EARSeL

NEWSLETTER

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EARSeL

European Association of Remote Sensing Laboratories

Front Cover – The 29th Symposium of the European Association of Remote Sensing Laboratories (EARSeL) will take place in Chania, Greece, from 15-18 June 2009 [http://earsel29.maich.gr], accompanied by the 2nd Workshop on Education & Training [17 June 2009], and the 4th Workshop on Remote Sensing of the Coastal Zone "Coasts and Climate Conflicts" [18-20 June 2009]. Exhibitions, excursions and other events of scientific and cultural interest are scheduled.

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EARSeL membership fees, 2008

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Laboratory/Company with fewer than 10 researchers	330€
Laboratory/Company with 10 or more members	500€

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1. EDITORIAL

Dear members,

Another year full with EARSeL events is ending. Another one is knocking at the door. The Remote Sensing community interacted within and supported all EARSeL actions and events throughout the year, providing feedback and indicating new challenges that need our attention. We thank you for your contributions, as these are the living heart of EARSeL, and invite you to express yourself through this newsletter along with the rest of EARSeL events.

In the context of our continuous scientific discussion and update, you will find within this issue the annual reports of the SIGs of EARSeL on the topics of 3D Remote Sensing, Geological Applications, Development Countries, Archaeology and Cultural Heritage, Forest Fires, and Education & Training summing up their activities during the last twelve months. In addition, news regarding Remote Sensing activities throughout Europe and the world are presented. Moreover, do not forget to check the event calendar at the end of this issue.

As you already have noticed in the front cover, a major event of our Association, the 29th Symposium together with the General Assembly will take place in June at the premises of the Mediterranean Agronomic Institute of Chania in Greece. You are all welcomed to participate, join the presentations, mingle with the audience, guide the discussions, be part of the future activities of SIGs and/or working groups, and hear about recent developments on

- New sensors and instruments
- Image processing techniques
- Data fusion
- Imaging spectroscopy
- Radar remote sensing
- Land use and land cover
- Urban remote sensing
- Land degradation and desertification
- Hydrology, land ice & snow
- Oceanography
- Forestry
- 3D spatial analysis
- Natural and cultural heritage
- Developing countries
- Thermal remote sensing

In addition, you are all invited to participate in the accompanying 2nd Workshop on Education & Training [17 June 2009], and the 4th Workshop on Remote Sensing of the Coastal Zone "Coasts and Climate Conflicts" [18-20 June 2009]. Exhibitions, excursions and other side-events of scientific and cultural interest are also scheduled.

Last but not least, the editorial team would like to thank Mr. Petros Rodakinias from the University of Thessaly, who has been a member of the EARSeL newsletter editorial team during the last year, for his support and excellent cooperation. At the same time we would like to welcome our new member in the editorial team from the University of Thessaly, Ms. Sofia Margoni, who eagerly took over and supported us for the edition of this issue.

We would like to wish you, your families and all that are dear to you, a very merry Christmas and hope the new year will bring you health, happiness and scientific achievement.

Sincerely,

The Editorial Team

2.NEWS FROM EARSeL

2.1 SIG ON 3D REMOTE SENSING ANNUAL REPORT

The activity of the SIG 3D Remote Sensing in 2008 was concentrated on the Bochum Workshop "Remote Sensing – New Challenges of High Resolution", jointly organized by four SIGs and held during the EARSeL symposium in Istanbul.

During the Bochum Workshop three sessions were related to SIG 3D Remote Sensing. Both main topics – the data acquisition by optical satellite and aerial images – were covered. The orientation and DEM generation based on the stereo satellite Cartosat 1 was one key issue. With 2.5m ground resolution, a base to height relation of 1:1.4 and a spectral range including near infrared, this satellite offers optimal conditions for the generation of height models up to a standard deviation of 2.5m for Z. Like for several other satellites the orientation with geometric reconstruction and with rational polynomial functions leads to satisfying results. The generation of 3D-city models based on IKONOS-triplet combinations supports the detailed data acquisition even if problems with large buildings still exist. Nevertheless detailed 3D-city models have been made with such images. The Greater Municipality of Istanbul is using IKONOS images for a regular check of the buildings every three month in the district area. Also the geometric potential of digital aerial images for detailed and precise height models in mining areas was presented as well as the use of actual and historic aerial images for determination of cliff retreat.

An overview about available optical space systems usable for 3D point determination was given in the Istanbul symposium. A Wallis-filter improved the automatic image matching for height determination in open, but also in forest areas for SPOT-5 stereo scenes. A 3D-city model based on SPOT-5 super-mode imagery over the city area of Cairo was part of an urban climate study. The system calibration of a combination of oblique and vertical cameras as well as the potential of the combination of large scale vertical and oblique images for detailed interpretation of build up areas completed the session. Such images from Pictometry and MultiVision are getting very popular.

Dr.-Ing. Karster Jacobsen

2.2 SIG ON GEOLOGICAL APPLICATIONS ANNUAL REPORT

Geohazards have been recognized as one of the prime fields of focus for earth scientists for the coming decade featuring also high on the political agenda (e.g., GMES and GEOSS). Earth observation plays a vital role in understanding geological processes, shaping the earth' dynamic environment' and the natural hazards that they entail.

In 2006 and 2007, the SIG Geological applications of EARSeL in collaboration with the Geological Remote Sensing Group of the RSPSOC and IGOS geohazards working group organised workshops on Lowland geohazards (floods, subsidence) in Warsaw, Poland (2 June 2006) and Geohazards in mountainous areas (mass movements) in Bozen, Italy (8-9 June 2007).

During the 2008 EARSeL Conference, the SIG Geological Applications organized a session focusing on seismic hazards. The SIG invited Mike Abrams of the NASA Jet Propulsion Laboratory to kick off the session with an overview paper on the use of ASTER in monitoring of seismic events. Using multi temporal ASTER data, a subpixel method was developed that allowed surface deformation close to faults to be mapped (the Cosi-Corr method). Mike showed several examples of the method that is complementary to the more widely used InSAR technique that allows the extraction of deformation away from faults.

Valerio Baiocchi (University of Rome) in his talk on evaluation of the damages provoked by seismic events through remotely sensed imagery, presented work using stereo-pairs from high resolution satellite data for automatic extraction of digital models of the surface (DSM), to appraise changes and transformations of areas following catastrophic events such as, for instance, seismic events.

Graham Ferrier (University of Hull) presented a paper on the application of an integrated airborne hyperspectral and LiDAR remote sensing dataset in resolving the frequency and intensity of earthquakes at Sfakia in Crete, Greece. The aim of this project was to investigate the utility of an integrated airborne hyperspectral and LiDAR remote sensing dataset to improve under-

standing of the frequency and intensity of earthquakes along the Sfakia piedmont in southern Crete by identifying and differentiating the different fan segments on the basis of the relative proportions of the different iron and clay species in the soils.

Muhammad Shafique (ITC) presented a paper entitled "Predicting topographic aggravation of seismic ground shaking by applying Geospatial tools". In his talk he presented a model based on regional topographic effects by employing digital elevation model (DEM) derived topographic features to predict and map topographic amplification and de-amplification. Topographic features were derived from the Shuttle Radar Topography Mission (SRTM) and Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) DEMs for realistic prediction and demarcation of topographic aggravation of seismic shaking. Impact of slope angle, height, wavelength and damping on amplification and de-amplification of seismic shaking was analyzed in homogeneous lithological and geotechnical environment. Finally, Richard Teeuw (University of Portsmouth) wrapped up the session and presented some of the ongoing work on 'Tropical volcanic islands, coastal landslides & tsunami risk'.

