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NEWSLETTER

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European Association of Remote Sensing Laboratories

Front Cover – Central picture: UNESCO Headquarter, Venue of the 30th EARSeL Symposium.

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EARSeL Newsletter Editors

Rosa Lasaponara
lasaponara@imaa.cnr.it

Antonio Lanorte
alanorte@imaa.cnr.it

Rosa Coluzzi
coluzzi@imaa.cnr.it

Nicola Afflitto
afflitto@imaa.cnr.it

Institute of Methodologies for Environmental Analysis (IMAA), Italian National Research Council (CNR)
Tel:+390971427111
Fax: +39 0971427271

Editorial Assistance

EARSeL Secretariat
Gesine Boettcher
Nienburger Strasse 1,
30167 Hannover, Germany
Tel: +49 511 7622482
Fax: +49 511 7622483
Email: secretariat@earsel.org

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The Newsletter is a forum for an exchange of news and views among the members of the Association. The opinions expressed in the Newsletter do not necessarily reflect the views of the editor, the EARSeL Bureau or the other members of the Association.

1. EDITORIAL

Dear members,

Another year full with EARSeL events is ending.

Following a good tradition, this newsletter issue contains the annual reports of the SIGs of EARSeL, summing up their activities during the last twelve months, along with news regarding Remote Sensing activities and the event calendar. As you already have noticed in the front cover, a major event of our Association, the 30th Symposium together with the General Assembly will take place in May-June in Paris at the UNESCO Headquarters.

You are all welcomed to participate in this important event, join the presentations and discussions, be part of the future activities of EARSeL community. You are cordially invited to participate in the joint workshop organized in Ghent, Belgium, from 22-24 September 2010, by Rudi Goossens.

In this issue you will also find one feature article by Marco Giardino, focused on some NASA activities dealing with the use of remote sensing for archaeology.

We thank you very much for your contributions and invite all of you to interact within and support all EARSeL actions and events throughout the new year, providing feedback and indicating new strategic challenges in the field of remote sensing.

Sincerely,

The editorial team

2. NEWS FROM EARSeL

2.1 ACTIVITIES OF EARSeL SPECIAL INTEREST GROUP RADAR REMOTE SENSING

The two high-resolution SAR satellite sensors COSMO-SkyMed (Italy) and TerraSAR-X (Germany), both launched in 2007, meanwhile became operational standard means for mapping by imaging radar according to the Synthetic Aperture Radar Principle (SAR). End of this year a sister satellite of TerraSAR-X, called TanDEM-X, is scheduled for launch. Both satellites shall conduct a bistatic InSAR campaign lasting for several years. The final product will be a global DEM which shall outperform SRTM. This DEM will be finally commercialized by Infoterra, Friedrichshafen, Germany.

The scientific efforts of the SIG focused on the establishment of a project to validate DEM derived from imagery of state-of-the-art satellite SAR sensors like those mentioned above. This project will be conducted in cooperation with and in the framework of the ISPRS Commission VII/2 working group "SAR Interferometry" (Internet: http://www.commission7.isprs.org/wg2/).
In November 2009, DLR approved a proposal that aimed at the investigation of several test sites in different countries using 50 TerraSAR-X images based on high-quality reference data. Details will soon be revealed on the SIG's website.

On the side of conference activities, the main event in 2009 was the **29th EARSel Symposium** in Chania, Greece where two **specific sessions** were organized by the SIG Radar Remote Sensing. The papers dealt with a variety of topics: the analysis of high-resolution COSMO-SkyMed and TerraSAR-X imagery, differential Interferometry for surface deformation mapping, crop classification, and oil spill detection. This reflects nicely the wide spectrum of applications connected to SAR.

The SIG will contribute to the upcoming 30th EARSeL symposium in Paris, France, from 31 May - 4 June 2010. Our plans for the future include also a **joint workshop** in Ghent, Belgium, from 22-24 September 2010, organized by Rudi Goossens. This workshop will involve SIG Urban Remote Sensing, SIG Radar Remote Sensing, SIG 3D Remote Sensing, SIG Thermal Remote Sensing, and SIG Developing Countries.

Uwe Soergel and Fabio Dell'Acqua

2.2 ACTIVITIES OF EARSeL SPECIAL INTEREST GROUP URBAN REMOTE SENSING

29. Annual EARSeL Symposium Imagine Europe

Mediterranean Agronomic Institute of Chania

Crete, Chania, Greece 15-18 June 2009

- Member of the Scientific Commitee (Derya Maktav)
- Chairman: Session: Urban Remote Sensing I (Derya Maktav)
- Member of the Scientific Commitee (Carsten Jürgens)
- Chairman: Session: Urban Remote Sensing II (Carsten Jürgens)

- Papers (Derya Maktav)

✓ Land cover and coast line change detection by using object oriented imageprocessing in Alaçatı, Turkey (GUCLUER Dolunay, BULENT Bayram, DERYA Maktav (poster)

✓ A study in the application of remote sensing and GIS for the archaeology of the hinterland of medieval Constantinople/Istanbul (MAKTAV, Dery) (oral)

2009 Joint Urban Remote Sensing Event

The 5th GRSS/ISPRS Workshop on Data Fusion and Remote Sensing over Urvban Areas (URBAN 2009)

The 7th International Urban Remote Sensing Conference (URS 2009).

Shanghai, China

20-22 May, 2009

- Chairman: Plenary Session (Prof. Yaqiu Jin, Prof. Derya Maktav
- Chairman: Student Contest Session I (Derya Maktav, Carsten Jürgens)
- Chairman: Student Contest Session II (Carsten Jürgens, Derya Maktav)
- Chairman: Student Prize Ceremony (Paolo Gamba, Carsten Juergens, Derya Maktav)
- Chair of TC of URS: Opening Session (Carsten Jürgens)

International Conference on Recent Advances in Space Technologies (RAST 2009)

Space for the Developing World

Istanbul, Turkey

11-13 June 2009

- Member of the International Program Committee (Derya Maktav)
- Special Session on Remote Sensing Applications (EARSeL-SIG URS)
- Chairman: Special Session on Remote Sensing Applications (Derya Maktav)

Joint Project

Gaining additional urban space (GAUS) – Detection and valuation of potential areas for inner urban development with remote sensing and GIS.

Objective of the proposed research project is the development of a technology based instrument for supporting the municipal area management authorities with regard to urban consolidation and smart growth. Aerial photographs and satellite images constitute the basis for an up-to-date and partly automated detection of potentially usable areas. Within a GIS, HR remote sensing data with a spatial resolution partly below one meter offers opportunities for adequately registering even smallest potential building areas with their exact extent and location.

The project is supported by the Intensified Cooperation (IntenC) programme which supports innovative approaches in areas of high current technological interest or relevance to the German-Turkish relations. The partners of the programme areThe Scientific and Technical Research Council of Turkey (TÜBITAK) and the Federal Ministry of Education and Research (BMBF). The project has started on March 2009.

Project leaders are: Alexander Siegmund (University of Education Heidelberg), Derya Maktav (Istanbul Technical University), Carsten Jürgens (Ruhr University Bochum).

Preparations for the Joint Urban Remote Sensing Event 2011

2011 Joint Urban Remote Sensing Event

The 6th GRSS/ISPRS Workshop on Data Fusion and Remote Sensing over Urvban Areas (URBAN 2011)

The 8th International Urban Remote Sensing Conference (URS 2011).

Munich, Germany

2011

Preparations for Gent Workshop 2010

2.3 ACTIVITIES OF EARSeL SPECIAL INTEREST GROUP FOREST FIRE

REPORT of the 7th International Workshop

The 7th International Workshop on Advances in Remote Sensing and GIS Applications in Forest Fire Management was organised by the Institute of Methodologies for Environmental Analysis (IMAA) of the Italian National Research Council (CNR), in collaboration with the University of Alcalá and the European Space Agency.

The Matera workshop was the most recent of a series of technical meetings that were

organised by the EARSeL SIG on Forest Fires after its foundation in 1995. The previous meetings were held in Alcalá de Henares (1995), Luso (1998), Paris (2001), Ghent (2003), Zaragoza (2005) and Thessaloniki (2007).

The main focus of the workshop was on the operational use of remote sensing in forest fire management. However, a large number of paper contributions were also related to the pre-fire planning and management, as well as the real-time detection and monitoring of active fires, and the evaluation of the effects of forest fires.

The workshop was attended by 97 participants from 16 different countries. The most of the participants originated from European Mediterranean countries with smaller numbers of attendants originating from other European countries such as Germany, Switzerland, Belgium, the U.K, and Austria. Finally, a small number of participants originated from non-European countries such as South Africa, Canada, the USA, Mexico, and Colombia.

