Agency (ESA) within the *RISK-EOS* GMES Service Element, and has been contracted by the French Space Agency (CNES) to produce added value EO-derived products (reference mapping and rapid crisis mapping) within the framework of the International Charter "Space and Major Disasters".

forecasts and the hydrological models. After a long week-end, the SERTIT team was asked to perform value adding mapping tasks on the afternoon of January 26th, and delivered the first crisis products to the Civil Protection in the evening – flooded areas near Montauban, Toulouse region – derived from a satellite acquisition of January 24th.The next satellite acquisitions took place in the afternoon of the 26th (Japan's ALOS PALSAR satellite) followed by more acquisitions on the 27th (ESA's ENVISAT satellite) and on the 30th (SPOT 4). This enabled SERTIT to deliver a series of crisis products highlighting the flooded areas in the basins of the rivers Adour, Dordogne, Garonne, Isle and Charente (refer to image below).

Crisis map indicating (in light blue) the areas potentially flooded in the Adour River basin, near Dax, produced by combining a Landsat image from July 2001 with data captured by ESA's ENVISAT satellite on January 27th, 2009 (Credits: ESA and USGS for the imagery, SERTIT for the processing).

Road flooded in the aftermath of hurricane Klaus, in Saint-Vincent-de-Paul in the region of Dax, in the south-west of France (Credits: Alain Duvignau).

Although this result is already quite remarkable, it is still based on a best efforts principle, as stipulated in the Charter. Specialists worked long hours over a week-end and at night. The European Space Agency, its Japanese counterpart, French Space Agency CNES and Spot Image mobilised their satellite resources, while CNES was acting as coordinator. It is expected that the future GMES Emergency Response service will contribute to a decreased response time.

The main areas where progress is to be achieved in the future, and in particular in the framework of the *SAFER* project (refer to news item on page 87), are as follows:

- Production, when needed and in anticipation of possible emergencies, of reference maps for disaster-prone areas in Europe and around the world;
- Improvement of emergency service mobilisation and activation procedures;
- Development (based on precursory work conducted in the *BOSS4GMES* project) of an automated tool to ease and speed satellite tasking (automatic selection of the satellite best suited for the job, and an automatic imagery ordering system) and increase its efficiency;
- Structuring of a network of European service providers capable of maintaining an operational capability 24 hours a day, seven days a week all year around, in order to cope with emergencies of all types (floods, hurricanes, earthquakes, landslides, wildfires, tsunamis, volcanic eruptions, humanitarian crises etc.) anywhere in Europe or in the world;
- Ensuring the delivery to decision makers and field teams of derived products adapted to their needs.

Reference map: woodland mapping before the crossing of Klaus over the Parc Naturel Regional des Landes de Gascogne, Aquitaine Region, produced from SPOT 5 reference data (Credits: CNES/Spot Image and USGS for the imagery, SERTIT for processing).

The availability of a greater number of satellites possessing the appropriate sensors, several of them in constellations, such as the Sentinel family of satellites being developed as part of the Space Component of GMES, and also so-called "contributing missions" whose operators are not Parties to the Charter agreement (such as the COSMO-SkyMed or TerraSAR-X satellites equipped with radar payloads) will also contribute to the improved performance of Emergency Response services.

This will result in the capacity to deliver reference maps in six hours or less after an activation of the service and crisis maps 24 hours thereafter, while the response time was of 48 hours in the case of Hurricane Klaus.

But crisis maps were not the end of the story, as far as GMES products related to Klaus are concerned… After the end of the crisis, the Charter moved on to other emergencies (floods in Morocco, wildfires in Australia etc.) but there was still a lot to do in France to cope with the catastrophic consequences of Klaus, in particular for the forests of the Landes.

Amongst the work still to be performed there was still the contribution from Earth Observation to the evaluation of the damage to the forests. This evaluation is important for several reasons:

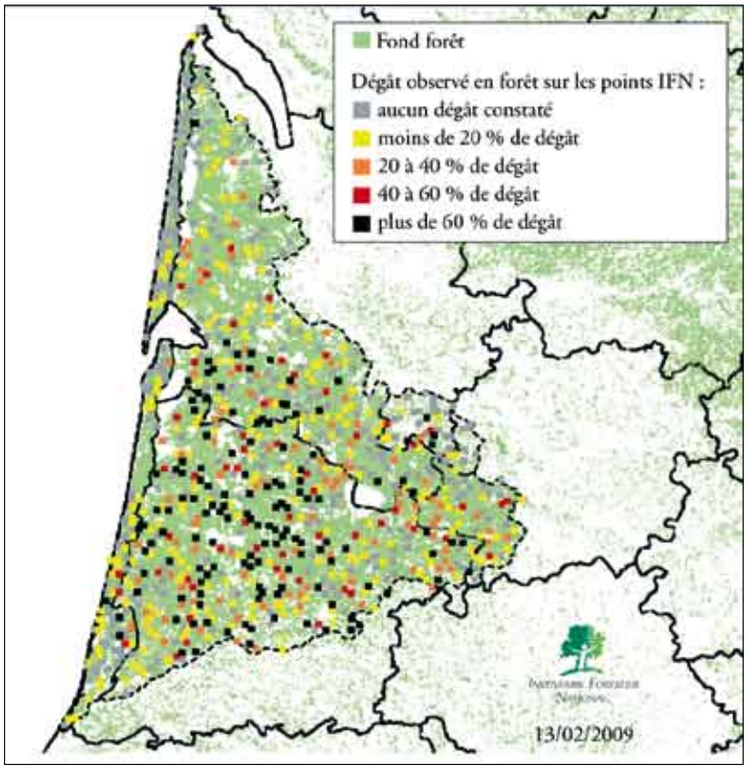
- To set priorities for on-site interventions (clean-up, hazards to forestry personnel or to the public, clogged ditches increasing the flood risk etc.);
- To devise relief measures for affected forest owners;
- To update plans for the next fire season and to cope with potential sanitary risks.

Traditional evaluation methods rely on the use of cameras mounted on aeroplanes or helicopters. These airborne assets are neither available, nor useable around the clock, they are quite expensive to operate and maintain, they

By comparing archive SPOT 5 imagery from June 6th, 2006, to an image acquired on January 29th, 2009, Spot Image was able to produce this basic mapping of the most affected wooded areas (in blue) south of Arcachon (Credits: CNES/Spot Image).

60% of the Landes pine forest was allegedly destroyed by Hurricane Klaus (Credits: Hélène Surget).

Preliminary test sample of an estimate of damage to the forest cover around the town of Belin-Beliet (south-west of Bordeaux). Areas where anomalies in the forest cover have been detected by comparison with pre-storm imagery are featured in red (Credits: CNES/Spot Image and ESA for the imagery, SERTIT for processing).



Damage assessment report produced by France's National Forest Inventory (Inventaire National Forestier - INF) for the Landes forest. This report was produced from on-site surveys, three weeks after Hurricane Klaus. Earth Observation should enable reduced delivery times in the future (Credits: INF).

are not environmentally friendly (what about their carbon imprint, while the satellites are already there) etc. These airborne surveys are complemented by on-site verifications, but after a major hurricane like Klaus, these can be dangerous, in windfall areas, for the forestry personnel, or difficult if not impossible because of closed or damaged logging roads. Finally, airborne reconnaissance campaigns take time, especially when the areas to be surveyed are very large, as in the case of Hurricane Klaus.

Remote sensing can therefore be of great use to produce fast and seamless estimates of the damage to the forest cover. In the case of Klaus, test products have been produced by SERTIT, after another week-end of work and sent to forestry services in early February. They are currently being validated *in situ* by Forestry services (refer to example on page 37).

When such GMES forestry damage evaluation services are fully validated, it will become possible to integrate them into the operational processes of forestry services and, hopefully, decision makers will be able to access dependable information sooner.

The International Charter "Space and Major Disasters"

In July 1999, the European and French Space agencies (ESA and CNES) initiated the International Charter "Space and Major Disasters", with the Canadian Space Agency (CSA) signing the Charter in October 2000. The following agencies subsequently joined the Charter as members:

- US National Oceanic and Atmospheric Administration (NOAA)
- Indian Space Research Organisation (ISRO)
- Argentine Space Agency (CONAE)
- Japan Aerospace Exploration Agency (JAXA)
- United States Geological Survey (USGS) as part of the U.S. team
- UK's BNSC/DMCii
- China National Space Administration (CNSA).

The International Charter was declared formally operational on November 1st, 2000. It aims at providing a unified system of Space data acquisition and delivery to those affected by natural or man-made disasters through Authorised Users. Each member agency has committed resources to support the provisions of the Charter and thus is helping to mitigate the effects of disasters on human life and property.
An Authorised User can call a single number to request the mobilisation of the Space resources (satellites such as RADARSAT, ERS, ENVISAT, SPOT, IRS, SAC-C, NOAA satellites, Landsat, ALOS, DMC satellites and others) of the member agencies and the associated ground infrastructure, to obtain data and information on a disaster occurrence.
A 24-hour on-duty operator receives the call, verifies the request and passes the information to an Emergency On-Call Officer who analyses the request and the scope of the disaster with the Authorised User, and prepares an archive and acquisition plan using available Space resources.
Data acquisition and delivery takes place on an emergency basis, and a Project Manager assists the user throughout the process.
GMES Emergency Response services work in close cooperation with the Charter and could become the EU's leg of the Charter when GMES is fully operational.

This article has been written with the kind assistance of Paul de Fraipont (SERTIT) and Franck Ranera (Infoterra France).

GMES "Urban Atlas" delivers digital maps for city planning and paves the way for fruitful inter-city comparisons across Europe

WITH THE UPCOMING RELEASE OF THE « URBAN ATLAS », FOR THE FIRST TIME THIS YEAR GMES WILL SUPPLY DIGITAL MAPS OF 185 CITIES FROM ALL 27 EU MEMBER STATES. BY 2011, THE ATLAS WILL COVER MOST OF THE CITIES OF THE UNION LARGER THAN 100,000 INHABITANTS. IT IS EXPECTED BY THE EUROPEAN COMMISSION THAT THE URBAN ATLAS WILL DEMONSTRATE THE BENEFITS OF ECONOMIES OF SCALE BROUGHT BY GMES.

Prior to the Urban Atlas, data available through the CORINE European land cover data set had been geared to land cover and land use and its change over time in a generalised way at a European level. The Urban Atlas aims to deliver the detailed mapping that city planners require to monitor and manage urban densely populated areas. Such digital mapping, compiled from images acquired by satellite can, for instance, help city planners gain a better understanding of urban functions and their change, and, provide information to support flood prevention, for studies of climate change impact and for infrastructure and public transport planning and development. The ability to superimpose additional layers of data over the maps makes the service so much more useful. The Urban Atlas also offers cities the opportunity to build further detail on top of these maps, through the development of so-called "downstream services."

Because the Urban Atlas classifies urban functional zones, i.e. the dominant use of city blocks, it opens the way for fruitful inter-city comparisons on factors such as industrial or residential density, green areas, flood risks, and urban sprawl. This means cities can compare their land use patterns and learn from the experiences of other cities across Europe.

The Urban Atlas is the most recent focus of an initiative first launched as a pilot project in 2003 under Eurostat coordination: the Urban Audit. Then the project covered 15 countries – i.e. all members of the European Union at that time. Data collection is now scheduled to take place every three years, and the Urban Atlas is considered to be a major advance for the future of Urban Audit. Urban Audit seeks to track a broad set of indicators and to uncover trends for issues that are of particular importance to city planning – including demography, culture and recreation, as well as transport.

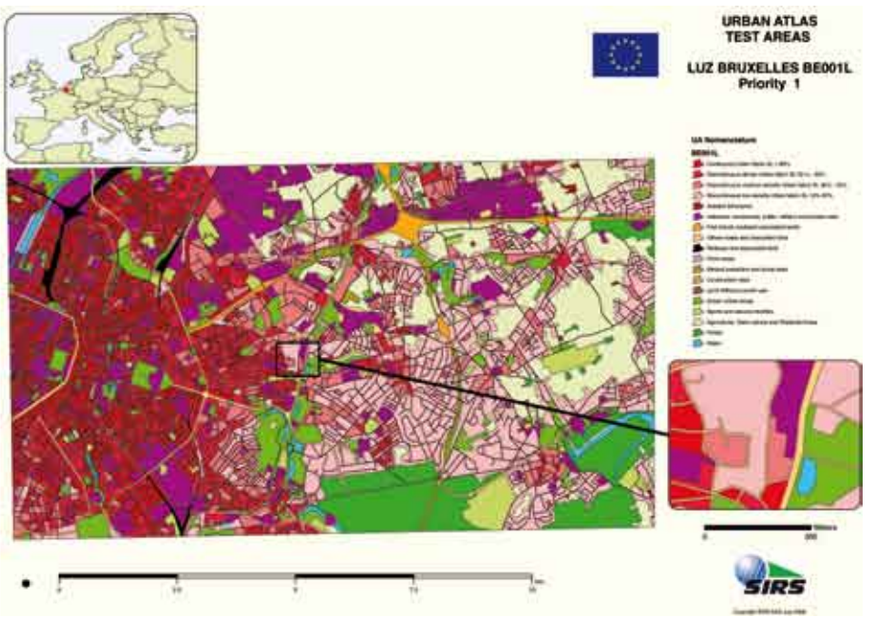
Commission Vice-President Günter Verheugen, responsible for Enterprise and Industry, and Commissioner Danuta Hübner, responsible for Regional Policy, issued a joint statement after the Urban Atlas contract signature:

"European cities and municipal authorities face significant new challenges for future urban planning and this project provides a practical and cost-effective solution for their needs. The Urban Atlas demonstrates the benefit of an integrated European approach and is an excellent example of how Space-based applications contribute to local solutions across Europe."

Günter Verheugen and Danuta Hübner (Credits: European Commission).

The European Commission district of Brussels (Credits: Melanie and John Kotsopoulos).

The Urban Atlas contract, a GMES Preparatory Action, was awarded as a combined project of the Regional Policy DG and the Enterprise and Industry DG, after a European tender, to SIRS (Systèmes d'Information à Référence Spatiale), a French SME from Villeneuve d'Ascq (Lille region). The contract is a service contract for the delivery of maps of major European urban



A test sample of the Urban Atlas: the centre-east part of Brussels (Credits: SIRS).

This article has been compiled from material received from the European Commission.

agglomerations. The work consists of the serial production of land use/land cover maps of larger urban zones (LUZ), as defined in the Urban Audit. The work is to be based on satellite images of the reference year 2006 ±1 that will be made available by the EC through ESA. The output of the work will be in the form of GIS (Geographical Information System) compatible vector maps for each urban agglomeration. With initial financial support of € 1 million from the European Regional Development Fund (ERDF), Urban Atlas is demonstrating the benefit of economies of scale in GMES. Full operability is targeted for 2011, with the first edition of the Urban Atlas, covering 185 cities (see list), due out later this year.

The delivery of these digital maps to the final end users – the European cities and their respective planning departments – will lead to a real validation of the impact of the Urban Atlas Project, its approach and results.