Prof. Freek van der Meer

2.3 SIG ON DEVELOPING COUNTRIES ANNUAL REPORT

EARSeL SIG on Developing Countries (DC) had two main activities in the year 2008.

EARSeL Joint Workshop "Remote Sensing – New Challenges of High Resolution"
Ruhr University in Bochum, Germany
5-7 March, 2008

That was the first workshop where four different EARSeL Special Interest Groups (SIGs) met at one location: 3D Remote Sensing, Developing Countries, Radar Remote Sensing and Urban Remote Sensing. The workshop started with an excellent opening talk given from Richard Sliuzas, ITC (International Institute for Geo-Information Science and Earth Observation), Netherlands. As an urban planner he pointed out the importance of high resolution imagery especially for the mapping of slums in Developing Countries. The first session related to the DC was the analysis of high resolution satellite imagery. After this very technical session, the parallel Developing Countries session consisted of two talks about general mapping methods from space and the generation of a bio-geo database for the Himalaya region. A multi-sensor image analysis of Bangladesh, the development of a poverty index and the use of Digital Elevation Models for the mapping of mountainous areas were presented in those sessions organized by the DC. Afterwards, again the parallel Developing Countries session presented a method for the monitoring of soil degradation processes in Ukraine and the fight against malaria outbreaks in Cameroon with additional usage of Google Earth.

A poster session was held in parallel to the oral presentations. An attractive and communicative social program was organized by Carsten Juergens and his eager student team from the Ruhr University.

The overall resume of this first Joint Workshop is very positive. It must be stated, that the synergistic findings are fruitful and the interdisciplinary scientific exchange between members of different SIGs leads to huge overall benefits. The concept of a Joint Workshop has been proved very well and it should definitely be kept for future EARSeL meetings.

4th Workshop of the EARSeL SIG on Developing Countries held in conjuction with 8th Workshop of the GISDECO, 4-7 June 2008, Istanbul, Turkey

Previous workshops of EARSeL SIG Developing Countries, established 8 years ago were: Ghent, Belgium (2000), Bonn, Germany (2002), Cairo, Egypt (2005) and the last one in Istanbul, Turkey. On the other hand, the GISDECO network was established in 1991 and organized 7 events up to the Istanbul workshop. Both groups bring together researchers, professionals, exchange expertise and knowledge and use remote sensing and GIS for the development of developing countries. The reasons behind this collaboration between DC and GISDECO are: (i) remote sensing and GIS are natural partners from data acquisition & monitoring – modeling – analysis & planning – visualization, (ii) especially in developing countries much is to be gained from this combination as many GIS datasets are outdated, (iii) it willprovide many opportunities for the scientific research & development,

and (iv) we have the special case of develveloping countries

- ✓ where most rapid changes occur; globalization, urbanization, rural & urban poverty, disasters, climate changes etc.
- ✓ where low and unequal development levels are available.
- ✓ where spatial and temporal coverage of maps are very poor.
- ✓ where government offices have low capacity levels.
- ✓ where geoinformation technologies have been adopted but not fully nor effectively used.
- ✓ where constraints in planning and implementation exist.

The Istanbul workshop was organized in parallel with the 28th EARSeL Annual Symposium and the other workshops in the Suleyman Demirel Convention Centre of Istanbul Technical University (ITU). A total of 44 registered participants presented their scientific papers during oral and poster sessions covering five different topics: (i) topographic mapping and DEMs, (ii) environmental issues, (iii) disaster management, (iv) rural development and land use planning, and (v) urban development and land use planning. This workshop showed that the DC & GISDECO partnership for such activity was very fruitful and revealed that the development related to the problems of developing countries can effectively be tackled by remote sensing and GIS as integrated technologies.

Besides the scientific programme, there were two main social programmes for the participants: The first one was the workshop dinner organized in the ITU restaurant located just at one end of the FSM bridge of Istanbul and had an excellent view to Bosporus. Workshop participants had a wonderful night with nice meals from Turkish cuisine and a lot of dancing with different kinds of music. The second was the excursion to the IMP (Istanbul Metropolitan Planning Center) of Bimtas company of Istanbul Greater Municipality, followed by the tourist tour to the famous Historic Peninsula of Istanbul. Participants found the opportunity to get detailed information about the projects running in IMP with regards to the urban and land use planning, architectural design, mapping and cultural heritage documentation by lidar technology. After lunch, participants were taken to the Historic Peninsula by bus and made a walking tour that started from Hagia Sophia and Blue mosque and ended at the Suleymaniye Mosque. They had many stops on the road and each stop, Historian Necdet Sakaoglu from IMP gave them brief information about the historic monument located in that stop. The tour finished in the Suleymaniye Mosque Garden with the wishes to meet somewhere in the world in near future with good health and happiness.

As a result of this useful combination, DC and GISDECO are planning to have another workshop in 2010, but this time far from Istanbul, in Yogokarta, Indonesia. Work is continuing to handle this event with the support of University of Gajda Mada, Yogokarta. Contacts to get the support of AARS (Asian Association for Remote Sensing) are underway as well.

We hope we will meet you again with new knowledge and ideas for issues in developing countries and expecting to see new faces in our groups.

Dr.Gurcan Buyuksalih

Dr.Peter Lohmann

2.4 SIG ON REMOTE SENSING FOR ARCHAEOLOGY AND CULTURAL HERITAGE ANNUAL REPORT

The Special Interest Group (SIG), on Remote Sensing for Archaeology and Cultural Heritage (Re.Se.Ar.C.H.) has been activated in 2007 by two Italian research Institutes (IMAA and IBAM) of the National Council Research in collaboration with UNESCO. The mission of the SIG is to foster interaction among archaeologists, geologists, remote sensing experts, scientists and managers interested in using remote sensing (from ground, air and space) and Information Technologies to improve traditional approach for archaeological investigation, protection and management of Cultural Heritage. The SIG was formally launched in June 2007 at the annual **EARSEL** Symposium held in Bozen on June 1-6, 2007.

In the context of **Re.Se.Ar.C.H.** activities, biannual workshop events have been planned. In particular the 1st International Workshop on **Advances in Remote Sensing for Archaeology and Cultural Heritage Management** was held in Rome 30 September - 4 October 2008.

The II International Workshop on Advances in Remote Sensing for Archaeology and Natural/Cultural Heritage Management will be held in Paris at the UNESCO headquarter.

The 1st workshop was organised by the Institute of Methodologies for Environmental Analysis and the Institute for Architectural and Archaeological Heritage of National Research Council (www.cnr.it) , in collaboration with the Earth and Environmental Department and the Cultural Heritage Department of National Research Council, with the patronage of UNESCO, Mibac (Italian Ministry of Cultural Heritage and Activities) and the sponsorship of European Space Agency (ESA), Italian space Agency (ASI), BELSPO (Belgian Science Policy), CNR, and Geocart srl.