Pre-workshop activities included an open to the public session comprised three lectures on the 'Global Monitoring of essential Climate variable: the case of fire' by Olivier Arino (ESA), 'Remote Sensing of Forest fires at the European Forest Fire Information System - by Jesus San Miguel-Ayanz (Joint Research Centre), and 'Remote Sensing technology for wild fire risk assessment by Pol Coppin (Katholieke Universiteit Leuven, Belgium)

The main activities of the Workshop included 6 invited lectures, 4 poster sessions, 4 general discussion sessions, and a round-table discussion session. The different activities of the Workshop are presented in more detail, in turn, below:

INVITED LECTURES

The invited lectures focused on the following topics:

- Remote Sensing of vegetation fuel moisture content: advances in measurements and modelling by Mark Danson , University of Salford, UK),
- Wildfire Statistic: Implications for ecology, Risk and Government by Bruce Malamud, EGU, Natural hazard Division,
- Accuracy requirements for the operational use of fire products by Everett A Hinkley, USDA Forest Service, Remote Sensing Applications Center (RSCA)
- Lessons Learned: Experience in UAS/Sensor Operations Supporting Real-Tiome Wildfire Observations and data delivery by Vincent Ambrosia (NASA)
- Burnt severity estimation from remotely sensed data using simulation models by Angela De Santis INSA (Ingenieria y Servicios Aeroespaciales,
- GMES Operational Burned Scar mapping Services of the RISK EOS project by Marc Paganini, European Space Agency.

POSTER SESSIONS

The poster sessions focused on four topics, namely, 'Pre-fire Planning and Management' (1st session), 'Accuracy requirements for the operational use of fire products' (2nd session) 'Fire Detection & Monitoring' (3nd session), and 'Fire effects assessment: burned land mapping, fire severity determination and vegetation recovery assessment' (4rd session).

During the first session 19 posters were presented focusing on the mapping and modelling of fire occurrence, fuel type mapping, fuel moisture content (FMC) estimation, fire behaviour modelling and fire risk modelling.

During the second poster session 9 posters were presented focusing on the validation of Remote sensing products for fire management, fire risk assessment, burned area mapping.

During the third poster session 7 posters were presented focusing on the detection and monitoring of active fires.

Finally, during the fourth and last poster session 18 posters were presented in relation to burned area mapping, fire severity mapping, post-fire mapping and monitoring, and post-fire vegetation recovery assessment. It should be noted that during the poster sessions one-to-one discussions with the authors was encouraged while after the end of each session a general discussion of the session was made.

GENERAL DISCUSSIONS

The general discussions were based on the active participation and the brainstorming of the attendants on the subjects that were briefly introduced by the coordinators. The first general discussion on 'Prefire Planning and Management' was coordinated by Mark Danson (University of Salford, UK) and Emilio Chuvieco (University of Alcalà- Spain), the second general discussion on 'Validation of Remote sensing products for the operational use of fire products' was coordinated by Luigi Boschetti (University of Maryland). The third general discussion on 'Fire Detection & Monitoring' was coordinated by Vincent Ambrosia (NASA) and Rosa Lasaponara (CNR-IMAA) while the fourth general discussion on 'Post-Fire evaluation' was coordinated by Joannis Gitas (CSIC) and A. Pietro Brivio (CNR-IREA).

ROUND TABLE DISCUSSION

The round-table focused on the 'Operational use of remote sensing – User needs and priorities' and was moderated by Rosa Lasaponara (CNR-IMAA) with the participation of Michael Flanningan (Canadian Forestry Service), Everett Hinkley (USDA Forest Service, Remote Sensing Applications Center, RSCA), and Phil Frost (CSIR, South Africa),

General Assembly of the SIG group

Emilio Chuvieco, current chairman of the SIG Fire group presented the trajectory of the group in the last years and the activities carried out, mainly focused on the technical workshops (every other year) and maintaining of the web page. New projects could be identified within the group, such as a growing participation of European researchers in global fire research programs, and establishing of a network of validation sites. Considering the length of the SIG coordination, Emilio Chuvieco suggested that another expert may take a new group leadership. Dr. Ioannis Gitas, from University of Thessaloniki, Greece was proposed as new chairman of the group.

Publication

Selected papers will be included in a special issue of the Earth Interactions Journal, which will be published in 2010 while the total of the presented lectures and papers were included in the following recently published volume:

Title: Proceedings of the 7th International Workshop of the EARSeL Special Interest Group on Forest Fire. Towards an Operational Use of Remote Sensing in Forest Fire Management

Editors: Rosa Lasaponara and Emilio Chuvieco

Publisher il Segno - ISBN 978-88-904367-0-3

2.4 ACTIVITIES OF EARSeL SPECIAL INTEREST GROUP LAND USE USE AND LAND COVER

Report of the 3rd Workshop on "Remote Sensing of Land Use & Land Cover", 25-27 November 2009 in Bonn, Germany

Land use and land cover is a basic information layer required by various application fields. Pan-European coverage as well as more local studies are needed. Operational products and services based on remote sensing information are in place since many years, with CORINE Land Cover as its flagship. They also form an essential part of the EU GMES programme. New sensor systems as well as the increasing availability of multi-temporal and multi-scale data sets require the continuous adaptation of existing and development of new methodologies for data analysis.

The EARSeL Special Interest Group on Land use & land Cover intends to bring together scientists from different disciplines working on this specific field. In particular a platform for exchange between science and operational applications shall be facilitated.

After a first thematic workshop in Dubrovnik in 2004 and a second event in Bonn in 2006, the third workshop was organized from November 25 to 27 again in Bonn, Germany. More than 133 participants from 30 countries registered for the workshop, mainly from European countries but with various overseas contributions from the Americas, Asia and Africa.

The 3-day workshop programme was subdivided into five thematically grouped session blocks on methods, national and

European land cover mapping, multi-source approaches, forest and land degradation, land use land cover mapping in the tropics and sub-tropics as well as two well-attended interactive poster sessions.

The EARSeL treasurer, Ioannis Manakos, opened the workshop by introducing EARSeL and its activities as well as by highlighting the activities of the special interest group. In the following three keynotes were given by Anette Reenberg (Univ. Copenhagen) 'The Global Land Project of IHDP/IGBP - an umbrella for integrated land change studies'. It was emphasised that LC/LU indicators produced by remote sensing methods should be translated to ecosystem characteristics. Jörg Szarzynski (UN-SPIDER office Bonn) was speaking about “Space-based solutions in support of impact assessment and global disasters management: the UN-SPIDER programme”. All kinds of available space based data are used to optimize the mitigation / relief operations by the UN. Marc Paganini (ESA/ESRIN, Frascati) "Preparing Sentinel 2, ESA exploitation projects in land use and land cover" introduced Sentinel-2 satellite, which is much awaited by all those European users, who are interested in regional land cover mapping. There will be two Sentinel-2s with planned launch years of 2012 and 2016. Sensor bands will be similar to Landsat-7 and SPOT 4/5 with 10/20 m pixel size. There will be 3 narrow bands to support atmospheric correction.

Some papers which were attractive for the reviewer are listed below. In the “Methods” session: Defense Meteorological Satellite Program (DMSP-OLS) night-time imagery were used to analyse impervious surfaces, which proved to be a good proxi of modelling CO_2 emissions (P. Sutton et al., Denver/USA). A. Salberg and R. Solberg (Norway) introduced a method to support classification of cloud- and snow contaminated multitemporal high-resolution satellite images.

The “National and European Land Cover mapping” and the following “Discussion on EU land cover products, INSPIRE) sessions included many large-scale projects. We have heard about “CLC2006: Mapping Land Cover of Europe under GMES (G. Büttner, Budapest/ Hungary). Several national LC/LU mapping projects have been introduced (UK by G. Smith, Spain by M.E Caballero, Portugal by M. Caetano, Netherlands by G. Hazeu, Finland by M. Kallio) most of them use some variants of the object oriented approach. As example of top-down organisation regarding the GMES Land Monitoring Core Service was presented (S. Kuntz, Germany). Points of discussion after the sessions were: satellite image availability, accessibility of LU/LC data (free; free for government only; not free), what the user can benefit from INSPIRE?

In the session “Multi-source Approaches” S. Vogt (Freiburg/Germany) presented a study which documented the post WW2 development in Germany by comparative evaluation of aerial photographs taken in 1945, 1975 and 2003.

The sessions in the last day dealt with “Forest & land degradation” and “LULC on tropics & semiarid areas”. P. Hostert (Berlin/ Germany) was speaking about mapping illegal logging in the Ukrainian Carpathian mountains in the period of 1990-2007, the era of economical transition in the country. A case study for Kalimantan / Indonesia was presented within the framework REDD (Reducing Emissions from Deforestation in Developing countries).

The authors would like to stress the very good poster contributions to the workshop. As a result very lively discussions arose in front of the posters during these two afternoon poster sessions. The best poster was elected by all participants and awarded to the contribution by Leitão, P.J., Rabe, A., Osborne, P., Moreira, F. and Hostert, P. from Humboldt University in Berlin, Germany for their paper “Hard vs. Soft classification of land cover for use in species habitat modelling”.