THE 185 EUROPEAN CITIES TO BE MAPPED UNDER THE FIRST PHASE OF THE URBAN ATLAS

AUSTRIA Graz Innsbruck Linz Salzburg Wien BELGIUM Antwerpen Brugge Bruxelles Charleroi Gent Liège Namur BULGARIA Plovdiv Sofia CYPRUS Lefkosia CZECH REPUBLIC Brno Ceske Budějovice Liberec Olomouc Ostrava Plzen Praha Usti nad Labem DENMARK Aarhus København ESTONIA Tallinn Tartu FINLAND Helsinki Oulu Tampere Turku FRANCE Aix-en-Provence Bordeaux Clermont-Ferrand Grenoble Le Havre Lille Lyon Marseille Metz Montpellier Nancy Nantes Nice Orléans Paris Rennes Rouen Saint-Etienne Strasbourg Toulon Toulouse Tours GERMANY Berlin Bielefeld Bonn Bremen Dresden Essen Frankfurt am Main Hamburg Hannover Karlsruhe Köln Leipzig Mönchengladbach München Nürnberg Stuttgart Trier Wuppertal GREECE Athina Irakieio Joannina Larisa Patra Thessaloniki Volos HUNGARY Budapest Debrecen Győr Miskolc Pécs IRELAND Cork Dublin Galway Limerick Waterford ITALY Bari Bologna Brescia Cagliari Catania Firenze Genova Milano Modena Napoli Padova Palermo Reggio di Calabria Roma Taranto Torino Trieste Venezia Verona LATVIA Liepaja Riga LITHUANIA Kaunas Panevėžys Vilnius LUXEMBOURG Luxembourg MALTA Gozo Valletta NETHERLANDS Amsterdam Apeldoorn Breda Eindhoven Groningen Nijmegen Rotterdam Tilburg Utrecht POLAND Białystok Bydgoszcz Częstochowa Gdansk Katowice Kielce Kraków Lodz Lublin Olsztyn Poznan Radom Szczecin Torun Warszawa Wroclaw PORTUGAL Aveiro Braga Coimbra Funchal Lisboa Oporto Setúbal ROMANIA Brăila Bucuresti Ciuj-Napoca Craiova Timişoara SLOVAKIA Banska Bystrica Bratislava Kosice Nitra Prešov SLOVENIA Ljubljana Maribor SPAIN Alicante Barcelona Bilbao Córdoba Gijón Las Palmas Madrid Murcia Palma de Mallorca Sevilla Valencia Valladolid Vigo Zaragoza SWEDEN Göteborg Malmö Stockholm Uppsala UNITED KINGDOM Birmingham Edinburgh Glasgow Leeds Liverpool London

GMES Spatial Planning services for Europe and its Regions

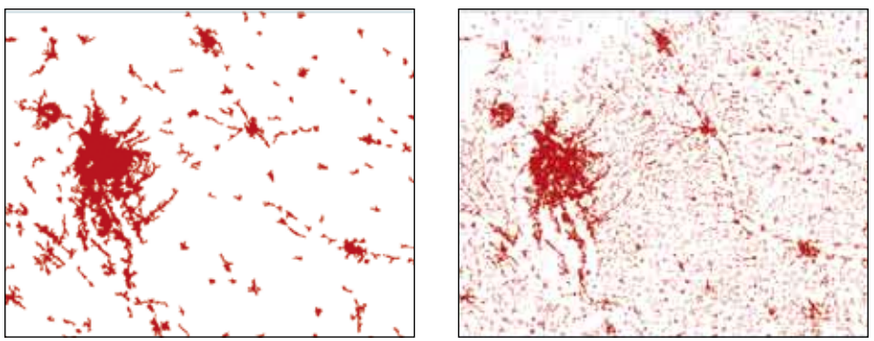
by Juergen Weichselbaum, Christian Hoffmann and Steffen Kuntz

WITH PRESSURE RISING ON ORGANISATIONS AND AGENCIES TO ASSESS THE ENVIRONMENTAL IMPACT OF REGIONAL POLICIES AND ACTIVITIES, THERE IS EVER-GROWING DEMAND FOR RELIABLE LAND USE DATA AND INFORMATION PRODUCTS. EVERY DAY, IN GERMANY ALONE, SOME 100 HECTARES OF LAND – THE EQUIVALENT OF 200 FOOTBALL FIELDS – ARE LOST TO URBAN DEVELOPMENT AND TRANSPORT INFRASTRUCTURE. WITH 75 PER CENT OF EUROPEANS LIVING IN URBAN AREAS, IT IS A SIMILAR STORY ALL ACROSS THE CONTINENT.

Strategies for soil protection and monitoring systems are urgently needed all over the world. Initiatives such as the Global Monitoring for Environment and Security (GMES) were established to address those issues by building a space- and ground-based infrastructure to provide reliable and timely Earth Observation information services.
Integrated spatial planning is a key element for limiting quality of life degradation and socio-economic losses that result from unbalanced land development and climate change. Uncontrolled land take by urban growth and the irreversible sealing of soil may aggravate the impact of floods through faster run-off, thereby increasing the exposure of local populations to risk and endangering both housing and infrastructure facilities.

Pre-GMES monitoring (CORINE Land Cover)

GMES monitoring (Land Monitoring Core Service)



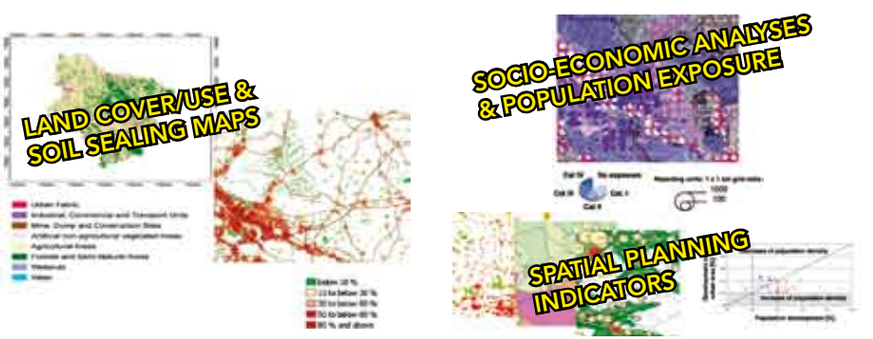
GMES reveals a 'real-world' picture of built-up areas, enabling regional governments and European authorities to engage in effective spatial planning and territorial monitoring based on more detailed information (Credits: EEA; GeoVille GmbH).

GMES Spatial Planning services for European and regional administrations

The *impervious area and sealing level* service within *GSE Land* (an ESA GMES Service Element) offers a solution to monitor urban growth and soil sealing from European down to regional administrative levels. The service provides a portfolio of spatially referenced and consistent geo-information products (maps, statistics, indicators and scenarios), addressing specific information needs arising from a number of regional, national and European directives and policies. Such data supports spatial planning authorities across Europe in their efforts to fulfil a broad range of monitoring and reporting obligations. The users of the service are spatial planning departments within regional governments as well as national or federal Environment Agencies. In addition, the service caters for the specific information needs of European Commission services.

The Spatial Planning geo-information services are based on the land cover and land use information derived from high-resolution Earth Observation (EO) data. Within GMES, European service providers have developed a highly-automated land use mapping application that further increases the reliability and data throughput of traditional processing approaches. The result provides European institutions, government bodies, and commercial customers with harmonised, cross-border land use data that enables users to make better decisions.

The land cover/land use maps depict with great accuracy the extent, development and density of built-up areas. They are subsequently integrated with ancillary geospatial and statistical data for use in Geographical Information procedures and models. These derived information products open the way for analysing demographic developments and urban land take trends and for describing the state of land consumption and its impact on the environment. An example is the utilisation of the spatially explicit built-up areas to refine coarse demographic statistics by spatial disaggregation modelling. The resulting localised statistics are a key input for relevant spatial planning indicators and for risk management applications. As a further element of the product portfolio, urban growth models can be employed to simulate and forecast potential scenarios of future urban land use change.



Integrated product portfolio for spatial planning, bringing together Earth Observation and in situ *data (Credits: GeoVille GmbH).*

Selected key policy questions answered	Service benefits
• How much and in what proportions is land being taken for urban and other development? • Where does the most significant land-take occur? • What are the drivers of uptake for urban and other artificial land development? • How many people are affected?	• Enriching bare statistics with geospatially explicit information • Guaranteeing European consistency and comparability • Facilitating the evaluation of policy options • Improving decision-making through better planning information • Moving from observing and monitoring to policy evaluation

GMES Spatial Planning services win user-funded extension in Lower Saxony

The State Authority for Mining, Energy and Geology of Lower Saxony in Germany (Landesamt für Bergbau, Energie und Geologie, Niedersachsen - LBEG) has been utilising Spatial Planning services from *GSE Land*. LBEG is the primary state-level expert body for soil protection in Lower Saxony, subordinate to the Ministry of Economics, Labour and Transport. It holds the legal mandate for monitoring, reporting and management of land resources, including built-up areas and soil sealing. It was among the first public organisations to be active in GMES, employing this new Earth Observation intelligence tailored to the objective of mitigating the impact of climate change.

The Lower Saxony areas of Hanover, Braunschweig und Lüneburg were covered as part of the *GSE Land* project. In order to obtain full coverage of the Federal State of Lower Saxony, LBEG financed the mapping of the missing areas in the region of Weser-Ems. The data was produced jointly by the GeoVille group and Infoterra GmbH and the mapping has already been published on the LBEG geodata web portal (http://memas01.lbeg.de/lucidamap/index.asp).

User testimony

"Being responsible for the protection of soils in Lower Saxony, the State Authority for Mining, Energy and Geology (LBEG) looked for a comprehensive land take monitoring service. The products generated by GeoVille through the ESA-GSE Land project fitted our needs, although they were limited to certain regions. We thus decided to place an order for these geo-information products for the entire State, as they represent a critical input for our soil information system."

Dr. Marion Gunreben
Dept. for Agriculture and Soil Conservation, Regional Planning / LBEG
State of Lower Saxony, Germany

Landesamt für Bergbau, Energie und Geologie

Integrated spatial planning is a key element for limiting degradation of quality of life and socio-economic losses that result from unbalanced territorial developments (Credits: Michael Buckley).

GSE Land is a GMES Service Element funded by the European Space Agency (ESA) within the European GMES initiative. The *GSE Land Impervious Areas and Sealing Levels* service provides relevant mapping and information services for spatial planning authorities at regional, national and European levels, providing insight into recent and future transboundary land-take trends and their impact on the environment. Through the recently started *geoland2* project, Spatial Planning Information will be developed into a fully operational service (refer to the article page 79).

Conclusion and Outlook

GSE Land has implemented Spatial Planning services in Regions across nine European countries. It has served as an important reference for the first implementation step of the European GMES Land Monitoring Core Service via the "*GMES fast track service on land monitoring - high resolution core land cover data for built-up areas, including degree of soil sealing 2006*" project implemented by the European Environment Agency together with the European Commission and the European Space Agency. This roll out of the service covers 38 countries spanning Europe from Portugal to Turkey and from Sicily to the North Cape.

In the frame of *geoland2*, the new GMES Land project, the Spatial Planning information services will be made further operational so as to foster the utilisation of innovative Earth Observation derived land cover / land use products for spatial planning applications at European, national and regional levels. A core set of policy-relevant indicators and urban growth scenarios will be rolled out to larger European implementation sites addressing, in particular, the impact of Trans European Networks (TENs) on urban land use change. This will further strengthen the role of EO-derived information products, as part of user-side decision-support systems and management tools, for the benefit of spatial planning and environmental impact assessments and, in the longer term, for the benefit of each and every European citizen.

Degree of soil sealing, per commune (LBEG)

Degree of soil sealing, High Resolution (GMES)

Comparison of existing soil sealing maps derived from classified ALB data (Automated Real Estate Register, part of the German cadastre) at the commune level (left) and high-resolution GMES soil sealing map (right) (Credits: LBEG, left image; ESA GSE Land, Geoville GmbH and Infoterra GmbH, right image).

GMES Spatial Planning services help to answer such key policy questions such as: How much and in what proportions is land being taken for urban and other developments? (Credits: François Schnell).

Jürgen WEICHSELBAUM holds a masters degree from the University of Vienna. He is a spatial planner with long-term experience in remote sensing and GIS (Geographical Information Systems) and is the Technical Director of GeoVille. He has been working in remote sensing and, for seven years, in projects related to spatial planning and environmental monitoring around the globe. He is GMES Technical Project Manager for the GeoVille group.

Christian HOFFMANN is the founder and Managing Director of GeoVille. The GeoVille Group is a private sector enterprise located in Austria and Luxembourg. It specialises in products and services related to Earth Observation and Geographic Information Systems applications. It is the leading company in Europe in using satellite data for spatial planning applications. Christian Hoffmann is also Task Manager for Spatial Planning in GMES Land and a member of the *geoland2* Executive Board.

Prof. Dr. Steffen KUNTZ holds a degree in forestry and has more than 25 years of experience in remote sensing applications for environmental monitoring. He is currently working at Infoterra GmbH as senior advisor for geo-information services. In this position he acts as project manager for GMES projects such as ESA´s *GSE Land*. He was task manager for the GMES Land Monitoring Core Service in FP 6 project *geoland*, leads the Land group in the FP 6 project *BOSS4GMES* and is designated task manager for the FP7 project *geoland2*. Since 2005 he has been teaching remote sensing and Geographic Information systems at the Albert-Ludwigs-University, Freiburg.

GMES supports a 'bottom up' approach to national and European-level land cover mapping - an example from the UK

by Geoff Smith

ONLY THROUGH HARMONISED MAPPING OF LAND COVER CAN GMES ACHIEVE SEAMLESS CROSS-BORDER MAPPING SUPPORT TO THE IMPLEMENTATION OF EUROPEAN POLICIES AND DIRECTIVES. THERE CAN BE TWO APPROACHES TO THIS MISSION – TOP DOWN THROUGH A COMMON STANDARDISED APPROACH – VERSUS BOTTOM UP, BUILDING ON EFFORTS AT MEMBER STATE LEVEL. EARTH OBSERVATION-BASED LAND COVER MAPPING HAS RUN INTO THIS ISSUE.

Europe's existing heritage is based on the 'top down' approach of the CORINE programme (COoRdination of INformation on the Environment) under the coordination of the European Environment Agency (EEA). CORINE (or CLC, for CORINE Land Cover) provides a 44-class land cover/land use nomenclature which ensures a consistent, standardised approach for continent-wide Europe, with respect to a specific 'reference year'. Such a 'top down' approach provides a harmonised tool for European-level usage, as well as a mapping solution where Member States do not have their own national land cover programmes.

However, the standardised nature of CORINE implies, by definition, a generalised approach which may not necessarily be tuned to specific Member State mapping requirements – either in terms of the nomenclature or the 'minimum mapping unit' at which it is applied. Some Member States therefore have their own land cover mapping programmes, designed to their own specifications, which can however still make use of the same (or similar) satellite data acquisition strategy as the Land Monitoring Core Service (LCMS), drawing upon a common GMES 'data service'. Such Member States can agree to transpose their national products to the European common specification as required; latterly to the 2006 update of CORINE (the so-called CLC2006). This 'bottom up' approach has tighter links to national *in situ* data, field mapping, national priorities and perspectives. Also, Member States are able to validate pan-European products with local knowledge and to work towards adopting a common data model to achieve interchangeable map products.