The workshop was attended by 107 participants from 25 different countries. Participants originated from European Countries (Belgium, Czech Republic, Denmark, France, Germany, Greece, Ireland, Italy, Romania, Norway, Poland, Sweden, Switzerland, UK) and non-European countries (Australia, India, Israel, Russia, Turkey, USA). During the four days of the workshop more than 100 papers were presented in the oral (75) or poster (25) sessions. All the sessions were characterized by a general discussion based on the active participation and the brainstorming of the attendants.

The topics of the workshop were:

- Aerial archaeology: from the historical photographs to multispectral and hyperspectral imagery.
- Active airborne sensors (lidar, SAR): data processing issues and applications.
- Satellite imagery for archaeology: data processing methods and study cases.
- Sub-surface reconstruction based on GPR, magnetic and electrical tomography for the archaeological research.
- Inverse problems related to sub-surface sensing.
- Integration of space/air borne and ground remote sensing techniques for archaeology and cultural heritage.
- 3D visualization and Virtual reconstruction of landscape and sites.
- Landscape archaeology and palaeoenvironmental studies based on Remote sensing, GIS and ICT.
- Management of cultural and natural heritage: Remote Sensing, GIS and ICT based applications.
- Rescue archeology.
- International Archaeological missions as 'laboratories' of archaeological science.
- Integration of remote sensing and ground truth.

The Workshop included invited keynote lectures on the following topics:

- A network of space partners assisting UNESCO on the conservation of our natural and cultural Heritage, by Mario Hernandez (UNESCO, France)
- World Heritage Sites in South Asia: Enhancing geophysical surveys with satellite imagery, by Armin Schmidt, UK (President of ISAP)
- Satellite Systems devoted to Earth's Remote Sensing: a tool for Archaeological Applications, by Francesco Vespe (ASI, ITALY)
- NASA airborne remote sensing for cultural resources management, By Marco Giardino (NASA, USA)

The workshop consisted of a single track of talks grouped mainly by the techniques used. It was remarkable how Geographic Information Systems (GIS) have allowed a fusion of remote sensing and other geographic data with traditional field-based techniques. Even so, it was clear to the geologist (TGF) that application of remote sensing techniques to archaeology was at a very early stage, similar to its early development in geology.

A few themes emerged which wove through the various talks and discussions.

A major dichotomy was apparent throughout the workshop between 1) detailed site-based studies, generally using geophysical techniques to supplement traditional field-based excavations vs. 2) context or prospection applications, which use broader coverage to provide a context to the site-based work and to seek new sites through surveys.

Site-based studies focused on low-altitude airborne (or kite and balloon) photography, often oblique, to map subtle surficial indicators (e.g. crop marks, soil marks, vegetation stress patterns) and geophysical techniques such as ground penetrating radar (GPR) and other electromagnetic (EM) techniques to probe the subsurface in a very limited area in conjunction with traditional surface mapping of the site. Usually these techniques were employed at known sites.

Context or prospection applications represented some of the newer applications of remote sensing techniques, which tend to be lower resolution and hence unfit for detailed site characterization. Many studies showed how satellite remote sensing can be used to characterize landscapes in a region, allowing prediction of occupation sites or transportation pathways. Airborne remote sensing (as distinguished from air photography) increases resolution, but is more costly and is not used extensively.

One promising remote sensing technique that could bridge the gap between prospection and detailed site characterization is airborne lidar. This technique provides highly detailed topographic data (less than 1 m spatial resolution) over large areas. Several talks showed how new sites were discovered and their topographic context and characteristics defined. Another 'cross-over' technique used by several investigators was very high resolution (VHR) satellite images. These basically replace air photography, so may or may not be cost-effective.

Both airborne photography and remote sensing techniques suffer from a plethora of possible data-collection possibilities. For both, season and time of day create variations in shadowing, soil moisture, vegetation stress, snow cover, etc. that affect the visibility of the subtle marks betraying buried archaeological sites. In addition, remote sensing techniques range the entire EM spectrum along with many possibilities for processing to bring out the subtle remote sensing signatures of archaeological remains. This wide variety of possibilities is one reason more traditional archaeologists haven't embraced remote sensing techniques. However, talks during the workshop indicated some convergence toward more 'popular' spectral bands, seasons, and processing techniques. Suggestions were made that the community should try to simplify these choices to a set of easily implemented techniques which can be included in image-processing packages. Simplifying the choices of remote sensing acquisitions will also reduce the cost of acquiring many scenes of the same site at different times.

In order to maintain and further enrich this steady flow of research and operational application, the Re.Se.Ar.C.H. SIG recognizes the need of also considering and addressing the following critical issues:

- Remote sensing of natural heritage
- Historical air and satellite photography. Need full lists of aerial photograph archives.
- Archaeological input to climate-change data bases.
- Cultural heritage management in a changing climate.

Tom G. Farr,
Rosa Lasaponara,
Nicola Masini

2.5 SIG ON FOREST FIRES

The SIG on forest fires meets every other year for a technical conference focused on the new updates in using remote sensing and GIS tools for fire prevention, fire detection and fire effects assessment.

The last meeting was held in Thessaloniki in September 2007. The previous meetings were held in Alcalá de Henares (1995), Luso (1998), Paris (2001), Ghent (2003) and Zaragoza (2005).The workshop was attended by 102 participants from 12 different countries. Most participants came from European Mediterranean countries with smaller numbers of attendants originating from other European countries such as Germany, Switzerland, Belgium and the U.K. Finally, a small number of participants originated from non-European countries such as Malaysia, Canada and the USA.

It was agreed that the next meeting will be organized by Prof. Rosa Lasaponara, from CNR-IMAA in Potenza. The meeting will be held in Mattera, the south of Italy, from 2-5 September 2009. It will deal with new advances in the use of data mining techniques for forest fire applications, as well as simulation models and validation approaches. In addition it will focus on the operational use of remote sensing in:

- pre-fire planning and management;
- fire detection and monitoring;
- post-fire evaluation and management;
- post-fire vegetation recovery assessment.

For more information about the forthcoming meeting, please visit the website:

http://www.forestfire.imaa.cnr.it/

For questions: earsel-ffsig@imaa.cnr.it

Emilio Chuvieco

2.6 SIG ON EDUCATION AND TRAINING

The Special Interest Group held its first workshop on June 6, 2008, in the framework of the EARSeL Symposium in Istanbul, Turkey:

EARTH OBSERVATION: From Research to Teaching in Schools and Universities

A report on the 1st Workshop of the Special Interest Group on Education and Training

"How can we improve the transfer of research to teaching in schools and universities?" This was the primary question asked to presenters and participants to the 1st SIG Workshop.

Indeed, a lay person who has never heard of "remote sensing" before could hardly tell the difference between Envisat and MERIS, nor recognize a low resolution image from a high resolution image. Even Geography teachers hardly possess adequate knowledge and skills to impart lessons using remote sensing images. Pupils and high school students find it difficult enough to understand physics, chemistry, engineering and biology. If we want to integrate Remote Sensing as an interdisciplinary instrument for making these subjects more interesting and appealing, we have to develop strategies towards an effective transfer of research results into teaching.

During the group discussion in the 1st SIG workshop, presenters and participants contributed interesting ideas and suggestions on how to improve awareness in schools and in the general public about Remote Sensing. We may start by developing a pupil-friendly language for teaching science and making different disciplines easily understandable. Project SEOS (http.//www.seos-project.eu) is one good example of bringing science closer to students by using simple, understandable language.