On Friday a short discussion was initiated in regard to organisational matters of the SIG. Matthias Braun asked for feedback on the workshop model, but also if the SIG should be more as "just" the regular bi-/three-annual organization of workshops. He and several members of the scientific committee reported that they received many high level contributions (in total about 126 papers were submitted), but only 30 slots for oral talks were available. This resulted in very high competition and the problem that many very qualified contributions had to be sent to poster. M.B. suggested e.g. a workshop model only with poster contributions, more

keynotes and discussions as other EARSeL SIGs organize their meetings. Several participants supported this although no general agreement was found. A suggestion for a dedicated mailing list for spreading news, announcements and so on was highly appreciated. The SIG team will see that this can be accomplished within the EARSeL geoland2 participation. George Büttner suggested having again some tutorial(s) on the next workshop and this was welcomed by all participants. Additionally, the suggestion for a method intercomparison exercise (e.g. for classification and change detection) received some attention and support. The idea would be to collect data from various test sites representing different land covers and make such a standardized set available (e.g. a certain number of images plus respective ground truth) to different groups to test the performance of their algorithms. Ideally, an independent accuracy assessment would be done by a single operator or group according to predefined rules in order to achieve maximum comparability. M.B. will evaluate if such a procedure will be feasible within the framework. Consequently, there seems to be quite some response and interest within the SIG for more joint efforts besides the workshops. The visibility of the SIG and EARSeL itself could certainly benefit from such additional activities that are so far not implemented otherwise.

The organizers would like to thank all participants for their coming to Bonn and the lively discussions and exchange during the event.

George Büttner (Buttner.Gyorgy@fomi.hu), Institute of Geodesy, Cartography and Remote Sensing, Bosnyák tér 5, H-1149 Budapest, HungaryMatthias Braun (matthias.braun@uni-bonn.de), Center for Remote Sensing of Land Surfaces, University of Bonn, Walter-Flex-Str. 3, D-53113 Bonn, Germany

2.5 ACTIVITIES OF EARSeL SPECIAL INTEREST GROUP FOR ARCHAEOLOGY AND CULTURAL HERITAGE

The SIG on archaeology and cultural heritage meets every other year for a technical conference focused on the new updates in using remote sensing and GIS tools for cultural heritage management, documentation, monitoring and preservation.

The first meeting was held in Rome (2008). During the 2009 the SIG activities have been addressed to the publication of outstanding progress resulted in the field of remote sensing for archaeology. Four Special Issues of prestigious international journals have been arranged with the contribution of participants to the Rome workshop. Archaeological Prospection, Journal of Cultural Heritage, Journal of Archaeological Science Photointerpretation have been (or are ready to be) published.

It was agreed that the next meeting will be focused on Cultural Heritage and Risk including the operational use of advanced technologies for cultural heritage management and protection from natural and man made disasters, the main topics of the Conference will be, but not limited to, the following:

- Adverse impact of natural Disaster on Cultural heritage
- Impact of human activities on archaeological sites and Landscape
- Threats from war and civil strife to Cultural heritage
- Ancient civilizations and natural disasters
- Man-made hazards and world heritage
- 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: from the detection to the monitoring

- Sub-surface reconstruction based on GPR, magnetic and electrical tomography
- 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 palaeo-environmental studies based on Remote sensing, GIS and ICT.
- Management and protection of cultural and natural heritage: Remote Sensing, GIS and ICT based applications.
- Rescue archeology.

The main activities of the Workshop will include lectures given by invited speakers, oral communications, poster sessions and a field excursion.

Full texts of the invited lectures, oral communications and posters, will be included in the Workshop Proceedings. Selected papers presented during the workshop will be included in a special issue of an International Journal.

Abstract and queries can be addressed to: lasaponara@imaa.cnr.it

- For more information about the forthcoming meeting, please visit the website: http://www.ibam.cnr.it/earsel/

- For questions:

  lasaponara@imaa.cnr.it

Sig activity 2009
Rosa Lasaponara

Institute of Methodologies for Environmental Analysis (IMAA),
Italian National Research Council (CNR)
C.da S.Loja, Tito Scalo (PZ), Italy
Tel:+390971427214
Fax: +39 0971427271

3. NEWS ITEMS

3.1 ESA AND EUMETSAT SIGN GMES FRAMEWORK AGREEMENT

NOV. 2, 2009 – SUCCESSFUL LAUNCH OF SMOS

Artist view of the SMOS satellite, launched on Nov. 2, 2009.

Monday 2 November, 01:50 UTC (02:50 CET) - The SMOS and PROBA-2 satellites were successfully launched atop a Rockot launch vehicle from the Plesetsk Cosmodrome (northern Russia)

The **SMOS** (Soil Moisture and Ocean Salinity) **mission** is a joint ESA / CNES (F) / CDTI (SP) Earth Observation program. The SMOS satellite has been **proposed by the French lab CESBIO** (Center for the Study of the BIOsphere from Space), a joint UPS-CNRS-CNES-IRD. CESBIO laboratory. It aims to develop knowledge on continental biosphere dynamics and functioning at various temporal and spatial scales.

The **SMOS payload** is a CASA EADS & Thales Alenia Space L-Band (1.4 GHz) 2D passive interferometric radiometer with a Y-shaped 3 arms synthetic aperture antenna. SMOS has been selected by **ESA** as its 2nd Earth Explorer Opportunity Mission.

The **primary scientific objective** of this mission is to obtain a better estimate of the spatio-temporal water budget at the global scale and ocean/atmosphere interactions through global observation of **soil moisture** and **ocean salinity**.

Water and energy fluxes at the surface/atmosphere interface are strongly dependent upon Soil Moisture. So, it is necessary to estimate the soil surface humidity for global circulation models and boundary conditions for large hydrological models. Sensitivity analyses show the importance of knowing a precise value on the soil surface humidity for precipitation field reconstruction.

Evaporation, infiltration and runoff are driven by moisture while soil moisture in the root zone governs the rate of water uptake by vegetation. Soil moisture is thus a key variable in the hydrologic cycle. Soil moisture and its spatio-temporal evolution is an important variable for numerical weather and climate models, and should be accounted for in hydrology and vegetation monitoring. The SMOS **Soil Moisture accuracy objective** is of 4% on volumetric soil moisture, with three days revisit and a spatial sampling better than 50 km.

Sea Surface Salinity is a very important variable for ocean circulation dynamics and for ocean/atmosphere coupling. It plays an important role in the Northern Atlantic sub polar area, where low salinity intrusions impact the deep thermohaline circulation and the meridional heat transport. Variations in salinity also impact the

near-surface dynamics of tropical oceans, where rainfall modifies the buoyancy of the surface layer and the tropical ocean-atmosphere heat fluxes. Salinity fields and seasonal and inter-annual variability are thus tracers and constraints on the water cycle and on the coupled ocean-atmosphere models. The SMOS **Ocean Salinity accuracy objective** is better than 0.1 PSU on a monthly grid scale (200 km). Knowing that a single measurement will be less accurate (~1 PSU), spatial and temporal averages will be needed for noise reduction.

Last but not least, significant research progresses are expected over the **cryosphere**, through improving the assessment of the snow mantle, and of the multi-layered ice structure. These quantities are of significant importance for **global change** research. Research on sea ice will also be carried out.

Even though both moisture and salinity are used in predictive atmospheric, oceanographic, and hydrologic models, **no capability exists to date** to measure **directly and globally** these key variables. SMOS aims at filling this gap through the implementation of a mission that has the potential to provide globally, frequently, and routinely this information. SMOS mission is also expected to provide significant information on **vegetation water content,** which will be very useful for regional estimates of crop production.

The **global observations** delivered by the SMOS mission are **unique** as of to-day. This proves both the ability of European laboratories to propose innovative cutting-edge missions, the willingness of ESA and national Agencies to open new paths by funding them, and the capacity of the European industry to build up the related instruments – a challenge indeed.

Yann KERR (CESBIO – SMOS PI),
Gérard BEGNI (CNES - EARSeL French delegate)

3.2 ESA HELPS MAKE SUMMER IN THE CITY MORE BEARABLE

As temperatures soar, scientists have been collecting data amid the ancient ruins that symbolise the birthplace of western culture. These data, combined with measurements from aircraft and satellites, promise to improve 'urban heat island' forecasts to make life in modern-day Athens easier during heat waves. Heat waves strike with relative frequency in the summer months across southern Europe but the Greek capital of Athens is notorious for its sweltering conditions. The city is particularly prone to high temperatures because of its dense layout, narrow streets, limited green space and long-standing air pollution problem. While the average daytime temperature for July is 33.5ºC, statistics show that the number of days that exceed 38ºC appears to be increasing dramatically.

Measurements at the Parthenon

Periods of hot weather are always felt more acutely in cities, especially at night. This is down to a phenomenon called an urban heat island, where the temperature in the city can be up to 10ºC higher than the surrounding countryside.

The built-up urban environment tends to act like a giant storage heater, soaking up the heat during the day and releasing it at night. Air pollution, traffic, lack of open space and low evaporation also contribute to the heat of the city. In addition, appliances such as refrigerators and air conditioners have to work harder as the temperature rises. In turn, this adds more heat to the environment causing the situation to worsen.

Increased daytime temperatures and reduced night-time cooling have a huge impact on human health and comfort. Urban heat islands are associated with above-average rates of mortality, especially amongst the elderly. This is sadly illustrated by the 10-day heat wave

that engulfed Athens in 1987 and responsible for claiming 926 lives. During this extreme event, the mercury climbed to 48ºC – the all-time highest temperature recorded for metropolitan Athens.