The LMCS therefore has adopted a dual approach, encouraged by the GMES Land Implementation Group, to ensure both 'top down' and 'bottom up' perspectives are included in GMES service development.

The Corine Land Cover 2000 data for the UK. The colour key denotes the European CORINE scheme, where the map has been generated by simplifying and recoding the UK 'Broad Habitats' product (Credits: Centre for Ecology and Hydrology).

The more detailed Land Cover Map 2000 for the UK. The colour key denotes the various land cover classes adopted to represent the UK 'Broad Habitats' nomenclature (Credits: Centre for Ecology and Hydrology).

UK land cover mapping – enforcing EU standards while also pursuing specific national mapping interests

The United Kingdom has always endeavoured to link its national mapping activities closely to those at European level. The key to this has been the generalisation of detailed national land cover mapping to the CORINE format as the UK's contribution to this European programme. For the most recent iteration of UK national mapping and the CLC2006 production, this integration has been taken one step further by adopting the GMES IMAGE2006 data set as the main source of EO data for national re-use. The current activities in the UK therefore represent a clear demonstration of a GMES service which supports national activity, which in turn ultimately feeds into European requirements with added value supplied by the Member State.

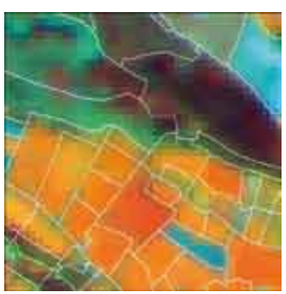
The UK national land cover

The UK national land cover mapping activity is part of the Countryside Survey programme (http://www.countrysidesurvey.org.uk/) which is funded by a partnership of government bodies led by the Natural Environment Research Council (NERC), through the Centre for Ecology and Hydrology (CEH), and the Department for Environment, Food and Rural Affairs (Defra) and undertaken by CEH.

The UK produces land cover maps at intervals of approximately 8 to 10 years, based on the analysis of multi-date data to capture the seasonal behaviour of different land cover types. Over time the approach to mapping has developed from 'simple' analysis in the early 1990s, based on the information content of the imagery only, to 'modern' object-based approaches which are able to incorporate existing national cartography in order to achieve a more accurate and spatially precise result. For the UK's Land Cover Map 2007 (LCM2007) that is currently in production, detailed national cartography has been generalised and supplemented by additional data to produce a 'land parcel' data set which meets a spatial specification for a 0.5ha minimum mappable unit (the smallest geographic area recorded by the mapping process) and 20 metre minimum feature width (referring to linear features in the landscape). The land parcels are then classified using multi-date satellite imagery, together with ancillary information such as digital elevation models and soil type.

As part of the GMES Land Monitoring Core Service (LMCS), the IMAGE 2006 data set of multi-date satellite images for the reference year 2006 (± 1 year) was acquired under the coordination of the European Space Agency, and is available both for mapping directly to the European specification by the LMCS and for re-use by national agencies. The IMAGE2006 satellite data compilation is a mixture of imagery from two different satellite systems (SPOT 4/5 XS and IRS LISS-III data with 4 spectral bands and re-sampled to 20 metre spatial resolution). These images have been the main satellite data input for producing the 'core' European land cover information (CLC2006 and Soil Sealing layer). Acquisitions were made for two dates, selected to Member State specifications or a minimum of six weeks apart seasonally, for each area.

Below are three images of a 1 km square showing (left) the generalised national cartography compared to a 25 metre spatial resolution satellite image (middle), labelled as national land cover, and (right) generalised to CORINE format (Credits: Centre for Ecology and Hydrology and Crown copyright).



Generalised national cartography overlaid on 25 metre resolution satellite imagery.

Cartographic 'objects' attributed via the satellite imagery to land cover classes, according to the UK national land cover scheme ('Broad Habitats').

The CORINE standard which simplifies and generalises the detailed national land cover classes adopts a coarser minimum mapping unit (i.e. detailed national land cover classes get merged to simpler land cover descriptions, and small patches are either merged or dissolved out).

The IMAGE2006 data set perfectly matched the requirements of the UK national land cover mapping project, although there was a slight offset in the reference year. Therefore, the IMAGE2006 dataset was selected as the main EO input to LCM2007, to improve harmonisation between UK and European level activity. Thus when LCM2007 is generalised and converted to the CORINE specification to form the UK contribution to CLC2006, it will be directly founded upon the same satellite data resource used for other areas of Europe.

Compliant Member State adds value to the European model

The production of LCM2007 and CLC2006 for the UK demonstrates a new model of cooperation between Member States and European bodies and initiatives. The GMES data service of IMAGE2006 is supplying high quality, consistently processed EO data for the whole of Europe. The Member State is using these data for national reporting, whilst also adding value and local expert knowledge to form products that are required at the European level. These are then collated by the EEA to form a consistent pan-European product.

Through collaborations within GMES projects, such as *BOSS4GMES*, the UK is also prototyping future Land Monitoring Core Services which could be delivered by a 'bottom up' approach, based on the generalisation of national mapping to deliver European requirements.

These activities in the UK demonstrate the utility and viability of GMES products and services supporting both Member State and European requirements, as long as the products and services are flexible and enable the various stakeholders to buy in at a level appropriate to their specific circumstances.

Geoff SMITH graduated with a degree in Environmental Science and then followed this with post graduate courses in Applied Geophysics and Remote Sensing. He completed his Ph.D at the University of Wales, Swansea, in 1994, researching the remote sensing of foliar biochemical content for forest canopies. He is a consultant at Spectro Natura, a British-based Earth Observation (EO) consultancy, after being for many years the Head of the EO Group at the UK's Centre for Ecology and Hydrology (CEH). He is working on the development of procedures that combine conventional cartography and remotely sensed images for improved land cover mapping and landscape analysis. Geoff Smith was instrumental in the development by CEH of the UK's Land Cover Map 2000 and 2007. His other research interests include applications of airborne remote sensing, especially imaging spectroscopy, and the development of methodologies to monitor dynamic environments, particularly through visualisation. He is the author of over 60 scientific papers, reports and reviews.

This article has been written in collaboration with Alistair Lamb (Infoterra Ltd.)

Earth Observation data provides operational support to Italian Civil Protection activities during an Etna eruption

by Prof. Bernardo De Bernardinis

WITH OVER 70 ERUPTIONS OVER THE PAST CENTURY, MOUNT ETNA ("THE BURNING ONE" IN GREEK) IS ONE OF THE WORLD'S MOST ACTIVE VOLCANOES. THE SLOPES OF EUROPE'S HIGHEST VOLCANO ARE ALSO HOME TO 800,000 PEOPLE, ATTRACTED BY FERTILE VOLCANIC SOIL AND, NOWADAYS, BY THE PROXIMITY TO CATANIA, SICILY'S SECOND LARGEST CITY. THE GREATEST DANGER RESULTING FROM ETNA ERUPTIONS IS LAVA FLOWING SOUTH-EAST TOWARDS CATANIA. THE APPLICABILITY OF GMES EARTH OBSERVATION DATA TO CIVIL PROTECTION OPERATIONS IN CASE OF VOLCANIC ERUPTIONS WAS PUT TO THE TEST BY THE ITALIAN CIVIL PROTECTION SERVICE DURING THE MAY 2008 ERUPTION OF MOUNT ETNA.

The applicability of Earth Observation (EO) data, and in particular Very High Resolution (VHR) imagery, for crisis management and its integration in Civil Protection operational service chains, is one of the most important issues for GMES Emergency Response services. During the Etna eruption of May 2008, the Italian Civil Protection Service (DPC) was able to successfully demonstrate this integration under operational conditions and to gain hands-on experience of the added value of EO data.

May 14th, 2008, 8:30am. Image received by the DPC Functional Centre from in situ *assets (Credits: DPC)*

The May 2008 eruption on Mount Etna

The "Vigilance" warning status was declared on May 13th, 2008, by the DPC (Dipartimento della Protezione Civile – Italy's national Civil Protection department). Over the next few days a range of data of various types arrived at the "Central Node" of the DPC from the local "Centres of Competence" (on the DPC organisation, see box on the following page). These data sets included:

- weather forecasts, with mapping of ash fallout forecasts in case of eruption;
- infrasonic signals from the *in situ* measurement network around the volcano indicating anomalous activities and their sources;
- seismic data, also from the *in situ* measurement network, revealing an on-going seismic swarm.

Because of variability in the incoming data, however, the Civil Protection Department turned to EO technologies to provide additional data on the crisis area, specifically the COSMO-SkyMed satellite constellation network. DPC, under a "*very urgent procedure*" – COSMO was in its commissioning phase and so not yet fully operational – submitted a data request to the Italian Space Agency (Agenzia Spaziale Italiana - ASI) responsible for COSMO-SkyMed operations.

Forecast Map of areas potentially affected by volcanic ash fallout for May 13th, 2008, from 9 am to 12 noon. Such information can be vital to ensure that health hazards to the population and to Civil Protection operatives, as well as risks for air traffic to the nearby Catania airport, are taken into consideration (Credits: DPC/INGV).

Over the next few hours, other information arrived, regarding the effusion rate (from AVHRR sensors on board NOAA-operated US satellites); the explosive activity and its consequences (from the combined analysis of data from European Meteosat Second Generation geostationary satellites and volcanic ash dispersion simulations); the deformation trend (which suggested a magmatic intrusion located on the summit area); and, the lava flow (mapped by high-precision planimetric survey). Nevertheless it was only possible to ascertain the source of the anomalous data and the observed lava flow, along with its precise location, when the satellite imagery from Cosmo-SkyMed became available through ASI on May 15th.

Each of the information sets was useful in piecing together the complex scenario that was unfolding, in order to assess the overall risk level for both the local

The Italian Civil Protection organisation in case of crisis

The Italian National warning system (for volcanic eruptions and for other types of catastrophe) is provided by the National Civil Protection Service (Dipartimento della Protezione Civile – DPC) and the Regions through a national network of 21 Functional Centres, together with 41 Centres of Competence specialised in risk management. The Centres of Competence provide the Functional Centres with forecasts relating to various types of risk (meteorological, hydro-geological, hydraulic, seismic, volcanic etc.) and their nature, criticality level and strength. Functional Centres are the operational support units able to deliver a multi-disciplinary decision-support and emergency response system.
Through one of its departments, the DPC provides the central node of the network of Functional Centres. DPC is also responsible for issuing guidelines and for defining procedural and operational standards for the entire network.
During the May 2008 Etna eruption, the DPC's gathered important data and information from its Centres of Competence in order to perform an evaluation of risks associated with the event and to forecast the possible evolution of the situation over the next hours and days.

The Etna seen from Catania (Credits: Roberto Zingales).

population and the Civil Protection in-field operators. In particular, the radar imagery from the COSMO-SkyMed satellite gave a clear and precise vision of the fragile deformation (cracks) that had occurred on the volcano; these were nearly impossible to detect through optical means because of cloud and volcanic plumes – the hot volcanic ash and gas emitted into the atmosphere during an explosive volcanic eruption.

Timely and useful inputs to the DPC

Looking back at this complex exercise, the key benefit to DPC was how quickly COSMO-SkyMed imagery became available. The request for data was issued on May 13th in the late afternoon, and the data products were available in the early morning of the 15th. It was these data that first established the presence of cracks on the surface of the volcano.

The data also made it possible to localise and measure the main fractures. This in turn led to the identification of "off-areas", a fundamental parameter required to regulate safe access to the crisis zone and to protect the in-field operators.

Finally, after the event, the information gathered during the Etna volcanic eruption was used for a demonstration exercise in collaboration with Telespazio, within the *BOSS4GMES* project.

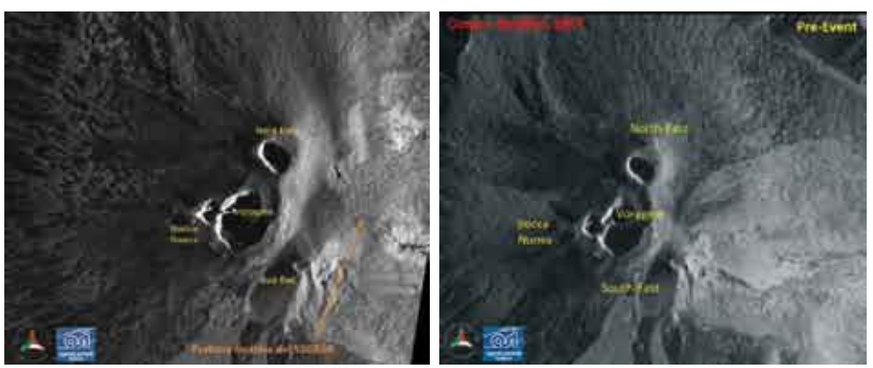
The Etna volcano

Mount Etna is both the highest active volcano in Europe and one of the world's largest continental volcanoes. Its activity is continuously monitored because of its extreme proximity to a populated city and important industrial infrastructures. Its historical activity is very well recorded. At its worst, in 1669, the volcano destroyed parts of the city of Catania. Over time a monitoring network has been put in place to provide warning of impending eruptions.

Eruptions on Etna are feared mostly for the volcanic lava flows that they cause. Flank vents, that typically generate high effusion rates, produce eruptions from fissures that open progressively downward from near the summit (usually accompanied by strombolian eruptions at the upper end). Precisely such a scenario occurred on May 13th, 2008.

COSMO-SkyMed

COSMO-SkyMed (COnstellation of small Satellites for the Mediterranean basin Observation) is an Earth Observation satellite system funded by the Italian Ministry of Research and Ministry of Defence and developed by the Italian Space Agency (ASI). It is intended for both military and civilian use, and is one of the so-called contributing missions of the GMES Space Segment. The full constellation will include four medium-sized satellites equipped with Synthetic Aperture Radar (SAR) sensors providing global coverage of the planet. Observations of a particular area of interest can be repeated several times a day (thanks to the availability of four satellites in orbit), in all-weather conditions (as radar sensors, unlike optical ones, can "see" through clouds and at night). The imagery will be applied to defence and security activities in Italy and other countries, seismic hazard analysis, environmental disaster monitoring and agricultural mapping. The first satellite was launched on June 8th, 2007, from Vandenberg AFB in California aboard a Delta II rocket. An identical rocket launched COSMO-2 on December 9th, 2007, and COSMO-3 on October 25th, 2008. The launch of COSMO-4 is expected in 2010.



Pre- and post-event images tell the story. The COSMO-SkyMed data enabled enhanced understanding of the developing crisis situation thanks to the satellite's capability to 'see' through bad weather, clouds and volcanic ash plumes, and to its guarantee of a short response time. During the Etna eruption event DPC required COSMO-SkyMed data acquired in spotlight mode, with a 1 metre spatial resolution. Data request and delivery were managed by the National Focal Point (ASI - Italian Space Agency). ASI is also the Centre of Competence in Earth Observation for DPC (Credits: DPC, COSMO-SkyMed, Telespazio).