It was suggested that more such projects which facilitate the access to science information for teachers and pupils should be conceptualized and developed. Activities for such projects may include training programmes for teachers on how to use remote sensing imagery; developing practicable hands-on exercises for pupils which can be done outside the classroom; developing teaching instruments and methods which combine art and science; developing learning software that are simple and need no PC-installation; information campaigns or exhibits that promote remote sensing; and cooperating with museums and national parks.

To ensure sustainability, pedagogic institutions should be encouraged to join such projects. In universities, pedagogic students should be encouraged to introduce new lessons or methods of teaching and incorporate such innovative approaches in their scientific work. Policy and decision makers of governments should be involved, as well. The aim is to convince them to integrate Remote Sensing in the normal school curricula and to incorporate remote sensing images in school books for biology, physics, chemistry, geography, etc. However, this is a long and tedious process and may take years before first results can be achieved.

In general, everybody agreed that a bi-directional approach can bring the fastest results. Each one has to do his part within his own area of influence. For example, teachers who already use remote sensing in their lessons should try to encourage their colleagues to do the same. International institutions like ESA and universities may approach policy and decision makers. Already there is a good deal of projects and tools available which were developed and financed out of taxpayers' money, but these are not being used nor propagated. It is high time we bring them closer to the public and give back to the people their money's worth.

The keynotes for the workshop were given by Francesco Sarti of ESA/ESRIN, Isabelle Kollar and Alexandra Siegmund of UEH.

There were eighteen presentations related to all fields of remote sensing applications in education and training contributed by different institutions in Belgium, Poland, Greece, Italy, Germany, Austria, the Netherlands and the United Kingdom (see Abstract Book http://www.earsel.org/SIG-ET/1st-workshop/WS-Education-Training_Abstract-Book.pdf).

Due to the great success of this first event of the Special Interest Group it was decided to organise a follow-up workshop in 2009, on the occasion of the 29th EARSeL Symposium.

More information on the EARSeL SIG Education and Training, including the Call for Papers of the 2nd Workshop, is available at: http://www.earsel.org/SIG-ET/index.html

Rainer Reuter

3. NEWS ITEMS

3.1 KOPERNIKUS: OBSERVING OUR PLANET FOR A SAFER WORLD

On September the 16th 2008, the new name of the European GMES Programme (Global Monitoring for Environment and Security) was unveiled: Kopernikus. The European Commission Vice President Günter Verheugen announced the name at the GMES 2008 Lille forum.

Europe presented Kopernikus at the forum as the second flagship of the European Space Policy following Galileo, the first flagship. The GMES 2008 forum was organised in the framework of the European Union French Presidency.

All partners of the initiative had expressed strong political support for Kopernikus ahead of the 5th Space Council decisions that were tabled on 26 September 2008 in Brussels.

Pre-operational GMES/Kopernikus services in the areas of ocean, land, atmosphere, risks, climate change and security were presented at the forum to decision makers and users. All actors were stressing the need for long-term sustainability of this public programme, as well as the need to grant continuity of data and services for the users.

At Lille, the European Commission (EC) stressed ESA's role as coordinator of the Kopernikus Space Component with its development and procurement role for the Sentinel Satellite series and its role of coordinator for contributing missions by Member States and other relevant partners of Kopernikus, such as the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT).

Over the last 30 years ESA has been developing Earth Observation satellites, notably all the European meteorological satellites in cooperation with EUMETSAT, but also the ERS-1, -2 and Envisat satellites, which are mostly oriented to perform measurements relevant for environmental and climate research.

Based on this long-lasting experience and on requirements derived from applications, ESA is already developing new missions called 'Sentinels'. The five Sentinel families under development will feature radar

Press conference by Philippe Busquin, European Deputy, Valerie Pecresse, French Minister for Higher Education and Research and The European Commission Vice President Günter Verheugen, after the announcement of the new name for GMES programme

and multi-spectral imaging as well as ocean and atmospheric monitoring capacities. The industrial phase of the first three of the five satellites is already ongoing.

As the 15th century scientist Copernicus revolutionised the understanding of our universe, Kopernikus brings the Earth back to the 'centre' of our concerns and will help us care for a better and safer world.

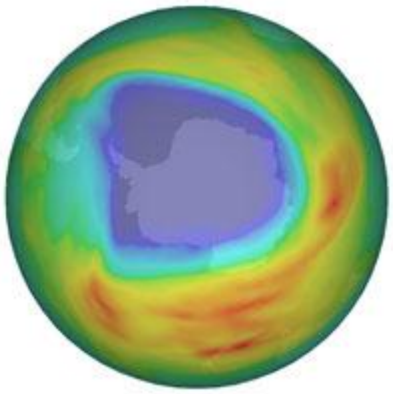
Source: ESA Homepage, 16 September 2008

3.2 2008 OZONE HOLE LARGER THAN LAST YEAR

The 2008 ozone hole – a thinning in the ozone layer over Antarctica – was larger both in size and ozone loss than 2007 but is not as large as 2006.

Ozone is a protective atmospheric layer found in about 25 kilometres altitude that acts as a sunlight filter shielding life on Earth from harmful ultraviolet rays, which can increase the risk of skin cancer and cataracts and harm marine life.

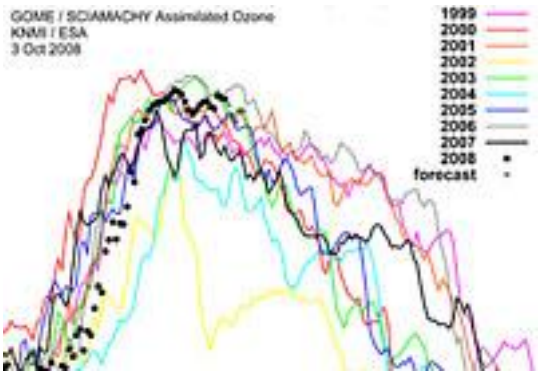
In 2008 the area of the thinned ozone layer over the South Pole reached about 27 million square kilometres, compared to 25 million square kilometres in 2007 and a record ozone hole extension of 29 million square kilometres in 2006, which is about the size of the North American continent.



Ozone hole during 7 October 2008 as measured by Envisat

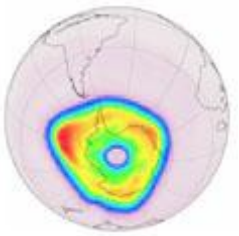
The depletion of ozone is caused by extreme cold temperatures at high altitude and the presence of ozone-destructing gases in the atmosphere such as chlorine and bromine, originating from man-made products like chlorofluorocarbons (CFCs), which were phased out under the 1987 Montreal Protocol but continue to linger in the atmosphere.

Depending on the weather conditions, the size the Antarctic ozone hole varies every year. During the southern hemisphere winter, the atmosphere above the Antarctic continent is kept cut off from exchanges with mid-latitude air by prevailing winds known as the polar vortex – the area in which the main chemical ozone destruction occurs. The polar vortex is characterized by very low temperatures leading to the presence of so-called stratospheric clouds (PSCs).