Measurements on the Acropolis museum roof

In order to improve our understanding of the complexities of how urban heat islands arise, so that more efficient alert systems can be developed and effective mitigation strategies adopted, ESA organised an airborne campaign that was recently carried out over Athens.

In a series of coordinated activities, a group of thermal remote-sensing and urban-climate experts from Greece and Spain carried out ground-based measurements at various sites in and around the Greek capital, whilst aircraft equipped with sensitive instrumentation passed overhead and satellites orbiting Earth acquired data simultaneously from space.

INTA aircraft and crew

The campaign, called Thermopolis 2009 from the classical Greek terms for hot (thermo) and city (polis), was led and coordinated by Prof. Spyridon Rapsomanikis from the Democritus University of Thrace. It was carried out as part of the Urban Heat Islands and Urban Thermography project within the framework ESA's Data User Element. Four Greek administrations also participated in the project: the city of Athens, the municipality of Amaroussion, the Hellenic National Meteorological Service and the General Secretariat for Civil Protection.

Prof. Rapsomanikis pointed out that, “Although the objectives of the Thermopolis 2009 project targeted the needs of ESA's Urban Heat Island and Urban Thermography Data User Element project, the generated dataset will, as an unavoidable by-product, generate unique scientific insight into the thermal budget of cities.”

Thermal image of Athens

The campaign follows a similar exercise successfully executed last summer in the city of Madrid, Spain, called the DESIREX 2008 campaign. The Thermopolis campaign in Athens began on 18 July, when two aircraft made simultaneous flights over the city. One aircraft, operated by INTA, Spain, took measurements with a hyperspectral imaging spectrometer called the Airborne Hyperspectral System. The spectrometer is sensitive to both visible and thermal infrared wavelengths, covering 0.442 µm –13.361 µm of the electromagnetic spectrum. The second aircraft, operated by Aerophoto Ltd, Greece, carried an air turbulence temperature pressure and relative humidity system.

Meanwhile, data were acquired from space by several satellites, including ESA's ERS and Envisat satellites, NASA's Landsat-5, Terra and Aqua platforms, the NOAA constellation, Eumetsat's Meteosat Second Generation-2 and the joint NASA-CNES satellite Calipso. At the same time, ground teams took atmospheric and radiometric measurements.

Aerophoto aircraft and crew

Prof. Kostas Kourtidis from the Democritus University of Thrace, who was in charge of the ground measurements, said, “The analysis of the dataset will allow us to better understand how urban heat islands vary in the city of Athens. This should help us come one step closer to the operational forecasting of urban temperatures at high spatial resolution.” A further five flights and associated ground measurements were conducted during the ensuing week, while the Athens weather obligingly reached over 36°C. In agreement with the National Technical

University of Athens and the Scientific Committee of the Acropolis Archaeological Site, the ground teams took extra *in situ* measurements on the Acropolis itself.

Thermal image of Lycabettus

Once analysed, the dataset will address a number of specific objectives; namely the quality assessment of urban heat island information products, the development of urban heat wave forecasting techniques, the development of appropriate alert systems and the detailed study of the phenomenon's spatial variability in metropolitan areas, which may help improve urban planning in the future to reduce the effects of heat waves. Dr Maria Varinou, from the General Secretariat for Civil Protection, is one of the users involved in the urban heat island project. She considered that the data collected during the campaign will be of great practical interest for the city of Athens, "Detailed mapping of urban temperatures and the associated heat stress for the citizens can help us position ambulances during heat waves; thus considerably shortening transport times to the hospitals for those suffering from the heat."

Source: ESA homepage 27 August 2009

3.3 Oceansat-2 Launched by India

Oceansat-2 was launched into its planned orbit on Wednesday, 23 September, 2009. It is the India's second remote sensing satellite meant to study the oceans and atmosphere.

Oceansat-2 is one of the few international missions that exclusively study marine atmosphere, coastal climate and wind speed. It replaces Oceansat-1 which was launched in 1999 (though it is still operational). It was built at a cost of Rs 160 crore.

According to ISRO, Oceansat-1 nearly revolutionised fish zone prediction and the information it gave fishermen through rural societies helped to double fishing catches. The 960-kg Oceansat-2, with a design life of five years, continues this service. Oceansat-2 carries three instruments – an Ocean Colour Monitor that films a sweep of 1420 km; a Scatterometer to read wind speed; and an Italian-made ROSA which is a GPS receiver for atmospheric sounding. Oceansat-3, with improved capabilities, is being planned for 2011-12.

Oceans, which cover almost 70% of the earth's surface, greatly influence its climate. Hence, oceans have a powerful impact on the world economy and daily life the world over.

Data from Oceansat-2 are in demand internationally, along with information from other Indian remote sensing satellites (IRSs), since understanding the Ocean role in shaping the earth's environment, has been a scientific priority.

Improved observations of the physical and biological parameters of oceans have become important for any meaningful study of the earth's environment.

The traditional approaches used to study oceans are based on the use of ships and buoys. Such methods are difficult and expensive, and very often not feasible at all.

Satellite-based observations provide reliable data on a regular basis and enable us to improve our understanding of the behaviour of oceans, and their role in shaping the earth's environment.

To understand behaviour of oceans it is essential to study their surface temperature, surface winds, humidity, precipitation, sea water salinity and other variables, at regular intervals.

Oceansat-2 will gather the needed data during its five-year mission life using the following three payloads - the Ocean Colour Monitor (OCM), the Ku-band Scatterometer (both made at SAC, Ahmedabad), and Radio Occultation Sounder for Atmospheric studies (ROSA).

Later reports (14 October 2009) indicated that all of the sensors were working properly.

http://www.isro.org/satellites/oceansat-2.aspx

3.4 New Airborne Lidar Observes Forest Canopies

A newly developed UV lidar aboard an ultralight airplane provides detailed vegetation and atmospheric characterization.

28 September 2009, SPIE Newsroom. DOI: 10.1117/2.1200909.1732

Forest-biomass contributions are essential for climate regulation because they act as sinks of atmospheric carbon dioxide and determine the water cycle. Climate change may lead to an increase in the frequency of ecosystem fires in regions such as southern Europe. To better understand and prevent the risks associated with forest-fire propagation and intensity, we require detailed information on the structure of the forest canopy. This is also essential for proper management and sustainable use of forest resources and to characterize the evolution of biodiversity.

These considerations are driving development of a new generation of active remote-sensing instruments and methodology. Such tools will contribute significantly to the planning of future satellite missions with payloads including canopy light-detection and ranging systems (lidars) for global surveys of the forest cover. In this framework, a French project (initiated jointly by the Pierre Simon Laplace Institute (IPSL) and the Agricultural and Environmental Engineering Research Institute, CEMAGREF) has led to deployment of a new airborne lidar prototype, LAUVA (lidar aérosol ultraviolet aéroporté), to study the vertical characteristics of the forest canopy in the Landes region in France. It was originally developed by the French atomic-energy commission (CEA) and the CNRS for atmospheric applications. The system was first deployed for African-monsoon multidisciplinary analysis[1] and subsequently adapted for canopy measurements. It is a compact, polyvalent lidar capable of measuring forest-canopy characteristics with unequalled flexibility, both in terms of adaptability of instrumental parameters and flight plan. Like typical spaceborne systems, LAUVA has a large footprint (~2.4m diameter from an altitude of 300m). By recording the full waveform of every laser return, the lidar simultaneously samples both the entire tree structure and the ground echo. Using a UV wavelength of 355nm enables eye-safe emission of energetic laser pulses (16mJ power at a frequency of 20Hz). In addition to the lidar and georeferencing instruments, the ultralight-airplace payload contains two cameras operating in three bands (UV, visible, and near-IR) to stereoscopically map the 3D canopy structure.

For the rest of this article, go to http://spie.org/x37301.xml?ArticleID=x37301

The SPIE Newsroom Page is at http://spie.org/x2420.xml

Juan Cuesta, Patrick Chazette,
Joseph Sanak, Tristan Allouis,
Sylvie Durrieu, Pascal Genau,
Cyrille Flamant, and Pierre H. Flamant

3.5 GOCE now operational

Following the launch and in-orbit testing of the most sophisticated gravity mission ever built, ESA's GOCE satellite is now in 'measurement mode', mapping tiny variations in Earth's gravity in unprecedented detail. The 'Gravity field and steady-state Ocean Circulation Explorer' (GOCE) satellite was launched on 17 March from northern Russia. The data now being received will lead to a better understanding of Earth's gravity, which is important for understanding how our planet works. It is often assumed that gravity exerts an equal force everywhere on Earth. However, owing to factors such as the rotation of the planet, the effects of mountains and ocean trenches, and density variations in Earth's interior, this fundamental force is not quite the same all over. Over two six-month uninterrupted periods, GOCE will map these subtle variations with extreme detail and accuracy. This will result in a unique model of the 'geoid' - the surface of an ideal global ocean at rest.

A precise knowledge of the geoid is crucial for accurate measurement of ocean circulation and sea-level change, both of which are influenced by climate. The data

from GOCE are also much-needed to understand the processes occurring inside Earth. In addition, by providing a global reference to compare heights anywhere in the world, the GOCE-derived geoid will be used for practical applications in areas such as surveying and levelling.