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This article has been written in collaboration with Pierluigi Soddu, Chiara Cardacci and Marzia Santini (DPC), Laura Candela (ASI) and Silvia Lozzi (Telespazio).

A training exercise in Cyprus puts GMES in action

by Veronika Gstaiger, Olaf Kranz and Alexandra Foerster

IN JUNE 2008, AN ASSESSMENT TRAINING COURSE BROUGHT LOCAL AND INTERNATIONAL CRISIS EXPERTS TOGETHER FOR A SIMULATION EXERCISE IN CYPRUS. THE COURSE INTRODUCED THE PARTICIPANTS TO THE APPROPRIATENESS OF THE EU'S MULTI-PARTNER APPROACH, AS WELL AS TO THE USEFULNESS OF REMOTE SENSING PRODUCTS AND SATELLITE COMMUNICATIONS. IT ALSO YIELDED POSITIVE LESSONS FOR FUTURE TRAINING CURRICULA.

In recent years natural disasters, industrial accidents and civil wars, seem to have multiplied, requiring more and more international humanitarian relief support. To secure the success of such support missions, well-trained disaster management staff is needed.

In response, the EU has developed the Community Mechanism for Civil Protection. Its aim is to support cooperation in Civil Protection assistance and interventions in the event of major emergencies that require urgent response actions. The Community Mechanism for Civil Protection has developed a number of tools to facilitate both preparedness and effective response to disasters at an EU level. An important part of the mechanism consists of common training and seminars for relief units from all over Europe. One-week "Assessment Mission Courses" (AMC) are part of this mechanism which has been fostering international cooperation in Civil Protection across the EU since 2002.

The AMC has been identified as an appropriate framework for the demonstration of services developed by the "Humanitarian Relief and Reconstruction" cluster of the *LIMES* GMES Project (Land/Sea Integrated Monitoring for European Security). Thus, a joint exercise was carried out by the AMC and *LIMES* in June and November 2008 in order to test optimised processing chains and prototypes developed within a realistic disaster scenario.

One of the objectives of the *LIMES* project is the development of satellite-based services providing relevant information and decision-support tools for the organisation and distribution of humanitarian relief and reconstruction. Another objective is to test and demonstrate possibilities for collaboration between the European Commission and EU Member States in crisis response activities, in synergy with *LIMES* services.
In the AMC, the *LIMES* team prepared technical support actions and provided navigation, satellite communications and mapping equipment. Furthermore, *LIMES* supported and accompanied the AMC activities in Cyprus, in the field and in the headquarters. The German Agency for Technical Relief (THW), the Johanniter International Assistance and the Cyprus Civil Defence (CCD) were responsible for the organisation of the AMC.

The scenario: earthquake and tidal wave

The Cyprus exercise was based on a simulated earthquake. The notional earthquake occurred in the eastern Mediterranean Sea with a tsunami-like tidal wave hitting the southern coast of Cyprus and causing major damage in some regions. In the centre and on the southern and south-eastern slopes of the Troodos Mountains, the scenario simulated blocked roads because of landslides, with some individual villages and dwellings affected. The scenario also included 'unconfirmed reports' of damage to one of the biggest dams in Cyprus, the Asprokremnos dam, 15 km south-east of Paphos.

Due to the events, the Government of the Republic of Cyprus (GoC) declared a simulated State of Emergency. As part of the Ministry of Interior, Cyprus Civil Defence (CCD) acted as the local emergency management agency operating from its General Headquarters

The *LIMES* project (Land/Sea Integrated Monitoring for European Security) will contribute to the GMES initiative until 2010 by providing core competence in Security services. The goal is to define and develop prototype information services to support security management at EU and global levels. Key aspects are the organisation and distribution of humanitarian aid and reconstruction; surveillance of the EU borders (land and sea); surveillance and protection of maritime transport for sensitive cargo; and, protection against emerging security threats (e.g. terrorism, illegal trafficking and proliferation of weapons of mass destruction).

For further information please visit http://www.fp6-limes.eu/

The exercise was based on a simulated earthquake in the eastern Mediterranean Sea with a tsunami-like tidal wave hitting the southern coast of Cyprus (Credits: Willis Davison).

The training scenario also included 'unconfirmed reports' of damage to one of the biggest dams in Cyprus, the Asprokremnos dam, 15 km south-east of Paphos (Credits: Paul Taylor).

Organisations responsible for the Cyprus *Assessment Mission Course*

The German Federal Agency for Technical Relief (THW) is the operative civil protection organisation of the Federal Government of Germany. THW provides technical assistance both within Germany and abroad. Nationwide, more than 80,000 citizens volunteer in these activities at 668 local THW sections.
THW offers a wide range of services, from acute emergency aid to long-term partnerships for civil reconstruction. Its "Rapid Deployment Units" enable the THW to react quickly and provide emergency humanitarian relief in case of crisis.

The Johanniter International Assistance (Johanniter-Unfall-Hilfe (JUH) consists of 200 national, regional, and local associations throughout the Federal Republic of Germany.
It is a professional association of "Diakonisches Werk" of the "Evangelical Church of Germany" (EKD), and it is recognised as a voluntary relief organisation for charitable and non-profit purposes. Building on the national medical expertise of JUH, Johanniter's international assistance concentrates on providing basic medical care to people living in disaster areas and in particularly disadvantaged regions of the world. In the event of a disaster, Johanniter can mobilise and coordinate a number of experienced full-time and volunteer members.

The main mission of Cyprus Civil Defence is the performance of various humanitarian tasks intended to protect the civilian population and help it recover from the immediate effects of hostilities or disaster as well as to provide the conditions necessary for survival.
The Civil Defence Force is organised by the establishment of civil defence units in almost all the urban areas and all the villages near the ceasefire line. Most of the units consist of conscripts and volunteers. Civil Defence members receive initial training and are further trained and positioned in different divisions of Civil Defence, for example the Sections of First Aid, Telecommunications, Welfare, Fire Fighting, Rescue and the Neighbourhood Watch Sections.

in the southern outskirts of Lefkosia and from several Civil Defence District Headquarters under the authority of the respective District Officers.

Assessment teams of Cyprus Civil Defence, the District Officers and the Mayor's Offices of the major cities conducted preliminary evaluations of affected buildings and infrastructure. Teams from the Ministry of Communication and Works were mobilised to restore essential infrastructure (water supply, communication, roads, airports etc.).

This overview map shows the simulated spread of the tsunami-like tidal wave and the affected regions in the southern part of Cyprus (Credits: LIMES *project, DLR/ZKI).*

After the Cypriot government sent a (simulated) request for international assistance to the European Union, the European Commission activated the Community Mechanism and delegated an EU Assessment Team consisting of experts from Member States.

The training course started with the arrival of the participants and an introduction to the most important information about Cyprus and the exercise itself. After the scenario started, the *LIMES* consortium trialled, jointly with the AMC team, their communication and analysis capacities.

Briefing in the field using one of the satellite-based maps (Credits: DLR).

The major mission of the assessment teams was to arrange appointments with key organisations in the disaster area and to gather information about the impact of the disaster on infrastructure and on people. The course participants were therefore divided into three groups taking charge of evaluating the situation in different regions and organisations.

Support from the *LIMES* team

During the exercise, the *LIMES* team played a supportive role in rapid situation assessment. It provided products for communication and navigation and demonstrated the benefit of

The situation map shows a pre- versus post- disaster comparison of the Asprokemmos dam in Cyprus. On the left hand the pre-disaster image is displayed; on the right the simulated dam breach can be seen. (Credits: LIMES *project, DLR/ZKI).*

satellite-based maps, information and communications, which can be used for situation assessment and preparation of briefings. Several map products (overview, situation and damage assessment maps) were generated during the different phases of the simulated disaster.

During a real crisis, input data is available at different points in time depending on the task load of the satellites, the amount of pre-processing needed, and the information to be extracted from the imagery. During the AMC the mapping products were delivered as they would have been in a real emergency situation.

On the first day of the exercise, the relief units received satellite-based overview (base) maps. These maps showed potentially affected regions and the spread of the tsunami-like tidal wave based on archive satellite image data (see an example on p. 59).

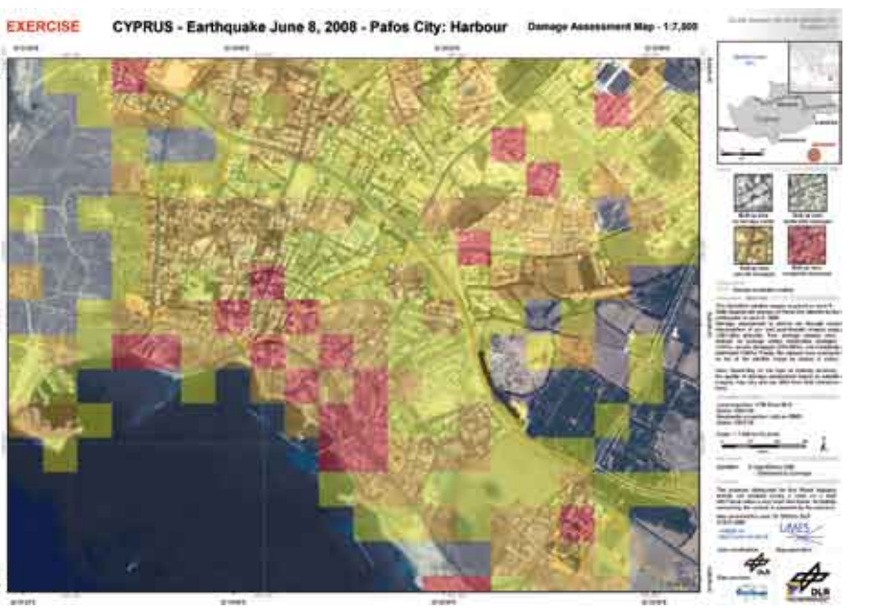
On the next day, the participants received situation maps presenting a first analysis of the impact of the earthquake and the subsequent tsunami. These maps were based on newly acquired satellite images. Finally, on the third day the *LIMES* team handed out updated situation maps and damage assessment maps which contained information gathered by field workers.

Cyprus Civil Defence testing one of the Mapcases (Credits: DLR).

The maps were sent as pdf-files to the assessment team and integrated into *Mapcases* – a communication tool developed by the German Aerospace Center (DLR) within the *LIMES* project. A *Mapcase* consists of a touch screen computer and several features for communication via satellite. It provides the opportunity to add such information as geo-coded pictures from a digital camera to a Point of Interest (POI). It features a Google Earth-like view with the capacity to adjust the final map to individual requirements (panning, zooming, activating/deactivating layers etc.) and to exchange information with other field teams or the back office.

One of the field teams works with the Mapcases *(Credits: DLR).*

The field workers can also use the *Mapcases* to write assessment reports with the assistance of an interactive wizard. The reports are produced to the United Nations Disaster Assessment Coordination (UNDAC) standard and can be linked to selected POIs.



On the damage assessment map the simulated damage classes are displayed in different colours (red being the colour indicating the worst damages) (Credits: LIMES *project, DLR/ZKI).*

Final AMC official meeting on June 11th, 2008: Olaf Kranz (coordinator of the LIMES *Humanitarian Relief cluster, DLR) with Cypriot Minister of Interior Neoklis Silikiotis and German Ambassador Rolf Kaiser (Credits: DLR).*

LIMES provided five *Mapcases* for this field exercise. One was used for receiving maps in the field and for making notes about Points of Interest (POI). This information was transmitted to the *Mapcases* of the other field workers and to the back office.

Deliverable: consolidated assessment report

Each Assessment Mission Course ends with a final session with the Minister or a substitute. In June 2008 the final briefing was presented to Neoklis Silikiotis, the Cypriot Minister of Interior, in the presence of the German Ambassador Rolf Kaiser. The meeting was followed by a final press conference with several national TV and radio stations along with journalists from the local press.

The final product of the exercise is a joint, consolidated assessment report, which, in the case of a non-simulated exercise, would be forwarded to the Member States of the European Union through the Monitoring and Information Centre (MIC) of the European Commission in Brussels.

"Not only is GMES of great benefit for disaster management, but a joint approach by partners at different locations can deliver complex services".

Results – consensus-building and feedback on user requirements

The *LIMES* Service received positive feedback from the trainees, course organisers and the Cyprus Civil Defence.

Press conference at the end of the final briefing at the Ministry of Interior (Credits: DLR).

The joint activities of the AMC and *LIMES* demonstrated not only that GMES services are of great benefit to disaster managers in the field, but also that a joint approach by different partners working at various locations all over Europe can be a very effective and rapid approach for delivering complex disaster management services. The division of labour by individual fields of expertise results in sound and reliable information products that can be rapidly distributed to the organisation that requests it. The latter is of particular importance in building acceptance for the services being provided, as it is crucial for supporting needs assessments.

The discussions with almost all course participants and trainers as well as with the course organisers about disaster management in general and the benefit of satellite-based information in particular resulted in a more precise picture of user requirements. This information provides a basis for further improvements of the products and future training programmes.

Veronika GSTAIGER studied Physical Geography in Regensburg, Germany and Innsbruck, Austria, with a focus on soil science and geo-ecology of mountainous areas. She wrote her diploma thesis on floods in Vietnam using TerraSAR-X satellite radar data at the DFD of the DLR. Since October 2008 she has been working as a research associate at the DFD for the team "Crisis Information and Rapid Mapping" and is involved in the cluster "Humanitarian Relief and Reconstruction" within the *LIMES* project.

Olaf KRANZ, born in Bremen, Germany, in 1973 has a degree in Physical Geography as well as an M.Sc in Geoinformation Science and Systems with key competencies in GIS (Geographical Information Systems), remote sensing, geo-ecology, soil science and land use management. Since March 2007, he has been working with the German Remote Sensing Data Center (DFD) of the German Aerospace Center (DLR) as a member of a research team on "Crisis Information and Rapid Mapping". He is leading the cluster "Humanitarian Relief and Reconstruction" within the *LIMES* project and coordinates the work package "Illegal Activities" within *G-MOSAIC*, the new GMES Security services project. He has more than eight years of international experience in GIS and remote sensing applications in Europe and Africa.

Alexandra FOERSTER studied Geography in Bonn. She worked in the ESA GSE (GMES Service Element) *Global Monitoring for Food Security* (GMFS) project for almost two years. Since December 2007 she has been working in the DFD of the DLR as a member of the research team "Crisis Information and Rapid Mapping" and she is involved in the *Respond* project (GMES products and services for Humanitarian Aid operators).