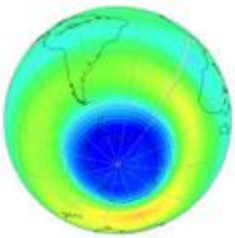


Ozone hole extension during the last 10 years

As the polar spring arrives in September or October, the combination of returning sunlight and the presence of PSCs leads to a release of highly ozone-reactive chlorine radicals that break ozone down into individual oxygen molecules. A single



Chlorine activation early September 2008



Average of total ozone values for September 2008

molecule of chlorine has the potential to break down thousands of molecules of ozone.

Julian Meyer-Arnek of the German Aerospace Centre (DLR), which monitors the hole annually, explained the impact of regional meteorological conditions on the time and range of the ozone hole by comparing 2007 with 2008.

"In 2007 a less concentric and larger polar vortex led to an early onset of the ozone destruction in the sunlit parts of the polar vortex," Meyer-Arnek said. "Therefore, we saw an ozone hole formation in the beginning of September 2007 which corresponded to the average behaviour of the years 1995-2006."

"In 2008 a more concentric polar vortex led to a delay of the onset of the ozone destruction of about one week. The preconditioning of the polar chemistry was about the same for both years, although in 2008 the temperatures were slightly below the 2007 temperatures leading to slightly improved formation of PSCs," he continued.

"Since the polar vortex remained undisturbed for a long period, the 2008 ozone hole became one of the largest ever observed."

Minimum values of the ozone layer of about 120 Dobson Units are observed this year compared to around 100 Dobson Units in 2006. A Dobson Unit is a unit of measurement that describes the thickness of the ozone layer in a column directly above the location of measurement.

DLR's analysis is based upon the Scanning Imaging Absorption Spectrometer for Atmospheric Cartography (SCIAMACHY) atmospheric sensor onboard ESA's Envisat, the Global Ozone Monitoring Experiment (GOME) aboard ESA's ERS-2 and its follow-on instrument GOME-2 aboard EUMETSAT's MetOp.

Scientists say that since the size and precise time of the ozone hole is dependent on the year-to-year variability in temperature and atmospheric dynamics, the detection of signs of ozone recovery is difficult.

"In order to detect these signs of recovery, a continuous monitoring of the global ozone layer and in particular of the Antarctic ozone hole is crucial," Meyer-Arnek said.

In order to train the next generation of atmospheric scientists to continue the monitoring, students at ESA's Advanced Atmospheric Training Course, held 15–20 September at University of Oxford, UK, were given the task of analysing this year's ozone hole with Envisat sensors.

Studying the Envisat data, the students' findings were in line with atmospheric scientists that the south polar vortex was more concentric in 2008 than in 2007, leading to a relatively late onset of ozone depletion, and that the size of this year's hole is similar to previous years.

"This exercise led us to realise that although many questions have been answered and much has been learned about the stratospheric chemistry and atmospheric dynamics driving ozone hole behaviour, many new questions must be raised especially concerning ozone hole recovery," said Deborah C Stein Zweers, a postdoc satellite researcher from the Royal Netherlands Meteorological Institute (KNMI) who attended the course.

"We want to know when the ozone hole will recover, how its recovery will be complicated by an environment with increasing greenhouse gases and how atmospheric dynamics will shape future ozone holes. These and many other questions will attract the attention of our generation of scientists for the next several decades."

Source: ESA Homepage, 7 October 2008

3.3 ESA LEADS THE WAY TO MAP BOREAL FOREST

How best to map 'boreal' or northern forest with spaceborne radar is the focus of an ESA campaign currently underway in northern Sweden. By answering this question, the campaign addresses one of the key objectives of the candidate Earth Explorer BIOMASS mission.

BIOMASS is one of six candidate Earth Explorer missions that has just completed assessment study and will be presented to the science community at a User Consultation Meeting in January 2009. Up to three of the missions will subsequently be selected for the next stage of development (feasibility study), leading to the eventual implementation of ESA's seventh Earth Explorer mission.

Covering about 15% of the Earth's land surface, boreal forest plays an important role in the global cycling of energy, carbon and water. The boreal region forms a circumpolar band throughout the northern hemisphere that extends through Russia, northern Europe, Canada and Alaska. The great expanse and large quantity of carbon contained in vegetation and soil make the boreal biome the world's largest terrestrial carbon reservoir.

Since forest biomass is half carbon, the BIOMASS mission, if selected, is expected to greatly improve our knowledge of how much carbon is being stored, where it is being stored and better quantify carbon fluxes between land and the atmosphere – important for understanding more about the global carbon cycle and climate change.

To achieve this goal, the mission will exploit the longest radar wavelength available for satellites observing the Earth from space – P-band. This wavelength is uniquely sensitive to mapping biomass from space. Malcolm Davidson, Head of ESA's Campaign Unit explains, "The BioSAR 2008 campaign represents the first-ever ESA airborne Synthetic Aperture Radar (SAR) campaign over northern boreal forest. Because of the importance of boreal forests for the BIOMASS mission, and the global carbon cycle in general, highly accurate and robust methods for transforming the P-band radar signals into forest biomass maps are required. By collecting airborne SAR measurements at P-Band over boreal forest and comparing these to extensive measurements made on the ground we can ensure that the satellite mission will accurately map forest biomass across this unique biome."

The campaign is being conducted in the air by DLR's (German Aerospace Center) Microwaves and Radar Institute using the E-SAR (Experimental Synthetic Aperture Radar) instrument. Ground measurements are also taken of essential forest charac-

teristics such as biomass, forest height and ground conditions by the Swedish University of Agricultural Sciences in Umeå (SLU) supported by the Swedish Defence Research Agency (FOI) and Sweden's Chalmers University. In addition, forest height measurements of the entire test site were made this summer using a sophisticated helicopter-based laser scanning system.

Measuring forest properties on the ground can be hard work especially when you also have to deal with mosquitoes, the harsh northern climate and rugged terrain. However, more than 300 plots within the forest were measured during the summer by SLU. This ground-based data is currently being compiled and formatted for analysis.

"We are very pleased that the Krycklan test site was selected for the campaign," said Johan Fransson from SLU. "It provides us with an excellent opportunity to conduct a large-scale inventory of forest properties in our research site and complements parallel efforts being made in our department to develop new methods for assessing and mapping forest resources using remote sensing. We expect to learn a lot from this campaign."

One interesting and unique feature of boreal forests is that, due to the harsh climate, they grow very slowly compared to temperate and tropical forests. As Lars Ulander from FOI and Chalmers University pointed out, "When entering some of the forest stands in the test site with larger trees, it is impressive to think how old these trees are. Some forest stands are more than 100 years old – so that biomass in such cases is the result of 100 years of growth."

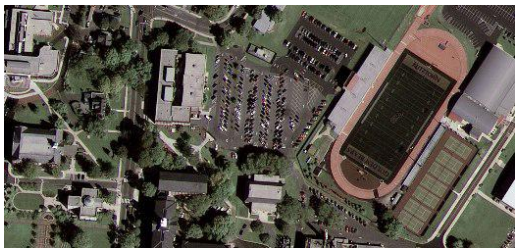
Beyond the immediate needs of the BIOMASS mission, the interest in the campaigns is expected to be enormous, as a complete remote sensing dataset and simultaneously acquired ground data are rare. Once the activity has been completed, the dataset will be made available to the wider scientific community through ESA.