A little over six months after launch, GOCE is now delivering the first set of data that will build into the most detailed map of Earth's gravity field ever realised. Before entering this mode, the satellite was tested thoroughly. It was then gently brought down from an altitude of around 280 km to its current orbit slightly below 255 km, which is extremely low for an Earth observation satellite.

During the three months after launch, the satellite was commissioned and calibrated, which is standard procedure to ensure that all systems are working as they should. This included testing GOCE's cutting-edge electric ion engine that helps keep the satellite's orbit 'drag-free', and its highly sensitive gradiometer instrument, which senses the gravitational tug of Earth. Gravity is stronger closer to Earth, so GOCE was designed to orbit as low as possible while remaining stable as it flies through the fringes of our atmosphere. To help avoid drag and ensure that the gravity measurements are of true gravity, the satellite has to be kept stable in 'free fall'. Any buffeting from residual air at this low altitude could potentially drown out the gravity data.

Space gradiometry and the use of the sophisticated electric propulsion are both 'firsts' in satellite technology, so the commissioning and calibration were particularly important for the success of the mission. This phase was completed in the summer, ready for the tricky task of bringing GOCE down to its operational altitude, which took a couple of months. {*Source: Spacedaily Rxpress}.*

3.6 ESA Issues Call For Earth Explorer Proposals

Oct 06, 2009

As part of ESA's Earth Observation Programme and its continuing endeavour to address critical Earth science issues, the Agency has released an opportunity for scientists to submit proposals for the eighth Earth Explorer mission. By focusing on science and research, the Earth Explorer series of missions is being flown to improve our understanding of how the Earth system works and how human activity affects natural Earth processes. Earth Explorer missions also test cutting-edge technology for Earth observation, as the recent GOCE gravity mission is clearly demonstrating. Earth Explorer missions fall into two categories: Core and Opportunity. Core missions respond directly to specific areas of public concern and are selected through widespread consultation with the science community.

Opportunity missions are lower-cost satellites that are relatively quick to build and fly so that they can respond to areas of urgent environmental concern. The user-driven process is fundamental to the development of both types of mission and provides the Earth science community with an efficient tool for advancing our understanding of Earth. In line with ESA's wish to involve the scientific community in this aspect of its Earth Observation Programme, the current call invites scientists from all 18 Member States and Canada to submit proposals to be evaluated as a potential Opportunity mission. The aim is to launch this mission by 2018.

The call – by 1 December 2009 - is expected to result in the selection of up to three candidate mission feasibility studies, after which they will be reviewed and one will be selected for flight. This process of involving the scientific community in the definition of new missions and a peer-reviewed selection procedure has, so far, resulted in six Explorer missions, in various stages of implementation, and three candidates, which are undergoing feasibility studies. The *'Gravity field and steady-state Ocean Circulation Explorer'* (GOCE) was launched on 17 March. It is mapping Earth's gravity field with unprecedented accuracy to advance oceanography, solid Earth physics, geodesy and sea-level research. *Aeolus* will provide global observations of wind profiles from space to improve the quality of weather forecasts and advance our understanding of atmospheric dynamics and climate processes. Aeolus is due for launch in 2011. *The 'Earth Clouds Aerosols and Radiation Explorer'* (EarthCARE) will improve the representation and understanding of

Earth's radiative balance in climate and numerical forecast models. EarthCARE is due for launch in 2013. The *'Soil Moisture and Ocean Salinity'* (SMOS) mission, scheduled to be launched on 2 November, will map variations of soil moisture and ocean salinity to further our understanding of Earth's water cycle.

The *CryoSat-2* satellite replaces CryoSat, which was lost in the launch failure of October 2005. Scheduled for launch early in 2010, it will observe fluctuations in the thickness of ice on land and floating in the sea to understand how climate change is affecting Earth's ice masses. *Swarm* will provide the best survey so far of the geomagnetic field and its changes over time in order to gain new insights into the Earth system by improving our understanding of our planet's interior and climate. Swarm is due for launch in 2011. The three missions undergoing feasibility studies are: *BIOMASS*, *CoReH2O* and *PREMIER*. One will be selected, leading to the launch of ESA's seventh Earth Explorer mission around 2016. {*Source: Space Daily Express}.*

First Worldview-2 Images: Dallas Love Field airport from DigtalGlobe's Worldview-2 satellite. October 27th, 2009.

3.7 Worldview 2 Launched

Digitalglobe's latest satellite, WorldView-2,was successfully launched into orbit from Vandenberg Air Force Base, Calif. on Thursday aboard a Delta II rocket. The rocket blasted off at 12:51 p.m. MDT and, after a little over an hour of flying, successfully deployed and signalled back to ground control from orbit, the company reported. The $283 million satellite is designed to be the most powerful civilian camera taking pictures of the earth's surface. DigitalGlobe supplies images to

government agencies, media, researchers and online mapping services. Launching WorldView-2 should leapfrog the company to top spot when it comes to sophisticated imaging capabilities. *See http://www.digitalglobe.com/index.php/88/WorldView-2* for details of the sensors aboard WorldView-2. It is expected to take nearly three months of calibrations and other adjustments before WorldView-2 is expected to be fully operational

3.8 DMCii Satellite Imagery Approved by US Department of Agriculture

Remote sensing solutions provider DMCii has been approved as a supplier of satellite imagery to the Office of Global Analysis, USDA, Foreign Agricultural Service (OGA USDA FAS) through its procurement agency Arctic Slope Regional Corporation (ASRC). DMCii was invited to supply satellite imagery to the OGA USDA FAS because it provides a unique combination of technical advantages for agricultural monitoring. Firstly, its satellites provide 22m and 32m Ground Sample Distance (GSD) multi-spectral imagery with a large 650km swath width that is capable of monitoring large areas rapidly. Secondly, the company is able to acquire daily images of a given location by coordinating the multi-satellite DMC constellation. Finally, multispectral image data is ideal for monitoring crop growth and is delivered in a highly calibrated Landsat-compatible format for immediate use in crop monitoring applications. DMC data has long been in regular use by precision agriculture services in Europe, where the speed of acquisition, accuracy and very large image size are exactly what is needed for successful monitoring of critical crop growth stages across entire countries.

DMCii delivers highly calibrated ortho-rectified imagery that can be imported directly into GIS applications. It has delivered 32metre GSD multispectral imagery since the first DMC satellite launched in 2002. The recent launch of two new 22metre GSD satellites, UK-DMC2 and Deimos-1 has greatly increased the imaging capacity of the constellation and has also doubled the number of image pixels per hectare to boost the effectiveness of the system for monitoring agriculture. By coordinating the constellation of satellites, DMCii covers vast areas within a very short space of time so that data shows the state of vegetation for a very specific period. For example, DMCii coordinated the imaging of 38 countries in Europe within tight time windows specified by each country. DMCii will provide a rapid delivery of data to OGA USDA FAS so that it can be used for rapid decision making during growth seasons. Cross compatibility is another important consideration when using different satellite imagery. The multi-spectral imagers used on the DMC satellites provide exactly the same spectral bands as the Landsat bands 2, 3 and 4 (R, G, NIR). They are also specially designed to provide highly calibrated imagery, with negligible differences in radiometry between DMC satellites so that data can be combined seamlessly. The large size of DMC images saves considerable time and expense for end users, because they cover huge areas and reduce the need to process large numbers of datasets. Through the agreement, DMCii data is now available on an approved supplier list from which the OGA USDA FAS and other Government departments coordinate data supply without the duplication of effort and expense.

Source: Earth Imaging Journal
http: //www.eijournal.com

3.9 Soil Moisture and Ocean Salinity satellite

A modified Russian ballistic missile successfully launched a $464 million European Soil Moisture and Ocean Salinity satellite.on Monday 2nd November 2009 to investigate Earth's water cycle by measuring moisture levels in soil and salt concentrations in the world's oceans. The SMOS satellite will spend the next three years creating the best maps of variations of moisture and salt in land areas and the open ocean. This data will help weather forecasters, climatologists, and water resource managers better predict changes in the water cycle. SMOS and another satellite, called Proba 2, rode into space on the power of a retired ballistic missile taken from the arsenal of the Russian military. The Rockot launcher lifted off from Plesetsk Cosmodrome at 0150 GMT.

SMOS was planned to be released in an orbit ranging in altitude from 465 miles to 476 miles, with an inclination of 98.4 degrees. Spacecraft separation occurred at about 0300 GMT Monday (10 p.m. EST Sunday). *{Source: Spaceflight Now, 2 November 2009}*

3.10 ISPRS Announces New Award

ISPRS has created a new award for the author of a text book that aids an understanding of remote sensing, photogrammetry or spatial science. The first medal will be presented at the 2010 meeting in Vienna. The International Society for Photogrammetry and Remote Sensing advances the sciences of aerial and space-based imaging. The Karl Kraus Medal is dedicated to the memory of Professor Karl Kraus, a passionate teacher and author of a number of textbooks. Article 1 of the Regulations states that the medal is awarded to authors of excellent textbooks in the fields of photogrammetry, remote sensing, and spatial information sciences, written in one of the official languages of the ISPRS, and published no more than eight years prior to the commencement of the quadrennial ISPRS Congress at which it is to be presented. On each occasion a maximum of two prizes can be awarded. Nominations for the first medal should be directed to Chen Jun, the general secretary of ISPRS at the National Geomatics Centre of China; 28, Lianhuachixi Road, Haidian, Beijing 10083, or via email to isprs@nsdi.gov.cn.