GMES Burn Scar Mapping kicks into full gear after 2007 wildfires in Greece

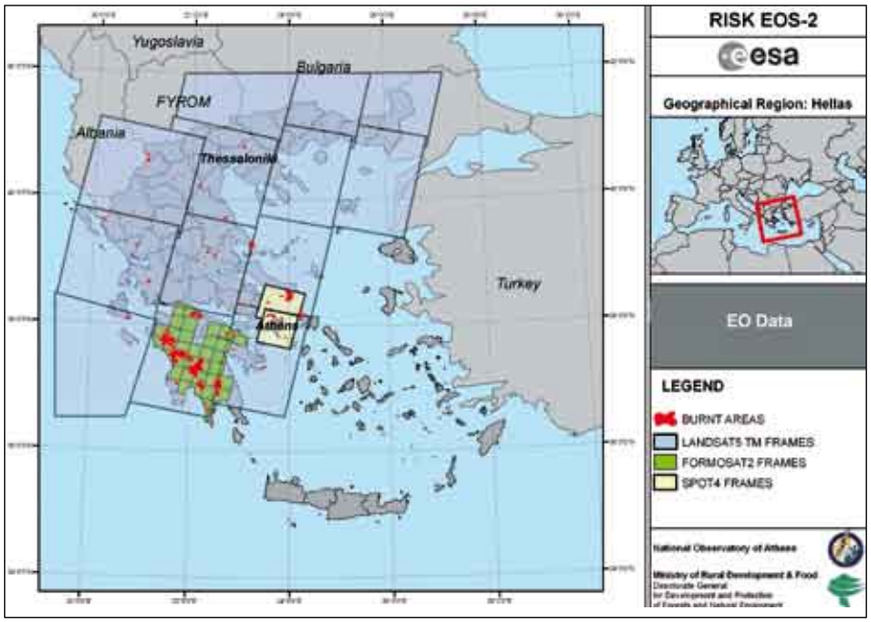
by Haris Kontoes, Nicolaos Sifakis and Iphigenia Keramitsoglou

IN THE SUMMER OF 2007 GREECE EXPERIENCED THE WORST WILDFIRE SEASON ON RECORD WITH SOME 3,000 FIRES, AUGMENTED BY A COMBINATION OF DROUGHT AND HEAT WAVES, CLAIMING OVER 80 LIVES AND 190,000 HECTARES.
WHILE THE FIRES CAPTURED THE HEADLINES, NATIONAL AND INTERNATIONAL ASSISTANCE WAS DISPATCHED TO THE STRICKEN AREAS.
SINCE THEN, THESE DEVASTATED AREAS HAVE ALSO BECOME PROVING GROUNDS FOR THE DEPLOYMENT OF GMES PRODUCTS AND SERVICES FOR NATURAL DISASTER PREVENTION AND MANAGEMENT.

After wildfires comes the time for damage assessment and reconstruction. In this context national and local governments in Greece have been making extensive use of GMES products and services provided to them through *RISK-EOS*, a GSE (GMES Service Element) financed by the European Space Agency. *RISK-EOS* provides services for crisis situations arising from natural disasters such as wildfires and floods.
The extension of GSE *RISK-EOS* to Greece has mapped the consequences of forest fires in a systematic way. The Earth Observation component consists of satellite images that portray the affected areas in various sectors of the electromagnetic spectrum (visible, near infra-red and short-wave infra-red), allowing the automatic production of highly accurate maps of the burnt vegetation.
Burn scar mapping (BSM) constitutes one of the basic services of GMES Emergency Response services. It aims at assessing damage from wildfires, both quantitatively and qualitatively, and at supporting the rehabilitation of the affected areas.
BSM uses images captured by more than one satellite, depending on the detail and accuracy required by the user (refer to map on page 65). Satellites with high spatial resolution sensors such as Landsat, SPOT and IRS are used to cover the entire country, while satellites with very high spatial resolution sensors (FORMOSAT-2, SPOT-5, IKONOS-2 and QuickBird) are used in addition over regions where particular detail is required. Maps are produced annually or seasonally (during summer) at various geographical scales, and are provided to those users in Greece, France, Spain, Italy and Portugal who have an institutional role in natural disaster management.

The 2007 Fires

While BSM within *RISK-EOS* was first applied in Greece as a pilot project during the summer of 2006, the 2007 season was marred by a series of massive forest fires that broke out all over Greece. That



Imagery coordination is the centre-piece for delivery of operational imagery by GMES. This picture shows how images of different regions of Greece were captured and delivered by different satellites, operating at different resolution levels – Landsat 5, FORMOSAT-2, and SPOT-4 satellites. These pictures were brought together into coherent imagery sets directly accessible by end users (Credits: NOA).

year, operational mapping of all forest fires that took place between May and October 2007 over the entire Greek territory was carried out. In all, 91% of Greece's territory – 120,000 km^2 – was covered (all but Crete and other islands that kept free of fires). The results of the project, delivered in two digital formats (vector and raster), are the only comprehensive, homogeneous inventory of burnt areas in Greece.
The work performed in the project revealed that the total burnt area was 193,656 hectares. The inventory shows the main fire incidents per prefecture as well as the estimates of the extent of burnt land cover types – coniferous, broad-leaved and mixed forests; natural pastures; bushes and heath land; and scrub (sclerophyllous) vegetation.

Greece lost over 190,000 hectares to wildfires in 2007 (Credits: NASA, MODIS image acquired on August 29th, 2007).

GMES experiment provides Greek citizens with fire detection satellite information

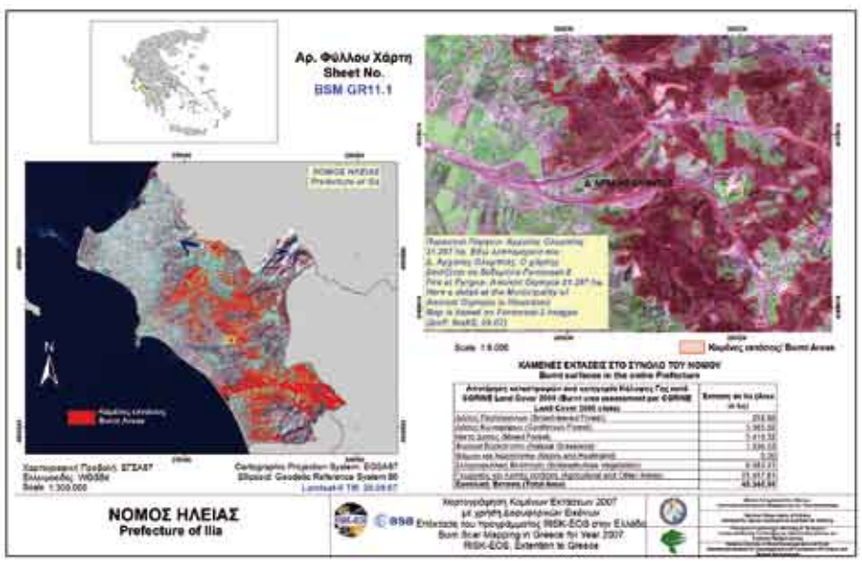
During the wildfires of the summer of 2007, as a pilot experiment, the National Observatory of Athens published on its website the results of the fire detection chain, using images from the SEVIRI sensor onboard Meteosat Second Generation satellites.

Throughout the crisis, starting 15 minutes after the Crisis Centre was activated, the SEVIRI sensor on board Meteosat satellites delivered a steady stream of images showing the progression of the wildfires (Credits: NOA/EUMETSAT).

National implementation

The implementation of *Burn Scar Mapping* in Greece was facilitated by the way in which the management of the *RISK-EOS* project is structured. Each of the national partners in the programme assumes responsibility for interacting directly with the country's end users. Direct communication between the partner-provider and the end users is enabled through personnel permanently assigned to the service who ensure that user needs are fulfilled.

In the case of Greece, ESA worked with the National Observatory of Athens (NOA) and most particularly the NOA Institute for Space Applications and Remote Sensing (ISARS). The ISARS scientists worked together with forestry experts from the Ministry of Rural Development and Food and the National Agricultural Research Foundation. They elaborated the specifications and the standardisation of the service, so as to closely follow the needs of both central and local services.



Burn Scar Mapping: on the left is a 1:300 000 scale Landsat image of the prefecture of Ilia. Burnt areas are shown in red. On the right, the area of ancient Olympia is presented in greater detail on FORMOSAT-2 images, with the 21,297 ha of burnt areas showing in dark purple (Credits: RISK-EOS *project, NOA).*

User testimonies

Dr. Georgios Tsiourlis from the Greek Forest Research Institute gives a detailed account of how GMES services operated during the crisis.

"Ten minutes after alert was first given, the fire monitoring and hot spot location service was activated, acquiring and processing in rush mode images from the SEVIRI sensor. Within 15 minutes of the fire alert, SEVIRI images clearly showed the location of fires all over the region of Peloponnesus.

One of the instructions was to protect sensitive infrastructure – the likes of hospitals, petrol stations and roads. This mission required updated reference maps. The maps delivered in real time by RISK-EOS *after activation of the Charter (see page 39) based on high and very high resolution satellite imagery, proved especially useful. All the available satellites were pointed towards the areas ablaze as a matter of priority.*

Later, after the fires had been put out, the assessment of the damage was completed in only one month, thanks to fast processing of images from the SPOT, Landsat and FORMOSAT-2 satellites."

Dr. Georgios Tsiourlis, Principal Researcher at the Forest Research Institute of the National Agriculture Research Foundation in Greece (Credits: Gil Denis).

Dr. P. Balatsos has had GMES mapping products in hand in a real-life, operational context. He has been able to compare these with existing tools and indicators. Here are his reflections:

"For the first time, GMES gave us the opportunity to have material to compare the mapping processes of our service with information that comes from other sources. This has helped us to evaluate our mapping process and to determine improvement needs.

We would also like to point out that higher resolution analysis, as delivered by GMES and RISK-EOS*, impacts many plans and projects to better manage forests in the future, particularly when it comes to forest fires.*

This is the first time we are seeing a joint effort to give information to the people and the services that need information. This is why we suggest to continue!".

Dr. P. Balatsos, Directorate General of Natural Environment and Forest Development and Protection, Ministry of Rural Development and Food of Greece.

The mapping products published are now delivered to and used on a regular basis by a range of institutions, both national (Ministry of Rural Development and Food, Secretariat of Civil Protection, Hellenic Centre of Biotopes and Wetlands etc.) and regional/local (Regional Forest Inspection and Rehabilitation Services etc.).

The Parnitha mountains after the fire. (Credits: Geraki).

Concrete applications by end users

End Users of BSM products integrated the data into their Geographic Information Systems (GIS) and used and evaluated them in comparison with the existing traditional solutions, namely field surveys. They report that the use of high and very high spatial resolution satellite data provides a unique solution for reliable mapping and post-fire management. After the 2007 fires, the data has, in particular, been of use for the following post-fire activities:

- Improving discrimination and mapping of the affected areas inside highly fragmented and complex areas;
- Monitoring and controlling the maintenance of original land uses
- Managing reforestation;
- Generating reliable statistics of damage;
- Educating forest officers in Fire Prevention and Post Crisis Planning;
- Assessing the forest fires impact on Natura 2000 sites (the European Union's nature protection areas network);
- Modelling fire behaviour for the future
- Implementing medium- to long-term soil conservation policies.

GMES Emergency Response services and the *RISK-EOS* project, and in this case Burn Scar Mapping, are thus proving useful and operational for forest and rural land management authorities in regions throughout the Mediterranean basin that are chronically subject to fires.

Fire looms over the Parnitha mountains, on the night of June 18th, 2007. Photo taken from Athens, 16km away (Credits: George Havlicek).

BSM mapping products

1. Maps of burnt areas
   Seasonal update, vector format, 1:10,000-1:50,000 scale
2. Enhanced cartographic product of burnt areas
   Seasonal update, vector format, 1:10,000-1:50,000 scale
3. Ortho-rectified post-fire satellite images
   Satellite map ortho-rectified for uniformity of scale, seasonal update, raster/bitmap format, 1:10,000-1:50,000 scale
4. Geographic Information Systems (GIS) integrating vector/raster BSM and damage assessment information layers
   Assessment information layers in vector format
5. Rapid fire mapping
   Daily update, raster format, 1:10,000-1:50,000 scale

Dr. Charalabos (Haris) KONTOES holds a Ph.D. in Remote Sensing of the Environment. He is a Principal Researcher at the Institute for Space Applications and Remote Sensing (ISARS) of the National Observatory of Athens (NOA), where he is responsible for the *RISK-EOS* extension to Greece Project. He has wide expertise in managing EC and ESA projects focusing on risk assessment and mitigation, risk monitoring and risk management systems relating to forest fires, environmental resource management and land use/land cover mapping. Past roles included Executive Secretary of the Hellenic Space Research and Technology Committee of Greece, Advisor to the Hellenic Ministry of Development in the preparatory work for the adhesion of Greece to ESA and Member of the GMES Steering Committee as well as National Representative of Greece to ESA's PBEO Programme Board.

Dr. Nicolaos SIFAKIS holds an M.Sc. in Remote Sensing and an M.Sc. in Environmental Physics, as well as a Ph.D. in Remote Sensing from University Paris-7. He is currently Principal Scientist at ISARS-NOA, in charge of the SEVIRI data receiving station. He was a pioneer in mapping air pollution with high spatial resolution, using satellite data. He worked at the European Commission as coordinator for the CORINE Land Cover project. He was also Advisor to the European Environment Agency and to NASA's Environment & Health Programme.

Dr. Iphigenia KERAMITSOGLOU holds a Ph.D. in Space and Atmospheric Physics from Imperial College London. She is a Researcher at the Institute for Space Applications and Remote Sensing (ISARS) at the National Observatory of Athens (NOA). She has been contributing as a Research Associate of the Remote Sensing and Image Processing Group of the Physics Dept. of University of Athens and the National Observatory of Athens. She is an expert in remote sensing of forests and eco-systems.

Further along the road to GMES

by Arnault Contet

THE EUROPEAN UNION IS SOMETIMES DISPARAGED FOR THE ALLEGEDLY SLOW PACE OF "THE EUROPEAN CLOCK". YET THE PAST TEN YEARS HAVE SEEN GMES MATURE INTO A PAN-EUROPEAN INITIATIVE THAT EUROPE'S LEADERS AND INSTITUTIONS NOW FULLY UNDERSTAND AND SUPPORT, HAILING IT A PUBLIC GOOD. THE RECENT INTENSE INSTITUTIONAL ACTIVITY HAS SHOWN HOW MUCH ALL EU ACTORS HAVE SUCCESSFULLY SWITCHED FROM DIVERGING INTERESTS TO A FIRM CONSENSUS THAT IS NOW PUSHING GMES ONE MORE STEP TOWARDS ITS OPERATIONAL PHASE.

The idea behind GMES is about to turn 11 years of age, and its lifespan is already marked by some notable milestones.
From the 1998 Baveno Manifesto, in which Europe's Space agencies first planted the roots of GMES, to the transformation of GMES into a more user-driven initiative, GMES has been through a long – and sometimes difficult – development. Yet the past few months have proven how important GMES has become on the European political stage. European governments and institutions have sent strong and clear political signs, creating a favourable ground for the operational phase of GMES.

Baveno, the "birthplace" of GMES, on the shores of Italy's Lago Maggiore (Credits: Axel Vogt).

European ministers responsible for Space at work during the Kourou informal Space Council of July 2008 (Credits: ESA/CNES/Ph. Baudon).

Institutional commitment to GMES

In 2007 the European Commission (EC) published a Communication sketching out a new European Space Policy and calling for a means to secure, *inter alia*, the development and financing of GMES. The months that have passed since then, and since the informal Space Council of Kourou in July 2008, have proven in many respects that the governments and institutions of the European Union now have a good sense of why GMES must keep on growing and what it can bring to a "knowledge-based society".