Source: ESA Homepage on 20 October 2008

3.4 GEOEYE RELEASES FIRST IMAGE COLLECTED BY ITS NEW GEOEYE-1 EARTH-IMAGING SATELLITE

GeoEye, a provider of satellite, aerial and geospatial information, released the first, color half-meter ground resolution image taken from its GeoEye-1 satellite. The satellite has been undergoing calibration and check-out since it was launched on Sept. 6 from Vandenberg Air Force Base in Calif. The Company will begin selling GeoEye-1 imagery products later this fall.

GeoEye-1 simultaneously collects 0.41-meter ground resolution black-and-white imagery in the panchromatic mode and 1.65-meter color (multispectral). This first image showing Kutztown University located midway between Reading and Allentown, Penn. was produced by fusing the satellite's panchromatic and multispectral data to produce a high-quality, true-color half-meter resolution image. Though the satellite collects imagery at 0.41-meter ground resolution, due to U.S. licensing restrictions, commercial customers will only get access to imagery that has been processed to half-meter ground resolution.



Kutztown University campus as seen by GeoEye-1 satellite

The Kutztown University image shows the campus, which includes academic buildings, parking lots, roads, athletic fields and the track-and-field facility. The image was collected at 12:00 p.m. EDT on Oct. 7, 2008 while GeoEye-1 was moving north to south in a 423-mile-high (681 km) orbit over the eastern seaboard of the U.S. at a speed of four-and-one-half miles per second. GeoEye-1 was built by General Dynamics Advanced Information Systems in Gilbert, Arizona, USA. The imaging system was built by ITT in Rochester, New York, USA.

Source: GeoInformation website on 14 October 2008

3.5 SATELLITES HELPING AID WORKERS IN HONDURAS

Humanitarian aid workers responding to devastating flooding in Honduras have received assistance from space, with satellite images of affected areas provided rapidly following activation of the International Charter on Space and Major Disasters.

Tens of thousands of people have been displaced and 33 lives have been claimed by floods and landslides brought on by a tropical depression that hit the Central American country on 16 October.

On 27 October, on behalf of the UN Office for the Coordination of Humanitarian Aid (UN OCHA), the UN Institute for Training and Research (UNITAR) Operational Satellite Applications Programme (UNOSAT) asked the International Charter on 'Space and Major Disasters', referred to as 'The Charter', for support. Satellite images of the area acquired by ESA's Envisat were delivered the same day.

The Charter, founded in October 2000 by ESA, the French Space Agency (CNES) and the Canadian Space Agency (CSA), works to provide satellite data free of charge to those affected by disasters anywhere in the world.

With inundated areas typically visible from space, Earth Observation (EO) is increasingly being used for flood response and mitigation. One of the biggest problems during flooding emergencies is obtaining an overall view of the phenomenon, with a clear idea of the extent of the flooded area.

The flooding is being compared to the devastation left by Hurricane Mitch, which killed about 6 000 people when it ripped through Honduras a decade ago. Overall, Mitch claimed more than 10 000 lives across Central America.

In the wake of Hurricane Mitch, ESA, CNES and Spot Image worked to provide rapid and accurate EO-based maps of the area to emergency response teams. The reaction by the space community to the impact of Mitch is considered a precursor to the Charter.

Today, the Charter has 10 members, including ESA, CNES, CSA, the Indian Space Research Organisation (ISRO), the US National Oceanic and Atmospheric Administration (NOAA), the Argentine Space Agency (CONAE), the Japan Aerospace Exploration Agency (JAXA), the British National Space Centre/Disaster Monitoring Constellation (BNSC/DMC), the U.S. Geological Survey (USGS) and the China National Space Administration (CNSA).

Source: ESA Homepage on 31 October 2008

3.6 ARCTIC SEA ICE DECLINE SHAKES UP ECOSYSTEMS

Uncertain as to how phytoplankton – microscopic marine plants on which much of ocean life depends – would respond to Arctic sea ice decline, researchers took advantage of NASA satellite images to show that the microscopic floating plants are teeming in regions of recent ice melt.

The explosion in phytoplankton populations is the result of new open-water habitat and, more significantly, an extended ice-free growing season, biological oceanographer Kevin Arrigo and colleagues from Stanford University in Stanford, Calif., reported last month in the American Geophysical Union's Geophysical Research Letters.

Since phytoplankton cycle carbon dioxide into organic compounds and also form the base of the marine food web, the researchers believe the booming populations could have complex ecological consequences.

"Arrigo and colleagues have brought together the effects of air-sea interaction, warming water, and decreasing sea ice extent," said Paula Bontempi, a program scientist at NASA Headquarters in Washington. "You start to look at all of these interlocking pieces and think: there has got to be an impact on phytoplankton and the ecology of the system."

Phytoplankton, like any plant, require nutrients to survive. However, Arctic Ocean surface waters usually have a limited supply of nutrients, which has led some researchers to assume that new areas of open water would not necessarily promote additional phytoplankton growth.

To find out how phytoplankton respond to diminished sea ice cover, the team calculated changes in the sea ice extent and phytoplankton growth from ten years of

chlorophyll measurements -- which are used to estimate phytoplankton abundance -- collected by the Sea-viewing Wide Field of View Sensor (SeaWiFS) instrument on the GeoEye satellite. The team also collected measurements of sea surface temperature and ice extent from other satellite instruments such as NASA's Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua and Terra satellites.

Researchers were most interested by what happened between 2006 and 2007, when the summertime minimum sea ice extent made its sharpest annual reduction since satellite measurements began in 1979.

By comparing maps of new ice free areas in 2007 with maps of increasing phytoplankton abundance since 2006, the team could deduce how much of that phytoplankton growth was due to newly ice free regions. In a similar way, the team could compare the maps of ice-free regions with maps showing the magnitude of an extended melt season, to deduce how much growth resulted from the longer season.

The team found that 30 percent of the increase in phytoplankton between 2006 and 2007 was due to large new areas of open water exposed by the extensive melting of sea ice. The other 70 percent of the increase could be attributed to a longer growing season, which in some Arctic regions was extended in 2007 by as much as 100 days, compared to 2006.

"We expected a big phytoplankton increase in the areas that were historically covered by sea ice because the plants now have sunlight." Arrigo said. "But the longer growing season is ultimately what allowed most phytoplankton to grow and increase productivity."

Phytoplankton and all plants naturally remove carbon dioxide, a greenhouse gas, from the atmosphere. Newly open water in the Arctic could therefore act as a new "sink" for carbon dioxide if marine plants and their carbon sink out of the surface waters to the deep ocean. Still, the magnitude of such a carbon sink remains to be seen because further growth could eventually be limited by the supply of surface nutrients. Scientists also wonder if the uptake of carbon into the Arctic Ocean will be temporary or long lasting.

Whales, seals, marine birds, zooplankton, and other marine animals all depend either directly or indirectly on phytoplankton for food. Researchers are uncertain what effect a boost in plant growth will have on the ecosystem, particularly migratory species that depend on the timing of sea ice melt and food availability. "The Arctic is undergoing so many changes already," Arrigo said. "Nobody knows how this will play out."

Source: NASA Homepage on 7 November 2008

3.7 VALUE OF SATELLITES RECOGNISED FOR CONSERVING WETLANDS

Wetlands contribute to our lives in remarkable ways by providing food and water, controlling floods, protecting against storms and supporting biodiversity, yet they are experiencing loss and degradation on a massive scale.