SPIE News/GetMapping Newsletter Visit http://spie.org/x2420.xml for interesting papers on remote sensing (too many to list here). There is a newsletter available via email - see the subscribe button on the top right of the web page. New this month are articles on faster processing of hyperspectral data and a new UV lidar for forestry applications.

Getmapping [info@getmapping.com] also has a regular newsletter that is of interest to those who work with data collected by airborne remote sneisng (both microwave and optical).

3.11 Basics of Geomatics

Geomatics, the use of which is becoming increasingly widespread, includes several disciplines and techniques for the study of the Earth's surface and its environments, and computer

science plays a decisive role. This book is offered as a review of the subject to stimulate the reader's interests.

The term *geomatics* was created at Laval University in Canada in the early 1980s, based on the concept that the increasing potential of electronic computing was revolutionizing surveys and representation sciences and that the use of computerized design (video-diagram) was compatible with the treatment of huge amounts of data. That period's revolutionary intuition was based on the geographical location of each object on our planet.

Geomatics is defined in the book as *a systemic, multidisciplinary, integrated approach to selecting the instruments and the appropriate techniques for collecting, storing, integrating, modelling,analysing, retrieving at will, transforming, displaying and distributing spatially georeferenced data from different sources with well-defined accuracy characteristics, continuity and in a digital format.*

Erected on the scientific framework of geodesy, it uses terrestrial, marine, airborne and satellite-based sensors to acquire spatial and other data. Some initiatives are presently developing worldwide using geomatics disciplines and techniques for the regulation of *GeoSpatial Information*, or more simply *GeoInformation* (GI) and for the adequate use of *Earth Observation* (EO) data for studying

and managing environmental hazards and risks.

Several countries, following common fundamental guidelines and procedures, are developing a *Spatial Data Infrastructure* (SDI). At planet level, the dream is to realize a *Global Spatial Data Infrastructure (GSDI)* capable of managing heterogeneous sets of data and to overcome the chronic absence of interoperability among *databases* (DB). This goal can be reached by implementing several SDIs at local, national, continental level and harmonizing them in a global context.

One practical example is represented by the *Infrastructure for Spatial Information in*

the European Community (INSPIRE), a European Union Directive that entered into force on May 15, 2007.

Other initiatives promote the collective effort for a better Earth environment, by increasing our understanding of the Earth's dynamic processes and enhancing forecasts of our environmental conditions. The *Group on Earth Observations* (GEO) was formed to undertake this global effort, and the *Global Earth Observation System of Systems* (GEOSS) was established on February 16, 2005, with the scope of addressing all nations involved to produce and to manage their information in a way that benefits the environment as well as humanity by taking the pulse of the planet.

As an example, the European initiative GMES (*Global Monitoring for Environment and Security*) is intended to propose solutions for an articulate, centrally coordinated system for risk management at a European level, contributing to GEOSS.

Geo-spatial Information is still a relatively new discipline with fuzzy contours, open to many interpretations. It embeds topography in its more modern forms (measurements with electronic instrumentation, sophisticated techniques of data analysis and network compensation, global satellite positioning techniques, laser scanning, etc.), analytical and digital photogrammetry, satellite and airborne remote sensing, numerical cartography, geographical information systems, decision support systems, WebGIS, etc. These specialized fields are intimately interrelated in terms of both the basic science and the results pursued: rigid separation does not allow to discover several

common aspects and the fundamental importance assumed in a search for solutions in the complex survey context.

The book does not lay claim to answering multiple issues that Geomatics includes, but it proposes an interdisciplinary integration in order to contribute toface the problems provided by this complex world.

The objective is to publish an integrated text on the surveying theme, containing simple and comprehensible concepts relevant to experts in Geo-spatial Information and/or specifically in one of the disciplines that compose it. At the same time, the book is rigorous and synthetic, describing with precision the main instruments and methods connected to the multiple techniques available today. The necessity of defining technical terms occurs in many passages of this book; an order on the labyrinth of definitions and acronyms that are often used in a general way is proposed. At this stage, with no existing universally recognized ontological dictionary and thesaurus, a nomenclature with the more commonly used definitions and which hopefully mediates between sometimes contrasting

positions have been selected. Mathematical demonstrations and deeper explanations have been omitted, but an accurate selected bibliography is provided, chapter by chapter, to assist in finding specific references.

The book is addressed to a wider group of technicians and students who may use Geo-spatial Information in their work, or who already use it as part of their daily professional activity or study. More specifically the book targets at land managers, operating in natural or anthropic environments (engineers, geologists, agronomists, architects, urban planners, operating in the field of architectural assets and environment, technicians at land-surveying agencies, etc.), and students at both first and master levels, more and more of whom are facing themes in which the disciplines of the survey play a determining role.

The readers, whether university student, professional, technician or lay student, will find ready access to the fundamental concepts and up-to-date information on the state of the art, giving them a wider field of view of the complex, multidisciplinary problems related to land surveying and the environment, especially in land planning.

For more information on the book, link to the web homepage: http://www.springer.com/978-1-4020-9013-4

Mario A. Gomarasca

gomarasca.m@irea.cnr.it

3.12 ENVI EX

ITT has announces dhe release of ENVI EX, a high-performance image analysis solution for geospatial analysts and GIS professionals. Developed in response to the growing convergence of mapping and image analysis applications, ENVI EX combines image analysis tools and integration with ESRI's leading GIS platform, ArcGIS, to streamline image analysis workflows and allow users to easily extract important information from imagery. ENVI EX also distills complex image analysis tasks into easy-to-use workflows, making image analysis faster and easier for analysts of all skill levels. The integration between ENVI EX and ArcGIS allows GIS users to easily exchange data and files with simple drag-and-drop methods that preserve the style, symbology, vectors and layer information from one product to another. The displays of both products can be linked to allow the movement across the screen of one application to occur simultaneously in the other product. *http://www.ittvis.com/ProductServices/ENVI/ENVIEX.aspx*

3.13 SOCET GXP v3.1

BAe Systems is offering the latest version of its SOCET GXP software. Modules include: import of a wide range of data formats, hyperspectral and multispectral data analysis, vector analysis including links to ArcGIS, and links to Google Earth. BAe claim that SOCET GXP integrates image analysis and geospatial analysis in one software application. Read all about it at *http://www.socetset.com/content/*.

4. FEATURE ARTICLE

NASA, Remote Sensing and Archaeology: An example from Southeast Louisiana

By Marco J. Giardino

NASA, Stennis Space Center

NASA Stennis Space Center, located in Mississippi, USA, undertook an archaeological survey of the southeastern Louisiana marshes beginning in 2003. Progress on this activity was severely hampered by the 2005 hurricane season when both Katrina and Rita devastated the study area. In 2008, the NASA team reinitiated the analysis of the project data and that work continues today.

The project was conducted initially in partnership with the U.S. Army, Corps of Engineers New Orleans District and Tulane University. NASA and its partners utilized a wide variety of satellite and airborne remote sensing instruments combined with field verification surveys to identify prehistoric archeological sites in the Southeastern Louisiana delta, both known and still undiscovered. The main approach was to carefully map known sites and use the spectral characteristics of these sites to locate high probability targets elsewhere in the region.

The archaeological activities were conducted in support of Coast 2050 whose stated goals is to sustain and restore a coastal ecosystem that supports and protects the environment, economy and culture of southern Louisiana[1]. As the Coast 2050 report states: "[T]he rate of coastal land loss in Louisiana has reached catastrophic proportions. Within the last 50 years, land loss rates have exceeded 40 square miles per year, and in the 1990's the rate has been estimated to be between 25 and 35 square miles each year. This loss represents 80% of the coastal wetland loss in the entire continental United States."[2] (Figure 1).

Figure 1: Historic cemetery once on land now in open water due to wetland loss.

[1] Louisiana Coastal Wetlands Conservation and Restoration Task Force and the WetlandsConservation and Restoration Authority. 1998. Coast 2050: Toward a Sustainable Coastal Louisiana. Louisiana Department of Natural Resources. Baton Rouge, La.
[2] Ibid: 1

Among the irreparable damage caused by the loss of wetlands, is the destruction of archaeological sites. This region of Louisiana is formed by ancient and modern deposits of the Mississippi River. Anthropogenic activities like oil production and levee construction aggravate the loss of land caused by natural processes like subsidence.

The region is very difficult to survey using traditional archaeological survey methods due to the presence of numerous waterways, swamps, marshes, and wetlands. The study area includes the Louisiana parishes of Jefferson, LaFourche, Plaquemine and St. Charles. This region has been occupied more or less continuously since about 400 B.C.E.