As a flagship initiative of the EU Space Policy alongside Galileo, GMES now needs to move another step forward. EU leaders have set an agenda to drive GMES all the way to an operational phase, scheduled for 2011. Under the French Presidency of the EU, the European ministers responsible for Space gathered in Kourou for an informal meeting and expressed their political will to see the European Union become a global player in Space Policy and to turn GMES into a tool that benefits European citizens and thus improves their well-being. Representatives of EU Member States pointed to the need to enhance coordinated action between the European Commission and the European Space Agency (ESA). They also underscored the necessity to put behind this effort a political vision that addresses the challenges ahead. The Member State representatives called for the creation of mechanisms that will ensure the continuity and the efficiency of the EU Space Policy. They also expressed their wish for a permanent and economically sustainable structure for GMES, which can be achieved only on the basis of long-term EU funding.

ESA Director General Jean-Jacques Dordain, ESA's Council President Maria Van der Hoeven, Valérie Pécresse, French Minister of Higher Education and Research and representative of the French Presidency, chairing the meeting, and EC Vice-President Günter Verheugen, during the 5th Space Council held in Brussels on September 26th, 2008 (Credits: Council of the European Union).

The next major step in the recent political history of GMES was the Council Resolution entitled "*Taking the European Space Policy forward*", released on September 26th, 2008, after the 5th Space Council, which endorses the political orientations adopted at the Kourou meeting. This Resolution defines four areas on which the focus must be set:

- Space and climate change, hence the need to reach the operational phase of GMES quickly;
- Space and security;
- The contribution of Space to the Lisbon Strategy;
- Space exploration.

Bringing Space down to Earth and to its citizens

The very structure of the document itself endorses the conclusions of the Kourou meeting, in that it insists on the need for strong political leadership, resulting in "a vision for Europe in Space". The flagship initiatives are put into a wider perspective that includes Space exploration and the need to "bring Space down to Earth" and to its citizens. From a broad perspective, the Council acknowledges the EU Space Policy as a means to ensure the independence of the Union.

"Il est grand temps de rallumer les étoiles" – it is high time to rekindle the stars[1]

From an institutional perspective, this Resolution by the Space Council recognises the Triumvirate upon which further elaboration of the European Space Policy shall be based. Along with ESA and the EU Member States, the EC is to take on more responsibility, particularly in the field of Space applications. The EC may thus act as the guarantor of the use and development of Space-based services for the greater good, without impinging on the respective domains of ESA and the Member States.

Beyond the global governance of Space Policy at the EU level, several major items of the Space Council Resolution relate directly to GMES. The first is that the EU ought to act as a focal point to capture the demand for Space applications and understand each stakeholder's needs, in order to prioritise these needs and to ensure continuity of service. The Resolution clearly states that future GMES services will form a user-oriented public service, implying free access to GMES data and all resulting core services. However, as it was very honestly stated by Rheticus in the first issue of *Window on GMES: "Free data is a pipe-dream. Someone always has to pay."* The second item in the Space Council

1 Opening Remark of the speech of MEP Pierre Pribetich (PSE – France) quoting Guillaume Apollinaire, Plenary session held on November 19th, 2008.

"It is high time to rekindle the stars"… The launch of an Ariane V ECA rocket from the Kourou European Spaceport, from where the future Sentinel satellites, the Space component of GMES, will be placed into orbit (Credits: ESA/CNES/Ph. Baudon).

Resolution that applies to GMES addresses the legal framework to be defined in order to foster the development of new downstream services.

But the Space Policy of the European Union is not only about ESA, the European Commission and the Member States. The European Parliament is becoming a very active partner as well, and a "fourth member" of the Triumvirate outlined above. Indeed, the European Parliament has recently shown growing interest in Space-related issues, thus contributing to bringing Space closer to European citizens. On November 20th, 2008, Member of the European Parliament (MEP) Pierre Pribetich (France, PSE) presented a motion on behalf of the ITRE committee (Industry, Research and Energy) for a Resolution on the European Space Policy that was overwhelmingly adopted by the Assembly. In his speech, where he spelled out several prerequisites for a true European Space Policy and the sustainable implementation of GMES, Pribetich endorsed previous political statements about and in support of GMES.
The motion for a Resolution also raised the issue of the overall governance of GMES by calling the Commission and the Council of the EU to set a precise calendar for the creation of an efficient governance structure for GMES.

"We care for a safer planet"

The EC addressed this issue of governance in its Communication *"We care for a safer planet"*, issued on November 12th, 2008. This EC Communication gives a first insight into the consensus that has come about regarding the main governing principles of the GMES programme, which are in line with the political vision outlined in the Space Council Resolution *"Taking forward the European Space Policy"*.

According to this governance model, the European Commission would act as the overall political coordinator and as a rudder, while the European Space Agency would coordinate implementation of the Space component. As far as the European Sentinel satellites and their missions are concerned, the operational role for the Space infrastructure would be split between ESA for Land and Emergency Response services and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) for Ocean and Atmosphere services. The European Environment Agency (EEA) too is to play a major role, alongside the EC, in supervising several *in situ* data streams, whilst the European Union Satellite Centre (EUSC) contributes to several security-related services.

A key driver for future GMES governance is not only to maintain but also to deepen the user-driven orientation. This hinges for the most part on the *in situ* component and on the creation of *ad hoc* structures and their full involvement in the GMES governance process:

- EU agencies will act both as future users of GMES services and as contributors to aggregate and define service requirements. In addition, a Board composed of users will be set up to address both technical and scientific issues;
- The *in situ* component is likely to play an important role in bridging a possible gap between the GMES programme and user needs, since most *in situ* resources are placed under the control of national, regional or local government entities. These entities will thus act as data providers, and also as the very users of GMES services, particularly as far as the Land and Emergency Response services are concerned.

Next steps towards an operational GMES

The EU Competitiveness Council meeting of December 1st and 2nd, 2008, is the latest cornerstone of the recent GMES institutional process, one that sets clear and ambitious milestones, thus drafting a provisional calendar for the next steps to be taken.

First, the question of the governance of GMES should be settled in 2009, when the Commission makes a legislative proposal for an EU Earth Observation programme, paving the way for an adoption by 2010. On that topic, the programme may even retain as its final name… GMES. By the first quarter of 2009, the Commission should thus propose an interim GMES governance and management scheme that can be deployed up until the full-fledged implementation of the GMES programme. The Council recommends setting up a Steering Group involving Member State representatives as a precursor to the Partners Board proposed in the EC Communication *"We care for a safer planet"*. Moreover, a detailed action plan highlighting relevant decision milestones, including the operational funding necessary for GMES for 2011–2013, is requested by mid-2009. Funding for the period beyond 2013 should be allocated in the next multi-annual EU financial framework, which translates into financial terms the policy priorities of the EU.

The Competitiveness Council has asked for further clarifications from the European Commission about overall GMES governance, that is to say about the role, mandate and working practices of the various bodies that will be involved in the future management scheme of the GMES programme. The Competitiveness Council also asked to evaluate the idea of a Scientific and Technical Committee, and recommended that the interim governance of GMES be enlarged to Associated Countries that are not members of the EU, in line with Europe's desire to keep the EU Space Policy open and, therefore, a platform for international cooperation to tackle global issues.

With an eye on future implementation of GMES, the Competitiveness Council expressed the wish that GMES services should keep pace with developments in the field of the European environment policy and security policy issues and initiatives.

Finally, it is worth noting the intent of the Competitiveness Council to promote GMES amongst citizens, decision-makers and end users. This political will to foster communication about GMES is crucial, since the sustainable economic development of GMES will strongly depend on the emergence of downstream services developed on a supply and demand model. No one doubts that GMES is an opportunity both for European industries, SMEs and for the user community at large. In that respect, two years before GMES is to turn operational, it becomes crucial that the Space Community as a whole raises awareness amongst those who do not know GMES yet, and who are major stakeholders of the future European "knowledge-based-society".

That's not all folks…

Today, nearly eleven years after the Baveno Manifesto, where does GMES stand? We can now begin to visualise the future governance of GMES. At a broader level, GMES also illustrates the benefits of the Lisbon Strategy for European citizens and industry. The recent institutional progress, combined with the further development of services within the newly launched 7th EU Framework Programme (FP7) projects, undoubtedly puts GMES on track for operational deployment in the 2011 time horizon. Finally, to conclude this article, it can be pointed out that a somewhat simple fact needs to be considered: GMES helps to bring economic development and environment together in a single concept. It creates a great opportunity to get rid of the dichotomy, not to say the antinomy, between economic growth and sustainable development.

Arnault Contet was born in 1980. He holds a dual French/British M.A. in European Policy Studies. He works for a public affairs consultancy in Brussels. Previously, he worked in Toulouse for the Regional Council of Midi-Pyrénées in France, both as the Region's representative in ERA-NET research projects and as coordinator for the implementation of the Network of European Regions Using Space Technologies, NEREUS. This article is a personal contribution to *Window on GMES*.

For further information, you may go on http://ec.europa.eu/gmes/key_docs.htm to download the recent key documents on GMES.

THE LILLE "GMES FORUM 2008" – REAL-LIFE PRODUCTS AND SERVICES MAKE GMES A TANGIBLE REALITY

A handful of cities are closely linked to the history of GMES… Baveno is where GMES was born in 1998. In Göteborg, in 2001, the EU Heads of Government launched the institutional development of the initiative. Munich is where, in 2007, the German Presidency of the EU pushed forward a "roadmap" for GMES. Since September 2008, Lille can be added to this select list – not for political decisions, not for institutional milestones, but as the first show-case of tangible GMES applications in all six target compartments – Land, Ocean, Atmosphere, Emergency, Security, and Climate.

From September 15th to 17th, under the aegis of the French Presidency of the EU, and in conjunction with the European Commission, Conseil Régional Nord-Pas-de-Calais (the regional Assembly of France's Northern Region) hosted the "*GMES Forum 2008*" in Lille.

"GMES Forum 2008" featured an Exhibition area with demonstrations by the service providers who are the builders of the services. Joining them in the demonstrations and assessments were the end users who have been working with them to turn GMES into palatable, usable services. The demonstrations then also paved the way for critical evaluations and exchanges, to better identify the needs and deliver the solutions.

The conferences enabled GMES users and service providers to showcase pre-operational services (Credits: CNES/ Fabien Ploegaerts).

Pierre Bahurel (right), Head of Mercator Océan, presenting GMES Marine Core Services to Günter Verheugen, Vice-President of the European Commission, and Valérie Pécresse, French Minister for Higher Education and Research (left) (Credits: CNES/ Fabien Ploegaerts).

Lille was a time for demonstration of feasibility and usefulness, not for service deployment and market launches. What participants came in contact with were pre-operational services, in line with the timeline of GMES. That said, some permanent services featured for the first time in Lille are here to stay on a permanent basis. Among them are the GMES user web portals, which give GMES users a single point of entry for obtaining all GMES-generated products and data.

The EC/ESA booth in the Exhibition hall (Credits: CNES/ Fabien Ploegaerts).

The organisers wanted to demonstrate the benefits of GMES and its pre-operational services both to end users and to the web of companies that could benefit from the initiative by using the results of this public investment to develop new markets opportunities and improve their competitiveness. The Forum also provided an opportunity to increase awareness of GMES among decision-makers and media representatives.

The event featured a set of round tables, with senior European figures expressing support to the further development of GMES. Among them were: Günter Verheugen, Vice-President of the European Commission, Valérie Pécresse, French Minister for Higher Education and Research, Dominique Bussereau, French State Secretary in charge of Transportation, Philippe Busquin, Member of the European Parliament and former EC Commissioner for Research, Daniel Percheron, President of the Nord-Pas-de-Calais Regional Council, as well as several Members of the European Parliament.

The following all have something in common: *the European Commission DGs (External Relations, Humanitarian Aid, Environment, Regional Policy), the*

Gil Denis (Infoterra France) (right) presenting GMES Emergency Response services to Dominique Bussereau, French State Secretary in charge of Transports (Credits: Fabienne Grazzini).

For each of the six thematic areas of GMES – Ocean, Land, Emergency Response, Atmosphere, Security and Climate – achievements and future developments were presented on specific exhibition areas (Credits: CNES/ Fabien Ploegaerts).

Council of the European Union, the European Environment Agency (EEA), the European Maritime Safety Agency (EMSA), the German Mapping Institute, the Italian Civil Protection, the United Nations Office of the High Commissioner for Refugees, international corporations such as Shell, the EUFOR Tchad/ RCA peace-keeping force, the Swedish Maritime Organisation, the Canadian Ocean and Fisheries Department, the UK Met Office and Météo France, the European Centre for Medium-Range Weather Forecasts, AIRPARIF (the Paris air quality monitoring centre), the IPCC (Intergovernmental Panel on Climate Change, the Region of Madrid, the Luxembourg Water Management Administration, the UN Economic Commission for Africa, the Bavarian State Agency for Environment, and Greece's Agricultural Research Foundation. What is it that brought them together? They are all users of GMES pre-operational services, and they all took part in the *Lille GMES Forum 2008* and participated in round tables to present and share their experiences with real-life implementations of GMES services.

Representatives of entities in charge of making GMES happen – the EC's DG Enterprise and Industry, the European Space Agency, EUMETSAT, the EEA, the French and German Space agencies, the European Union Satellite Centre – also outlined "the way forward".

In the discussions as well as in the exhibition hall, all the service providers, in tandem with their users, presented the achievements of GMES services to date, by way of practical, real-life examples of what GMES does, and what value it adds to users' operations.

The Lille GMES Forum 2008 was attended by more than 800 participants from across Europe and from other continents.

The booths of each of the GMES thematic areas enabled a fruitful dialogue between service providers and users (Credits: Gil Denis).

Presentations made during the GMES Forum 2008 round tables can be viewed at http://webcast.ec.europa.eu/dgenttv/portal/?viewConference-5167

GMES LAND MONITORING SERVICES MOVE TOWARDS OPERATIONAL FULL-SCALE PRODUCTION

With the start of the *geoland2* project, the GMES Land Monitoring services are getting closer to full-scale production. The project aims at moving the Land Monitoring Core Services towards their industrial age. *Geoland2* seeks to create operational processing lines and production capabilities for large area environmental monitoring, with high-value deliverables such as high-resolution, wall-to-wall map coverage of European land cover.

The *geoland2* technical kick-off meeting held in Mol (Belgium) in November 2008 and attended by over 100 *geoland2* stakeholders focused immediately on the tasks at hand, with splinter sessions aiming to consolidate the work programme. Discussions made it clear that some product specifications have yet to be fully agreed by all stakeholders, particularly for the wall-to-wall high resolution coverage of European land cover and land cover change project. But participants also offered numerous valuable suggestions and identified appropriate methods to reach the goals of the project.

Alexander Kaptein (Infoterra GmbH), Coordinator of the project, "kicks-off" geoland2 (Credits: geoland2).