Wetlands are areas that are covered with water for long enough periods to support plants that thrive in wet soils, so they are not all wet year-round. The areas include marshes, swamps, bogs and wet meadows.

Countering their loss requires baseline information on wetland resources and effective monitoring programmes, but because they are often made up of complex and impenetrable terrain monitoring them is very difficult.

In this context ESA carried out the GlobWetland project from 2003 to 2008 in order to demonstrate how employing satellite data can support the inventorying, monitoring and assessing of wetland ecosystems. The project was carried out in collaboration with the Ramsar Convention – an international treaty for the conservation and sustainable use of wetlands.

ESA recently presented the results and findings of GlobWetland with a side event at the main policy-making forum of the Ramsar Convention on Wetlands, the Tenth Meeting of the Conference of the Contracting Parties (COP 10).

The COP 10, held in Changwon, Republic of Korea, from 28 October to 4 November 2008, addressed the importance of further developing and intensifying internationally coordinated actions for the conservation of wetlands. More than two thousand wetland

specialists from around the world attended the Conference entitled 'Healthy Wetlands, Healthy People'.

During the COP 10, Ramsar adopted 33 resolutions, which includes the Strategic Plan that specifies measures to implement the international treaty for wetlands conservation from 2009 to 2014, and the 'Changwon Declaration on human well-being and wetlands'.

At its side event, ESA announced it will initiate a follow-on GlobWetland project, planned for 2009, and consulted with attendees about how the project could help fulfil the newly adopted Ramsar strategies. The implementation of these will require international, national, and local bodies involved in the implementation of the Convention to rely on suitable geo-information to better understand wetland areas, complete national inventories, perform monitoring activities, carry out assessments and put in practice suitable management plans based on up-to-date, reliable information.

Participants of the side event acknowledged the efforts and resources assigned by ESA in promoting and demonstrating the benefits of Earth Observation (EO) technology for the Ramsar Convention.

Speaking at the side event, Demetra Spala of the Hellenic Ministry of Environment, Planning and Public Works, said that Greece will develop a monitoring protocol using the technology demonstrated in the GlobWetland project.

"We will recommend to the Ramsar Secretariat and Contracting Parties to adopt these methodologies. The benefits are multiple. They would improve our knowledge for more efficient decision making and facilitate the reporting to the Convention," Spala said.

Dr Heather MacKay, Chair of the Ramsar's Scientific and Review Panel (STRP), said: "EO could be a cost-effective and very productive tool for the Convention. The technology is ready and mature enough for uptake on a certain number of areas. The STRP sees huge value for all Parties involved in the implementation of the Convention at all scales from global to regional, national and local scales."

With the follow-on of the GlobWetland project, funded by the Agency's Data User Element, ESA will strengthen its collaboration with the Ramsar Secretariat and wetland managers to further increase the operational use of EO technologies in support of the Convention and contribute to the set up of a Global Wetland Observing System (GWOS), one of the main objectives of the Ramsar Strategic Plan.

The Ramsar Convention on Wetlands was established in 1971 as an intergovernmental treaty aimed at establishing a framework for the stewardship and preservation of wetlands. Today more than 1822 wetlands have been designated as Wetlands of International Importance, a total area of 168 million hectares. The Convention's 158 national signatories are obliged to report on the state of the wetlands for which they are responsible.

Source: ESA Homepage on 14 November 2008

3.8 ESA FOSTERING THE NEXT GENERATION OF EARTH SCIENTISTS

ESA has launched a new initiative – the Changing Earth Science Network – to support young scientists undertaking leading-edge research activities aimed at advancing our understanding of the Earth System.

Although the Earth has undergone significant changes in the past, there is mounting evidence that the changes imposed, mostly by human activity, during the last 150 years cannot be compared with any previous change.

Realising the importance of further understanding our planet and how it may react to these recent changes, ESA drafted a new science strategy for Earth Observation (EO) in 2006 titled 'The Changing Earth'.

The strategy, drafted in collaboration with the scientific community, outlines the 25 major scientific challenges faced today in which EO may provide key contributions to better understand the interacting components of the Earth System – including water, atmosphere and land.

The new Changing Earth Science Network initiative will allow young postdoctoral researchers to address these scientific challenges by maximising the use of EO satellite data from ESA and its Third Party Missions.

The initiative will support young scientists starting their career in the area of Earth Science for a period of two years to undertake innovative research projects specifically addressing these key scientific challenges. By providing this opportunity, ESA will support the next generation of Earth scientists to enhance our knowledge of the Earth System while maximising the scientific return of ESA EO data.

The initiative aims to foster the development of a highly dynamic network of young scientist in Europe with a good knowledge of the Agency and its EO programmes. To this end, selected candidates will have the option to carry out part of their research in an ESA centre as a visiting scientist.

The first call for proposals was issued in November. From the proposals received, ESA will select up to 10 postdoctoral scientists from the Agency's Member States that put forward innovative research projects where ESA data may contribute to better understanding our planet. Selections will be announced in early 2009.

Incorporating the scientific community

Since their advent, satellite missions have become central to monitoring and learning about how the Earth works, resulting in significant progress in a broad range of scientific areas.

In the mid-1990s, ESA set up its Living Planet Programme and began working in close cooperation with the scientific community to define, develop and operate focused satellite missions.

Based on the 25 major scientific challenges identified in 2006, ESA is now reinforcing this strategy. In 2008, the Support to Science Element (STSE) was launched to provide support to future and on-going missions by taking a proactive role in the formulation of new mission concepts and providing multi-mission support to science.

The Changing Earth Science Network was developed as one of the main programmatic components of STSE. To learn more about this research opportunity, please visit www.esa.int/stse.

Source: ESA Homepage on 20 November 2008

3.9 WILKINS ICE SHELF UNDER THREAT

New rifts have developed on the Wilkins Ice Shelf that could lead to the opening of the ice bridge that has been preventing the ice shelf from disintegrating and breaking away from the Antarctic Peninsula.

The ice bridge connects the Wilkins Ice Shelf to two islands, Charcot and Latady. In an Envisat image acquired on 26 November 2008, new rifts can be seen to have formed to the east of Latady Island and appear to be moving in a northerly direction.

Dr Angelika Humbert from the Institute of Geophysics, Münster University, and Dr Matthias Braun from the Center for Remote Sensing, University of Bonn, spotted the newly formed rifts during their daily monitoring activities of the ice sheet via Envisat Advanced Synthetic Aperture Radar (ASAR) acquisitions.

"These new rifts, which have joined previously existing rifts on the ice shelf, threaten to break up a chunk of ice, which would cause the bridge to lose its stabilisation and collapse," Humbert explained. "These recent changes are happening slower and more continuously than the events we saw earlier this year."

In February 2008 an area of about 400 km² broke off from the ice shelf, narrowing the ice bridge down to a 6 km strip. At the end of May 2008 an area of about 160 km² broke off, reducing the ice bridge to just 2.7 km. Between 30 May and 9 July 2008, the ice shelf experienced further disintegration and lost about 1 350 km².

The Wilkins Ice Shelf, a broad plate of floating ice south of South America on the Antarctic Peninsula, had been stable for most of the last century before it began retreating in the 1990s. The peninsula has been experiencing extraordinary warming in the past 50 years of 2.5°C.