NASA collected the site files for known archaeological sites located in the four parishes from the Louisiana State Historic Preservation Office. Remote sensing data over 111 known sites were gathered through airborne and orbital missions. A total of sixty-six known prehistoric and historic sites were visited during the field survey. Each of these sites was mapped with differential GPS, taking specific care to create a vector file that best represented the spatial extent of each site. Accurate GPS vectors were needed to derive spectral characteristics of vegetation commonly found at archeological sites and of the shell deposits which are also common constituents of sites in this region. Archaeologists have long been aware that sites in the lowermost Mississippi River delta are normally associated with specific types of vegetation, specifically live oaks[3] (Figure 2). Using known sites as training sets, we conducted supervised classifications of the entire four parish region to identify high probability targets that based on vegetation and the presence of shell deposits would likely be undiscovered archaeological sites. The process leads to spatial modeling (specifically inductive modeling) where known archaeological sites are used in creating a model to determine the relationships to environmental properties[4].

Several types of remotely sensed imagery were used in this project. Landsat TM was employed to develop large scale regional maps identifying landforms where archaeological sites were normally located, these being mostly active and abandoned levees and channels. The geo-referenced TM images also served as the main planning and navigation tools for the field verification surveys.

In addition, NASA Stennis flew its Airborne Terrestrial Applications Sensor (ATLAS) on-board a NASA LearJet (ATLAS Mission 302). This multispectral instrument collected data in 12 channels ranging from 0.45 to 12.2 microns at a GSD of 2.5 m. To improve on the spectral resolution of the ATLAS, NASA employed the services of the Institute for Technology Development (ITD), a Mississippi State organization located at the Stennis Space Center. ITD developed and deployed the Real-time Data Acquisition Camera System (RDACS-3) a 120 band hyperspectral airborne system which collected data at 2m spatial resolution. The RDACS is not a true hyperspectral sensor, but it features some of the advantages of hyperspectral instruments. The RDACS system is an array of three digital cameras mounted underneath a singleengine airplane. Each camera is fitted with a filter that determines the wavelength sensitivity of the camera. In other words, the wavelength and

[3] Neuman 1976; Neuman and Byrd 1980

[4] Braland, Malinda (2007) *GIS Predictive Model for Locating Archaeology Sites in South Louisiana.* Master Thesis, University of Southern Mississippi.

width of the three bands may be chosen for each flight, based on the needs of each mission. During this project, NASA requested data collection in 10 nm wide bands within the green, red and near-IR wavelengths. These regions of the EM were deemed *a priori* to be the most diagnostic for identifying vegetation and shell deposits. In addition, IKONOS imagery was purchased over the project area and together with the ATLAS data provided the most useful information for identifying high probability locations.

Two other sensors were initially targeted for delivering data. These included NASA's AVIRIS (Airborne Visible InfraRed Imaging Spectrometer) a hyperspectral airborne instrument that delivers calibrated images of the upwelling spectral radiance in 224 contiguous spectral channels. Although the data was excellent, mission restrictions prevented statistically significant coverage of the region. The AVIRIS data therefore, was only incorporated over those few localities where it was already available in the archives.

While hyperspectral data proved more useful in deconvoluting the spectral signals (pixel unmixing) associated with the vegetation communities that characterized archaeological sites, the spectral response curves for shell middens were clearly identifiable in multispectral ATLAS and IKONOS data. In fact, the live oaks which are the most diagnostic plant on archaeological sites were also clearly identifiable spectrally in multispectral data. Consequently, due to the greater ease associated with storing, manipulating and processing multispectral data, these type data were preferred throughout the project.

Sixty-nine known sites were relocated in the field. Remotely sensed data from these sites confirmed (and quantified) what was generally already known: all sites were being rapidly destroyed by the loss of wetlands. Channel construction, salt water intrusion and natural subsidence are taking a heavy toll on these cultural resources.

In addition, analysis of specified spectral response curves identified 23 high probability localities ten of which were visited by the field crews before the hurricanes ended the in situ verification process. Of these ten, six turned out to be new archaeological sites.

Two additional important discoveries were made through the use of remote sensing. First it was determined that mound sites from the Plaquemine period (~A.D. 1000-1500) were originally arranged in specific patterns namely in groups of four mounds equally spaced and oriented along the four cardinal directions. Due to subsidence, several of the mounds in these patterns were no longer visible in the field but retained a characteristic signal in the remotely sensed data. This is most evident at the Buras Mound site and at the Bayou Robinson Mound site, both in Plaquemines Parish (Figure 3 and Figure 4).

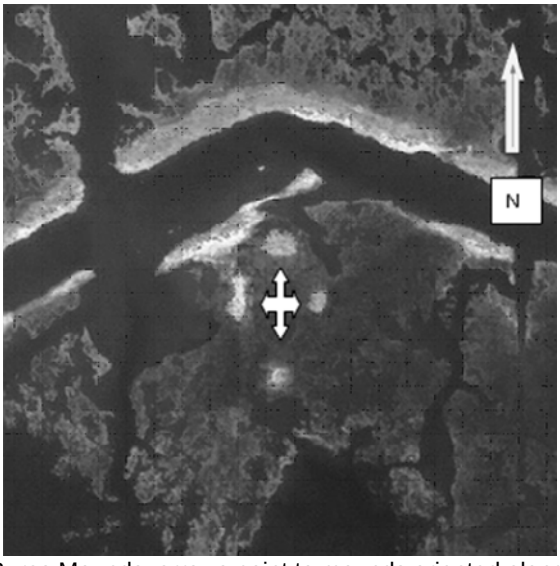

Figure 3 IKONOS Buras Mounds; arrows point to mounds oriented along cardinal directions

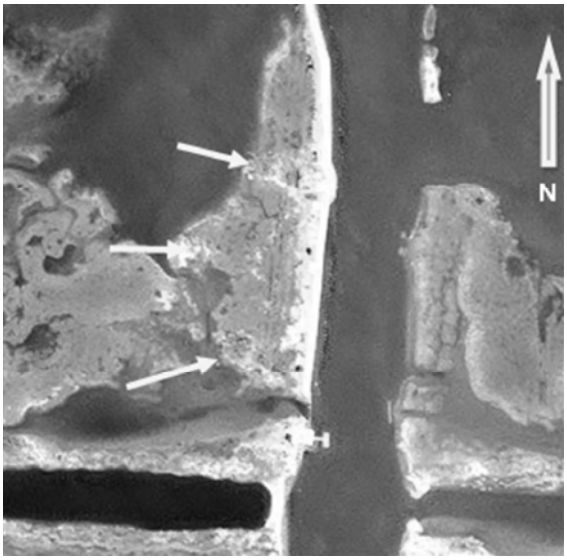

Figure 4: IKONOS Image, Bayou Robinson, RGB; arrows indicate mounds; eastern mound destroyed by dredging but evidence still present along the shell beach in the form of artifacts and charcoal

The other interesting discovery derived from the analysis of the remotely sensed images was a previously unknown "causeway" leading from Bayou Grand Cheniere to a 12 mound complex known as the Bayou Grand Cheniere site (16PL159). This site consists of 11 mounds grouped together to form a circle and a 12th mound located southeast of the main group. One conical mound in the group is approximately 60 feet (18.3 meters). All twelve mounds are covered by live oaks (*Quercus virginiana*) and yaupon holly (*Ilex vomitoria*) (Figure 5). The site was first explored in 1926 by Henry Collins[5] but had remained unvisited and unexplored until the early 21st century. Remotely sensed data from the RDACS system was used to accurately map the site and to identify the vegetation through spectral analysis. While conducting this latter analysis, we noted a linear feature extending from the site to the bayou (Figure 6). Repeated field surveys failed to identify it on the ground, even after it was noted on the imagery. In the imagery, however, the feature is clearly visible and represents the first evidence of a prehistoric "causeway" in this region.

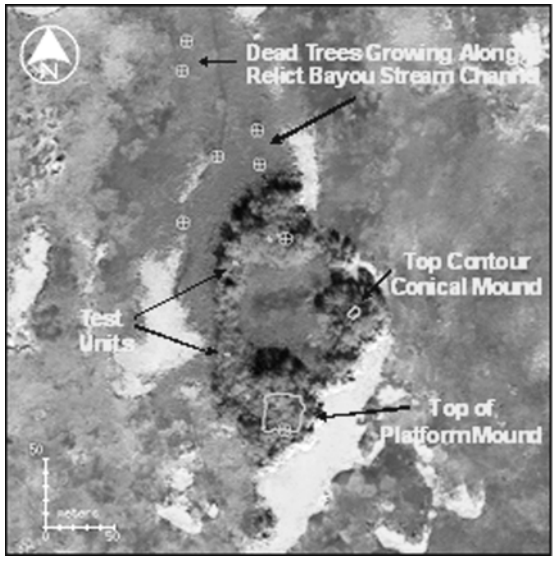

Figure 5: RDAC imagery showing GPS vectors

[5] Collins, Henry B. 1927 Archaeological and anthropometrical work in Mississippi. Explorations and Fieldwork of the Smithsonian Institution, 1926. Smithsonian Miscellaneous Collection volume 78.