Implementation and demonstration of operational production capabilities

Geoland2 builds on the results of previous and ongoing projects funded under the EC's FP6 R&D programme (*geoland, BOSS4GMES*), European Space Agency GMES Service Elements projects ("*GSE Land*", "*GSE Forest Monitoring*") and the European Environment Agency "*CORINE Land Cover / Fast Track Sealing 2006*" project. The key word for geoland was "consolidate", the focus of the GSEs was "develop and demonstrate services", and now the focus for *geoland2* is "implement and demonstrate operational production capabilities".

Geoland2 is the last brick towards the implementation of fully mature GMES Land services: the goals of the project are to organise a qualified production network, to build, validate and demonstrate operational processing lines and to set-up a user driven product quality assurance process to guarantee that the products meet the real user needs.

The architecture of *geoland2* consists of two layers, Core Mapping Services and Core Information Services. The Core Mapping Services produce basic geo-information on land cover and land use and its annual and seasonal changes as well as a variety of additional biophysical

parameters describing the continental vegetation state, the radiation budget at the surface and the water cycle, on the basis of satellite Earth Observation data.

The mapping products are of broad generic use: besides being a valuable information source in their basic form, they are the basis for more specialised geo-information services, focusing on a broad variety of thematic fields, like water quality, forest management, spatial planning, agri-environmental issues, the carbon cycle, food security etc.

These Core Information Services offer specific information for European environmental policies and international treaties on climate change, food security and the sustainable development of Africa.

geoland2 gathers more than 50 European service provider partners and over 80 major international user organisations. The project is financed by the European Commission within its 7th Framework Programme and its duration is 4 years.

This news item is based on a contribution from Steffen Kuntz (Infoterra GmbH/ geoland2 Task Manager).

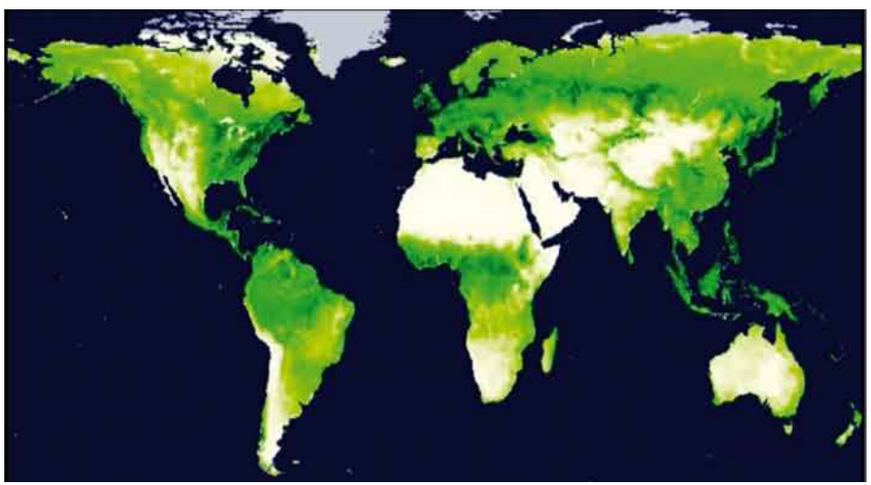
Core Mapping Services

- Land Cover and Land Use Information (EUROLAND): at the local scale, EUROLAND delivers very high resolution land use and land use change information for urban areas according to the new Urban Atlas specification for a multitude of European cities. It offers detailed information on the basis of 22 thematic classes and a 0.25 ha minimum mapping unit.
  At the continental scale, the Land Monitoring Core Service provides land cover information on the basis of 21 thematic classes plus 4 forest classes and forest density with a 1 to 5 ha minimum mapping unit for the whole European continent;
- Biogeophysical Parameters (BioPar). BioPar produces in near real-time and off-line a series of biogeophysical parameters describing the state of the continental vegetation, the energy budget at the surface and the water cycle. The bio-geophysical parameters are derived from mid- to low-resolution data at a global to continental scale. The update frequency is 1 to 30 days;
- Seasonal and Annual Change Monitoring (SATChMo): SATChMo provides very high to high resolution Area Frame Sampling over permanent samples representative for European and African environmental and ecological conditions for annual statistics of land cover and land cover change. Moreover, it delivers a complete medium resolution continental coverage of seasonal and annual vegetation parameters to produce land cover change and agricultural land use information. SATChMo operates at the continental scale throughout Europe and Sub-Saharan Africa. The products will be updated every 3 to 12 months.

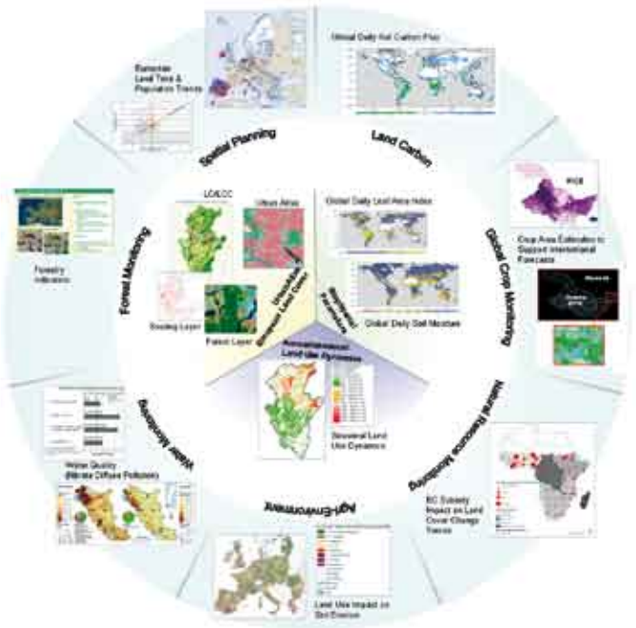
Core Information Services

Core Information Services, building on the information derived from the Core Mapping Services, address European environmental policies and international treaties and demonstrate the establishment of GMES end-to-end services in the following thematic fields:

- Spatial Planning: describe, explain and forecast urban land use change in Europe, in order to support sustainable land management, reduce land take and preserve the quality of life in Europe;
- Water: integrate Earth Observation (EO) derived land cover / land use information into water quality models that contribute to a sustainable and cost-efficient water management in Europe;
- Agri-Environment: evaluate the utility of the Core Mapping Services for the supply of EO-based indicators assessing the impact of agriculture on the environment and the effectiveness of agri-environmental measures in Europe;
- Forest: improving forest and biodiversity indicator information for policy reporting requirements at a pan-European level;
- Land Carbon: understand and assess the impact of weather and climate variability on terrestrial biospheric carbon fluxes, in the context of international conventions;
- Natural Resource Monitoring in Africa (NARMA): develop an environmental monitoring capacity for African countries, to address the needs of EC services and for regional and continental partners of the EC in Africa;
- Global Crop Monitoring (GCM): provide objective, real-time crop assessment and yield forecasts in support to EC Policies in the fields of Agriculture (Common Agricultural Policy) and Food Security.



Example of monitoring of biogeophysical parameters: product describing the state of the continental vegetation. The fraction of vegetation cover quantifies the part of the surface covered the vegetation, from 0 [white: bare soil] to 1 [dark green: fully vegetated] (Credits: geoland2/*MEDIAS-France).*



The architecture of geoland2 *is structured around two layers: the Core Mapping Services (CMS – inner circle) generate 'basic' land products, while the Core Information Services (outer circle) use the CMS products to generate specific information products for European policies (Credits:* geoland2*).*

LINKER: PREPARING THE OPERATIONAL IMPLEMENTATION OF GMES EMERGENCY CORE SERVICES

Because GMES Emergency Response services (as developed by the *SAFER* project, see page 87) must seamlessly integrate into the operational procedures of its users (e.g. civil protection organisations, humanitarian aid actors, Monitoring and Information Centre of the EC etc.), the European Commission has launched a so-called Preparatory Action.

Supporting the implementation of operational GMES services in Emergency Response

Following a tender procedure, the contract was awarded to the *linkER* consortium, led by Telespazio, in December 2008. The *linkER* team includes:

- leading European actors of Emergency Response such as DLR (the German Space Agency), ASI (the Italian Space Agency), the Italian Civil Protection (DPC), Indra Espacio, the Greek National Observatory of Athens, and DKKV (the German Committee for Management of Catastrophes);
- Information Technologies specialists (such as ELSAG-DATAMAT and GRID-IT);
- as well as training and communication professionals (Booz&Co).

Over the next three years, the *linkER* team will work to:

- link available and future GMES products and services with Emergency Management Systems in the EU, Member States, and international humanitarian aid organisations;
- develop a detailed understanding of the needs and technical environment of Emergency Response operators;
- define a joint approach to, and a common understanding of, the necessary procedural and IT interfaces, taking into account users' process flows;
- develop and deploy the required technical interface;
- inform Emergency Response stakeholders about existing and future GMES information, products and services;
- provide training for future users of GMES Emergency Response services.

LinkER *will provide training to future users, to ensure smooth implementation of GMES Emergency Response services (Credits: DLR).*

The *linkER* contract amounts to close to € 3 million. It shares with the Urban Atlas contract (refer to article on page 40) the privilege of benefiting from the first GMES operational budgets.

This activity fits nicely into the bigger European agenda: on February 23rd, 2009, the Commission has adopted a package of proposals for disaster prevention and reduction of risks. To reduce the impact of disasters within the EU, the Commission will support the development of knowledge-based disaster response prevention policies at all levels of government. An example of actions to be undertaken is to develop guidelines on hazard and risk mapping, using existing initiatives such as GMES.

A DECISIVE LEAP FORWARD FOR GMES SECURITY SERVICES

While the cold war has ended with the victory of democracy, threats to the security of Europe and its citizens have not disappeared. Peacekeeping, nuclear proliferation, piracy at sea, illegal immigration, drug trafficking, protection of vital infrastructure such as pipelines, and assistance to European residents in crisis areas, are but some of the areas where GMES will provide Europe with an autonomous source of information and with products and services that will deliver timely and reliable information to European decision-makers.

GMES Pilot Services for Security

The *G-MOSAIC* project, which aims at developing GMES Security services one step further, was launched in Rome on January 20th and 21st, 2009, at the headquarters of Telespazio, the company in charge of coordinating the project. Close to one hundred representatives of the 36 partner organisations (from 13 countries and two European institutions) participated in this official kick-off.

G-MOSAIC (GMES services for Management of Operations, Situational Awareness and Intelligence for regional Crises) is a three-year project, with a total budget of 15.3 million euros, of which the European Commission (DG Enterprise and Industry) will finance 9.6 million through a grant under the 7th Framework Programme for Research and Technological Development.

G-MOSAIC brings together industrial operators, public sector research and academia, indeed all the main players of GMES Security services in Europe:

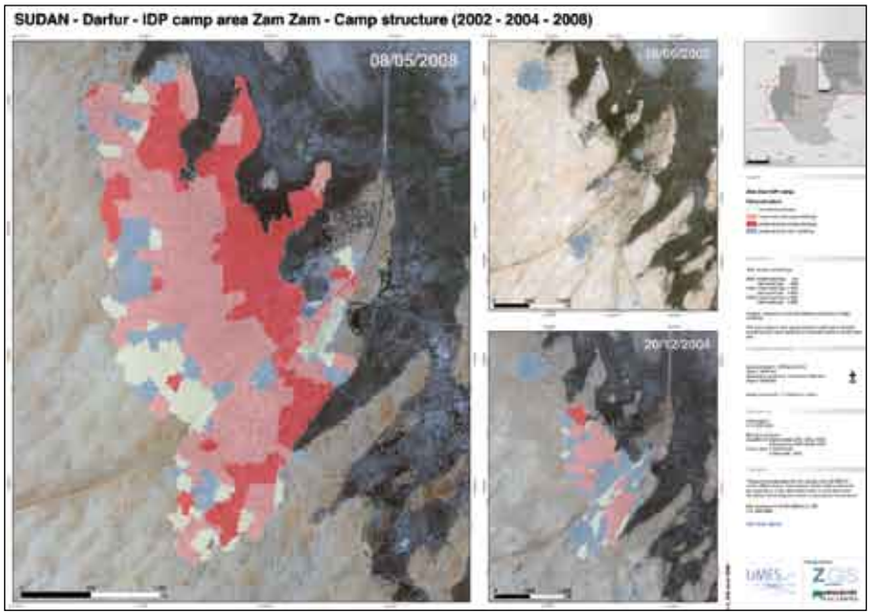
- industrial service providers such as Telespazio, Infoterra Global and its parent company EADS Astrium, GMV, Indra Espacio, Thales Alenia Space, and Thales Communications etc.;
- institutional stakeholders including the European Union Satellite Centre, the Joint Research Centre of the European Commission, DLR (the German Space Agency) and the Polish Space Research Centre;
- as well as representatives of leading European academic institutions and specialised small and medium size enterprises.

G-MOSAIC aims to identify and develop products, methodologies and pilot services for the provision of geo-spatial information in support of the external relations policies of the European Union, and to contribute to the definition and the demonstration of the sustainability of the GMES global security perspective.

The order of the day is for pilot services that lay the groundwork for future production of products and services.

The main results expected from *G-MOSAIC* are:

- the organisation of service chains and infrastructure for the provision of pre-operational pilot services in support of security activities, focusing on external regional crises in particular;
- the development of pre-operational Core Services for Security and the identification of related downstream services, based on what has been developed in previous GMES security and emergency response projects.



Camp Structure map (evolution between 2002 and 2008) of the Internally Displaced Persons Camp of Zam Zam (Darfur – Sudan) based on automatically extracted dwelling structures from QuickBird satellite images. The G-MOSAIC *project will enable the organisation of service chains and infrastructure for the provision of such products in a pre-operational mode (Credits:* LIMES *project, Z-GIS/University of Salzburg).*

G-MOSAIC will develop services for security to:

- Support intelligence and early warning, with the objective of deploying and validating those information services which contribute to the analysis of the causes leading to regional crises, such as weapons proliferation, conflicts over natural resources, population pressure, land degradation and illegal activities. One important aspect will be the development of crisis indicators.
- Support crisis management operations, with the objective of deploying and validating those information services which contribute to support planning for EU intervention during crises, EU intervention and citizen repatriation during crises and the

GMES Security services which will be developed in the course of the G-MOSAIC *project will benefit EU peace-keeping and citizen repatriation activities during crises (Credits: Italian Navy).*

EU High Representative Javier Solana visits Camp Europa of operation EUFOR Tchad/RCA in N'Djamena. Entities of the Council of the European Union, such as the EU Military Staff and the Situation Centre, are potential users of G-MOSAIC *(Credits: The Council of the European Union, photo by EUFOR Tchad/RCA).*

management of the consequences of crises, including reconstruction etc.

The *G-MOSAIC* potential users are the European Commission's DG-RELEX (External Relations) together with DG-Development, DG-ECHO (Humanitarian Aid), DG-Environment; Council entities such as the EU Military Staff and the Situation Centre; and, national institutions such as ministries of foreign affairs, police organisations, intelligence centres etc.

The European Parliament pins hopes on GMES for Europe's security and defence

The European Parliament calls it "necessary" to allow the European Union to use GMES for security and defence purposes. This was one of the conclusions of the report "on European Security Strategy and European Security and Defence Policies" presented by European Parliament Committee on Foreign Affairs Member Karl von Wogau that was adopted on February 19 – with 482 votes in favour, 111 against, and 55 abstentions.