If the ice shelf breaks away from the peninsula, it will not cause a rise in sea level since it is already floating. However, ice shelves on the Antarctic Peninsula are sandwiched by extraordinarily raising surface air temperatures and a warming ocean, making them important indicators for on-going climate change.

Long-term satellite monitoring over Antarctica is important because it provides au-

thoritative evidence of trends and allows scientists to make predictions. Over the last 17 years, ESA's ERS and Envisat satellite missions have been the main vehicles for testing and demonstrating the use of Earth Observation data in Polar Regions.

In the past 20 years, seven ice shelves along the Antarctic Peninsula have retreated or disintegrated, including the most spectacular break-up of the Larsen B Ice Shelf in 2002, which Envisat captured within days of its launch.

Envisat's ASAR instrument is particularly suited to acquire images over Antarctica during the local winter period because it is able to produce high-quality images through bad weather and darkness, conditions often found in the area.

Daily ASAR images of Antarctica are easily accessible to scientists. ESA will publish an update about the status of the Wilkins Ice Shelf in the event of a break-up.

Source: ESA Homepage on 28 November 2008

4. FUTURE EVENTS

4.1 CONFERENCES AND SYMPOSIA

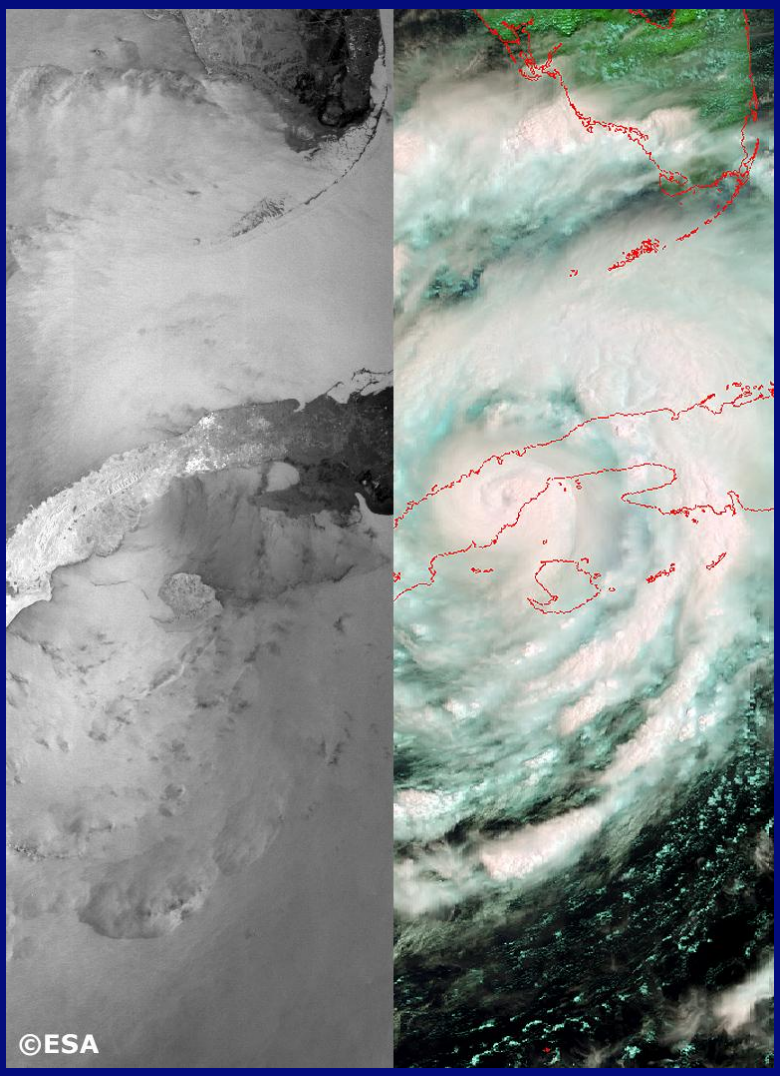
19 – 22 January 2009	Cartography and Geoinformatics for Early Warning and Emergency Management: Towards Better Solutions Prague, Czech Republic http://c4c.geogr.muni.cz/
10 – 13 February 2009	Map World Forum 2009 Hyderabad, India http://www.mapworldforum.org/
12 – 13 February 2009	1st Global Summit on Positioning & Navigation Hyderabad, India http://www.locationsummit.com
3 – 5 March 2009	International Geomatics Week, "The Future of Galileo – GPS today" Barcelona, Spain http://www.globalgeobcn.com
7 – 9 March 2009	2009 International conference on Digital Image Processing (ICDIP 2009) Bangkok, Thailand http://www.icdip.org
24 – 26 March 2009	Annual Conference & 100 Years Celebration of German Society for Photogrammetry, Remote Sensing & Geoinformation Jena, Germany http://www.dgpf.de/neu/
25 – 27 March 2009	Towards eEnvironment - Challenges of SEIS and SISE: Integrating Environmental Knowledge in Europe Prague, Czech Republic http://www.e-envi2009.org/
19 – 23 April 2009	European Geosciences Union: General Assembly 2009 Vienna, Austria http://meetings.copernicus.org/egu2009/
4 – 8 May 2009	33rd International Symposium on Remote Sensing of Environment Stresa, Lake Maggiore, Italy http://isrse-33.jrc.ec.europa.eu/
20 – 22 May 2009	Urban Remote Sensing Joint Event 2009 Shanghai, China http://www.urban-remote-sensing-2009.org.cn/
25 – 29 May 2009	2nd International Conference on Earth Observation for Global Change WangJiang hotel, Chengdu, China http://www.eogc2009.com.cn/
15 – 18 June 2009	29th EARSeL Symposium – "Imagin(e/g) Europe" Chania, Crete, Greece http://earsel29.maich.gr/

24 – 28 August 2009	ICA Symposium “True-3D in Cartography” Dresden, Germany http://kartographie.geo.tu-dresden.de/true3Dincartography09/

4.2 WORKSHOPS

26 – 30 January 2009	4th International Workshop on Science and Applications of SAR Polarimetry and Polarimetric Interferometry (POLinSAR) ESA/ESRIN, Frascati, Italy
16 – 19 March 2009	EARSeL 6th SIG Imaging Spectroscopy Workshop: "IMAGING SPECTROSCOPY: An Innovative Tool for Scientific and Commercial Environmental Applications” Ramat Aviv, Tel-Aviv, Israel http://www.earsel6th.tau.ac.il/
16 June 2009	2nd Workshop on Education and Training Chania, Crete, Greece http://earsel29.maich.gr/
19 June 2009	4th Workshop on Remote Sensing of Coastal Zones – ”Coasts and Climate Conflicts” Chania, Crete, Greece http://earsel29.maich.gr/
2 – 5 September 2009	EARSeL 7th SIG International Workshop on Forest Fires: “Advances in RS and GIS applications in Forest Fire Management”. Towards an operational use of remote sensing in forest fire management Matera, Italy http://www.forestfire.imaa.cnr.it/

Back Cover – View of hurricane Ike as seen by the Envisat's ASAR and MERIS sensors on the 9th of September 2008. Thanks to Envisat's ability to simultaneously capture radar and optical images, it is possible to view the top and bottom of a hurricane. Source: ESA



EARSeL Sponsoring Agencies:

Council of Europe European Space Agency

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