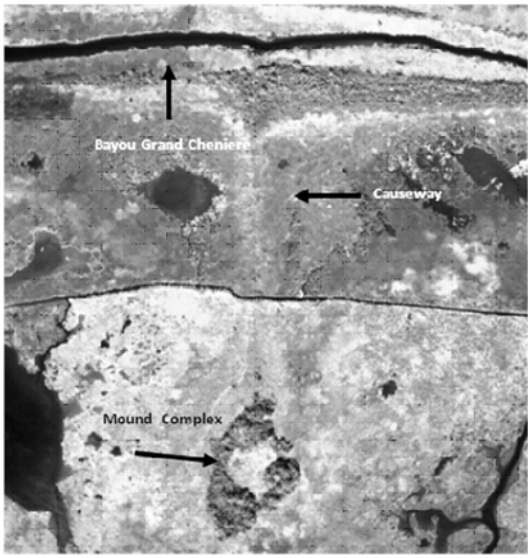

Figure 6: Bayou Grand Cheniere Site showing ‘causeway”, Bayou Grand Cheniere and the 12 mound complex; RDAC image, G,R,NIR

Analysis of the data continues today. Funding for further field work is not available at this time but NASA scientists continue to analyze the remotely sensed data and making it available to universities in the hope that more validation of the predictive model derived from this project will occur in the near future.

5. FUTURE EVENTS

5.1 CONFERENCES, SYMPOSIA AND WORKSHOPS

FORTHCOMING CONFERENCES

JANUARY 2010

***17 – 21 January, 2010*, San Jose, California, USA.** IS&T/SPIE Electronic Imaging. http://spie.org/electronic-imaging.xml*

FEBRUARY 2010

***2 - 4 February, 2010*, Turin, Italy**. International Symposium on Geo-information for Disaster Management. *http://www.gi4dm-2010.org/dates.php*.

***4 - 6 February, 2010*, Rome, Italy.** Special Session on Access, Quality, Processing & Applications of Satellite Imagery at 2nd International ICST Conference on Personal Satellite Services 2010 (PSATS'10). *http://www.psats.eu/docs/CFP_AQPAsatellite%20imagery_PSATS10.pdf*

***23 – 25 February 2010,* Boulder, Colorado.** IEEE GRSS Art, Science and Applications of Reflectance Spectroscopy symposium. *http://www.reflectancespectroscopysymposium.com/*

MARCH 2010

***3 – 5 March, 2010*, Denver, Colorado.** International LiDAR Mapping Forum 2010. *http://www.lidarmap.org/*

***15 – 17 March, 2010.* Haifa, Israel.** ISPRS Joint Workshop on Core Spatial Databases - Updating, Maintenance and Services - from Theory to Practice. *http://geo.haifa.ac.il/~isprs/HaifaJointWS/*

***17 - 18 March 2010,* ESA-ESRIN, Frascati, Italy**. Hyperspectral Workshop 2010, organised by the European Space Agency (ESA), the German Aerospace Center (DLR), the German Research Center for Geosciences (GFZ) and the Italian Space Agency (ASI).*www.congrex.nl/10C02*

APRIL 2010

***8 - 9 April, 2010*, Vienna, Austria.** ISPRS/ESPI/IAA Conference "Current Issues in Regulating Satellite Earth Observation" *http://www.espi.or.at/*

***11 – 16 April, 2010,* Sydney, Australia.** FIG International Conference 2010. *http://www.isaust.org.au/*

***14 – 18 April, 2010,* Washington, DC.** Association of American Geographers, AAAG. *www.aag.org*.

***26 - 30 April, 2010,* Venice, Italy. JRC** Oceans **F**rom Space Conference. http://oceansfromspace.jrc.ec.europa.eu/

***28 - 29 April, 2010,* Kuala Lumpur.** 6th International Remote Sensing and GIS Conference and Exhibition. *http://www.mrss.com.my/mrss2010/*

MAY 2010

***2 – 7 May,2010.,*Vienna, Austria.** EGU Geosciences UnionGeneral Assembly 2010 *http://meetings.copernicus.org/egu2010/*

***11 – 14 May,2010*. Guimarães, Portugal**. 13th AGILE Conference on Geographic Information Science: Geospatial Thinking*". http://agile2010.dsi.uminho.pt*

***17 – 20 May, 2010*, Paris, France.** 5th International Symposium 3D Data Processing, Visualization and Transmission. *http://www.3dpvt2010.org*

***26 – 28 May, 2010,* Hong Kong.** 14th International Symposium on Spatial Data Handling. Theory, modelling and concepts in Geospatial Information Science. *http://isgis.lsgi.polyu.edu.hk/*.

***31 May - 4 June,* Paris, France.** 30th EARSeL Symposium" Remote Sensing for Science, Education, and Natural and Cultural Heritage. *http://www.earsel.org/symposia/2010-symposium-Paris/*

JUNE 2010

***14 - 16 June, 2010*, Reykjavik, Iceland**. Second IEEE GRSS Workshop on Hyperspectral Image and Signal Processing - Evolution in Remote Sensing - (WHISPERS'10). *http://www.ieee-whispers.com/*

22 - 24 June 2010, **Newcastle upon Tyne**. ISPRS Commission V Mid-Term Symposium "Close Range Image Measurement Techniques". *http://www.isprs-newcastle2010.org/*

***28 June – 2 July, 2010,* Bergen, Norway.** European Space Agency Living Planet Symposium. *http://www.esa.int/LivingPlanet2010/*

***29 June-2 July 2010*, Ghent, Belgium.** GEOBIA 2010 "GEOgraphic Object-Based Image Analysis" *http://geobia.ugent.be/*

JULY 2010

***4 July, 2010*, Vienna, Austria.** ISPRS Centenary Celebration. *http://www.isprs.org/*

***12 – 16 July, 2010*, San Diego, CA**. ESRI International User Conference. *http://www.esri.com/events/index.htm*

***18 – 25 July, 2010,* Bremen.** 38th Scientific Assembly of the Committee on Space Research (COSPAR) & Associated Events "COSPAR 2010". *http://www.cospar2010.org/*

***20 - 23 July, 2010*, Leicester.** Accuracy 2010: International Spatial Accuracy Research Association (ISARA) Ninth International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences. *http://www.accuracy2010.org/*

***25 - 30 July, 2010*, Honolulu, Hawaii**. IEEE 2010 International Geoscience and Remote Sensing Symposium. *http://www.igarss2010.org/*

SEPTEMBER 2010

***1 – 3 September, 2010*, Cork, Ireland.** RSPSoc Annual Conference. Contact: Dr Fiona Cawkwell, *f.cawkwell@ucc.ie*

***1 – 3 September*, *2010*, Paris, France**. Photogrammetric Computer Vision and Image Analysis Conference and ISPRS Technical Commission III Symposium. *http://pcv2010.ign.fr/*

***13– 17 September, 2010,* Alice Springs, Australia.** 15th Australasian Remote Sensing & Photogrammetry Conference (15ARSPC) with ISPRS WG VIII/5 Workshop *http://www.15.arspc.com/*

***14 – 17 September, 2010,* Zurich, Switzerland.** 6th GIScience Conference. *http://www.giscience2010.org.*

***22 - 24* September 2010, Ghent, Belgium**. Joint workshop SIG Urban Remote Sensing, SIG Radar Remote Sensing, SIG 3D Remote Sensing, SIG Thermal Remote Sensing, and SIG Developing Countries.

NOVEMBER 2010

***8 - 12 November 2010*, Guanajuato, Mexico**. XIV International SELPER Symposium "Observation & Monitoring of the Earth related to Climate Change" (An ISPRS Regional Conference) *http://www.selper.org/* (in Spanish).

***15 – 18 November, 2010*. Orlando, Florida**. ASPRS 2010 Fall Conference. *http://www.asprs.org/ meetings/upmeeting.html.*

MAY 2011

***1 – 5 May, 2011,* Milwaukee, USA.** ASPRS Annual Conference. *http://www.asprs.org/ meetings/upmeeting.html*

JULY 2011

4 - 8 July, 2011, **Paris, France.** 25th International Cartography Conference (ICC2011). *http://www.lecfc.fr/*

AUGUST 2012

24 August- 3 September, 2012, Melbourne, Australia. XXII ISPRS Congress 2012. *http://www.isprs2012-melbourne.org/*

29 - 31 August 2011**. Calgary, Canada.** ISPRS WG V/3 Laser Scanning 2011(web site not ready).

Back Cover – Picture from the 3rd Workshop of the Special Interest Group on Remote Sensing of Land Use and Land Cover, 25-27 November 2009, Bonn, Germany.Organised by Matthias Braun, University of Bonn, and picture from the 7th International Workshop of the EARSeL Special Interest Group (SIG) on Forest Fires, Matera, Italy, 2 -5 September 2009, organised by Rosa Lasaponara, Institute of Methodologies for Environmental Analysis (IMAA), Italian National Research Council (CNR).

EARSeL Sponsoring Agencies:

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Information concerning EARSeL activities can be obtained from the

EARSeL Secretariat
Nienburgen Str. 1
30167 Hannover, Germany
Tel: +49 511 762 2482
Fax: +49 511 762 2483
Mail: secretariat@earsel.org
Http://www.earsel.org/