The Parliament also pointed a finger at the lack of coordination on defence expenditures and policies between Member States, and called for better coordination and division of labour – precisely the driving force behind GMES.

The Parliament thus reminded us of the broader context under which GMES is being undetarken and the hopes that are pinned on to its success.

SAFER: GMES EMERGENCY RESPONSE SERVICES ONE STEP CLOSER TO FULL-SCALE OPERATIONAL DEPLOYMENT

Every year, fires, floods, earthquakes and volcanic eruptions, landslides and other humanitarian crises claim the lives of thousands of citizens in Europe and around the world. With climate change, the frequency or intensity of such events may even increase. With the January 2009 start of the *SAFER* project, GMES Emergency Response services are moving one step closer to full-scale operational deployment.

On January 30th, 2009, the European Commission and Infoterra France invited to Brussels more than 100 European experts from the service industry, research organisations, Civil Protection units, Humanitarian Aid organisations and European Commission services for the official kick-off of the *SAFER* project.

SAFER (Services and Applications For Emergency Response) is a large European project funded in the frame of the GMES initiative. The *SAFER* project is preparing and paving the way for operational implementation of the GMES Emergency Response Service, reinforcing the European capacity to provide

This crisis map shows the extent of the floods as mapped by German Satellite TerraSAR-X on July 3rd, 2007. It covers a region of 950 km² south of York (Yorkshire, UK). One of the aims of SAFER *is to allow delivery of such rapid mapping products in 24 hours (Credits: DLR for processing, DLR/Infoterra GmbH and Landsat/USGS for this imagery).*

Expressmaps: a reference map built for an emergency response exercise on Banjul (Gambia) (Credits: Infoterra).

efficient support in case of natural crises and humanitarian disasters.

The main objective of *SAFER* is to provide a rapid mapping capacity in response to disastrous events. *SAFER* will deliver a comprehensive set of geo-information products, based on satellite imagery. The two main products are rapid damage assessment of affected areas and reference maps, which *SAFER* will prepare in anticipation for the most exposed areas. Such vulnerable areas may be mountain valleys with a history of flooding or landslides, dry lands or Mediterranean forests vulnerable to wildfires, the neighbourhood of a volcano or dense urban coastal zones. *SAFER* will also develop and validate specific value-added thematic products before a crisis situation (for early warning) and after a crisis (for reconstruction), in particular in areas of meteorological risks (floods, fires) and geophysical risks (volcanoes, earthquakes, landslides).

A major focus: improving response time

From 2009 onwards, *SAFER* will deliver services at full scale in response to real emergency situations, in Europe or abroad, as well as during specific exercises. The main performance criterion is improvement of the response time (to 24 hours for crisis maps) enabling a rapid evaluation of the extent of a crisis and the damage resulting from it.

The SAFER *product potfolio (Credis:* SAFER *project).*

SAFER ambitions and expected results

A user-driven operational service:
- SLA (service level agreements) and quality assurance
- Validation by users with independent entity

Rapid mapping with driving priority on quick information delivery:
- Gradual increase of number of activations : 35-40-60 events per year
- Information centre with maps & information prepared in advance
- Reference maps available in less than 6 hours
- Anticipation of new acquisitions, based on events monitoring

More complete information:
- Reference maps and toponyms anywhere in the world
- Reference mapping prepared in advance for more than 5 million km^2
- Progressive enrichment with thematic maps

An end-to-end service:
- Single point of contact available 24/7
- Geo-information available in the field
- Service gateway

Signature of the SAFER *Grant Agreement: from left to right Benoit Fleury (Director of Operations, Infoterra), Jean-Michel Darroy (CEO, Infoterra), Mats Ljungqvist (Project Officer from the European Commission's DG Enterprise and Industry), David Hello (Infoterra,* SAFER *Project Coordinator), Gil Denis (Infoterra, Head of Projects and Services) (Credits: Infoterra France).*

European civil protection authorities as well as humanitarian relief organisations (such as United Nations agencies or non-governmental organisations) need such timely and accurate information when responding to an emergency situation, both for decision-making support in the headquarters and for the in-field operatives involved directly in rescue operations.

The *SAFER* consortium, coordinated by Infoterra France, includes 54 partners from 16 countries (29 private organisations and 25 public institutions). With users such as European civil protection authorities or international UN agencies, *SAFER* is built around a core team of European industry and research institutes that have gained experience in this area within the framework of both the EC's 6th Framework Programme for Research and Technological Development and ESA programmes (including *PREVIEW, RISK-EOS, Respond, TERRAFIRMA, LIMES* and *BOSS4GMES*). A wide network of scientific partners and service providers extend *SAFER's* European dimension, in particular to the EU New Member States.

The total budget of this three-year project is € 40 M with a € 27 M grant funded by the 7th Framework Programme for Research and Technological Development of the European Commission. *SAFER* is therefore one of the largest projects launched at European level in the frame of the GMES initiative.

MARK YOUR CALENDARS, IT IS NO JOKE ! ON APRIL 1st, 2009, THE GMES MARINE CORE SERVICE WILL MOVE ONE MORE IMPORTANT STEP FORWARD

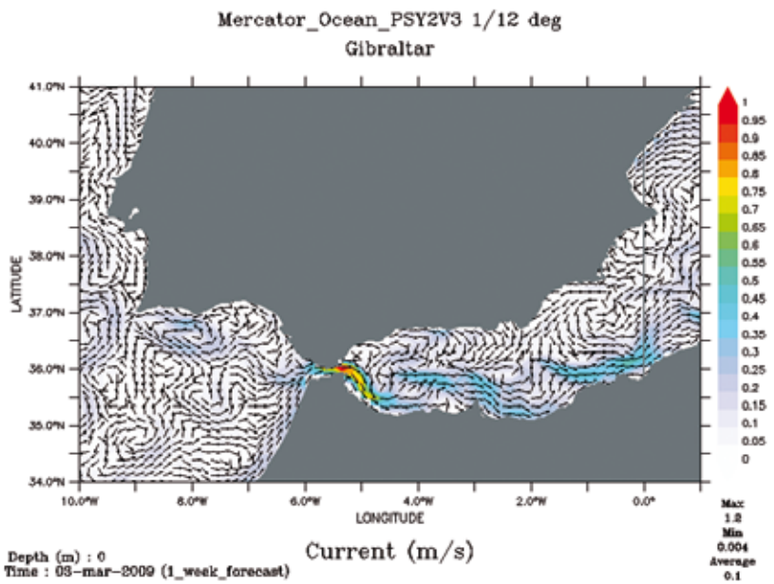
On this day usually reserved to fools, which in some countries also sees fish take pride of place*, the city of Toulouse, home to France's Space activities and operational oceanography, will be the scene of an important milestone in the history of European ocean monitoring, modelling and forecasting when it hosts the kick-off meeting of *MyOcean* at the Midi-Pyrénées regional assembly building.

MyOcean is the implementation project of the European Marine Core Service, one of the top priorities of the GMES initiative. This 3-year project will develop and run the first integrated pan-European capacity for Ocean Monitoring and Forecasting.

Based on the combination of Space and *in situ* observations, the *MyOcean* service will provide reference information on the state of the ocean (temperature, salinity, currents, ice extent, sea level, primary ecosystems etc.), anywhere (European seas and global ocean), at any depth, anytime (from the past 25 years to short term forecasts) and to anyone (open and free access to products).

Climate change, maritime security, oil spill prevention, marine resources management, seasonal forecasting, coastal activities, ice sheet surveys, water quality and pollution are some of the areas that will benefit from the developments undertaken in *MyOcean*.
The first version of the "*MyOcean* Marine Core Service" will be available from April 1st 2009, while the full operational service will start in October 2010.
Structured around a core team of Marine Service Operators, *MyOcean* is a consortium of 61 partners from 29 countries across Europe and beyond, steered by Mercator Océan (the French national operational oceanography centre). The project's total budget is € 55 M, of which the European Commission will co-fund to up to € 33 M.
The scientific challenge lies in developing and operating reliable global ocean monitoring and forecasting; whilst the technical challenge lies in transitioning to full operations at the pan-European level a distributed system of systems (based on architecture and organisation that integrate and homogenise existing capacities) comprising a dozen duty centres around Europe. The ultimate challenge is to turn the overall approach of operational oceanography into a full-service organisation driven by user needs, and linked, on a sustainable basis, with the main stakeholders of operational oceanography both in Europe – such as EUMETSAT – and internationally.

** In France, the April 1st tradition includes poisson d'avril (literally "April's fish"), paper fish that one is to pin to the back of an unsuspecting victim. The fish tradition is also widespread in other nations, such as Italy, where the term poisson d' avril is also used to refer to pranks pulled that day.*



The GMES Marine Core Service has developed oceanographic forecasting capabilities that MyOcean *will bring to fully operational status. This example shows a one-week forecast of surface currents around the straight of Gibraltar. Such information can be used in a wide variety of applications such as oil spill drift forecasting, forecasting services for fisheries or for offshore oil exploration, maritime transport route optimisation etc. (Credits: Mercator Océan).*

EUROPEAN MINISTERS PROVIDE FURTHER FUNDING FOR THE GMES SPACE INFRASTRUCTURE

In November 2008, the European Space Agency's (ESA) Ministerial Council pledged over € 830 million – some 97% of the budget requested – to Segment 2 of the GMES Space Component. This decision was then consolidated and put into practice in January 2009 through a binding agreement between the Commission and the Agency.

The GMES Space Component is the mix of Space (Sentinel satellites) and ground infrastructure that constitutes the backbone for all GMES services. Segment 2 of the GMES Space Component, which overlaps with Segment 1 and runs through to 2018, covers the development of the ground infrastructure and the completion of the full operational capability of the first three Sentinel missions, each of which is intended to operate as a pair of satellites.

The European Space Agency Council at Ministerial level, The Hague, Netherlands, November 25th, 26th, 2008 (Credits: ESA - A. Le Floc'h).

The monies will thus fund the completion of the existing constellations, with the launch of the second « twin » Sentinel satellites (1B, 2B and 3B) during 2015 through 2017, along with the necessary ground support. Instruments for the Sentinel 4 and 5 missions will also be launched on-board other planned satellites, along with a Sentinel-5 precursor. The budget will also support studies.

The decision by ESA's Ministerial Council outlines the political will to forge ahead with GMES in spite of the adverse conditions that are starting to grip the Members States' economies and budgets across the continent. Observers have commented that at stake are both high-tech jobs, Europe's technological advance, as well as GMES and the environment and security benefits it is expected to deliver.

The next major institutional landmark for the Space infrastructure of GMES can be expected to be 2011, when the satellites are in orbit and funding is needed for operating them. Or, to put it differently, the decision reached during the Ministerial Conference ensures continuity in satellite imagery infrastructure and paves the way for the build-up of the operational Space Component of GMES, in a timeframe of another 10 years.

NEW FP7 SPACE BROCHURE FROM DG ENTERPRISE AND INDUSTRY

Let's embrace space – Space Research Projects under the 7th Framework Programme for Research (FP7) presents 18 projects and support actions in the areas of GMES, and support for Space foundations. Most of the projects mentioned in this edition of _Window on GMES_ are included in this brochure.

The brochure provides insights into the objectives and aspirations behind each project. As an innovative feature it includes testimonies from all Project Coordinators, outlining the added value of their efforts for Europe and Europeans.

Like earlier information material on projects funded by the European Commission under FP6, such as the brochure *Space Research – Developing applications for the benefit of the citizens*, the FP7 brochure includes contact details on all projects, and in this respect it might serve as a tool for enhanced cross-border networking among potential future participants in FP7 projects.

Copies of this material may be ordered directly from DG Enterprise and Industry.

Please contact Tobias Gräs (tobias-skovbjerg.gras@ec.europa.eu).

ESA OPENS A DEDICATED WEBSITE FOR GMES SERVICE PROVIDERS' DATA ACCESS

All Earth Observation (EO) data to be used by GMES service providers is now available via one single web site. This single repository of information makes it easier for service providers to locate the satellite data and imagery they will be using and also keep up to date with new releases. In effect, this website creates a direct, seamless link between the service providers and the EO data providers.

Access to the data from the GMES Space Component (consisting of current ESA satellites, the future Sentinel missions and other current and future contributing missions) is reserved for the Service Providers – the entities from both the private and public sectors that process this EO data to create information services for end users.

http://gmesdata.esa.int/home

For the ordinary user, the website features an impressive series of preview pictures that give an exciting sense of the range and complexity of the GMES EO programme (see "browse data").

The data and services are accessible in the form of Datasets – pre-defined collections of coherent multi-mission products. The overall collection of available Datasets is called the GMES Space Component Data Access Portfolio (GSC/DAP).

WEATHER FORECASTS FROM ECMWF WILL BE FREE OF CHARGE THROUGHOUT GMES PRE-OPERATIONAL PHASE

The European Centre for Medium-Range Weather Forecasts (ECMWF) provides operational medium- and extended-range forecasts for scientific research, tapping a state-of-the-art computing facility. At its 70th session, in December 2008, the ECMWF Council unanimously agreed to make ECMWF data and products free of charge throughout the GMES pre-operational period. This development can further contribute towards the creation of powerful and sophisticated core services during the GMES pre-deployment phase, particularly in the area of severe weather forecasting and prevention.

The Centre is an independent international organisation supported by 31 countries, including the Member States of the European Union, and operating out of England. It distributes medium-term weather forecasts to national meteorological centres, concentrating primarily on early warning for extreme weather phenomena.

- Infoterra Ltd – Project Coordinator, United Kingdom

- Aristotle University of Thessaloniki, Greece
- Arsenale Novissimo, France
- Astrium SAS, France
- Centre for Ecology and Hydrology, United Kingdom
- Collecte Localisation Satellites, France
- Danish Meteorological Institute, Denmark
- Deutsches Zentrum für Luft und Raumfahrt e.V., Germany
- Dipartimento della Protezione Civile, Italy
- Direction de la Défense et de la Sécurité Civiles, France
- Eurimage, Italy
- European Centre for Medium-Range Weather Forecasts, United Kingdom
- European Union Satellite Centre, Spain
- Flemish Institute for Technological Research, Belgium
- GAF AG, Germany
- GeoVille Informationssysteme und Datenverarbeitung GmbH, Austria
- Hellenic Centre for Marine Research, Greece
- Indra Espacio S.A., Spain
- Infoterra France, France
- Infoterra GmbH, Germany
- Institut Français de Recherche pour l'exploitation de la Mer, France
- Istituto Nazionale di Geofisica e Vulcanologia, Italy
- Joint Research Centre of the European Commission, International Organisation
- Luiss Business School - Divisione di Luiss Guido Carli University, Italy
- Mercator Océan, France
- Met Office, United Kingdom
- Météo-France, France
- PRO DV Software AG, Germany
- SERTIT (Université de Strasbourg), France
- Spacebel S.A./N.V., Belgium
- Spot Image, France
- Squaris, Belgium
- Stiftelsen Nansen Senter For Fjernmaaling, Norway
- Sveriges Meteorologiska och Hydrologiska Institut, Sweden
- Telespazio S.p.A., Italy
- Thales Alenia Space, France
- University of the West of England, United Kingdom

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