EARSeL

September 2010
N° 83

NEWSLETTER

EARSeL

European Association of Remote Sensing Laboratories

Front Cover –Pictures from the ISPRS Centenary Celebrations held in Vienna on 3 to 4 July 2010 relating to the signature of the agreement for close cooperation among EARSeL, SELPER, AARS and AARSE.

EARSeL Newsletter

ISSN 0257-0521
Bulletin of the European Association of Remote Sensing Laboratories, http://www.earsel.org
December 2009 – Number 80

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

Published by:
Institute of Methodologies for Environmental Analysis (IMAA), Italian National Research Council (CNR)
Printing by: Cromotema, V.N. Gaia, Portugal (www.cromotema.pt)

Subscription Rates, 2010

Members receive the Newsletter as part of the annual membership fee. For non-members, the annual rates (4 issues) are as follows:

Within Europe	80€
Outside Europe	88€
Personal subscription from members	30€

EARSeL membership fees, 2010

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

CONTENTS

EARSeL Bureau		
	CHAIRMAN Dr Rainer Reuter Institute of Physics University of Oldenburg 26111 Oldenburg, Germany Tel: +49 441 798 3522 Fax: +49 441 798 3201 Email: rainer.reuter@earsel.org **VICE-CHAIRMAN** Lena Halounova, Ph.D. Remote Sensing Laboratory Department of Mapping and Cartog-raphy Faculty of Civil Engineering Czech Technical University in Prague Thakurova 7 166 29 Prague 6 Czech Republic Tel: +420 22435 4952 Fax: +420 22435 5419 Email: lena.halounova@earsel.org **SECRETARY-GENERAL** Dr. Ioannis Manakos Department of Geoinformation in Environmental Management Mediterranean Agronomic Institute of Chania 73100 Chania, Greece Tel: +30 28210 35040 Fax: +30 28210 35001 Email: manakos.earsel@earsel.org	**TREASURER** Dr Rosa Lasaponara Institute of Methodologies for Environmental Analysis (IMAA-CNR) 85050 Tito Scalo (PZ), Italy Tel: +39 0971 427214 Fax: +39 0971 427271 Email : lasaponara@imaa.cnr.it **EARSeL SECRETARIAT** Gesine Boettcher Nienburger Strasse 1, 30167 Hannover, Germany Tel: +49 511 7622482 Fax: +49 511 7622483 Email: secretariat@earsel.org **INTERNATIONAL RELATIONS** Dr Mario Hernandez Chief Remote Sensing UNESCO 1 Rue Miollis 75732 Paris cedex 15 France Tel: +33 1 45 68 4052 Fax: +33 1 45 68 55 70 Email: ma.hernandez@unesco.org

1. EDITORIAL

Dear members,

After the summer, we would like to give you news you about the EARSeL activities.

We are pleased to inform you that in the framework of the ISPRS Centenary Celebrations held in Vienna on 3 to 4 July 2010 an agreement for close cooperation was signed with three international remote sensing associations outside Europe

These are:

- the **"Sociedad de Especialistas Latinoamericanos en Percepcion Remota", SELPER** (http://www.selper.org/). The association situated in Bogotá, Colombia,
- the Asian **Association on Remote Sensing, AARS**: (http://www.a-a-r-s.org/acrs/). 30 national organisations in Asia and Australia are members, and seven European and American institutes and societies are associated members. AARS organises annual conferences on remote sensing, the 31st Asian Conference on Remote Sensing will be held on 1-5 November 2010 in Hanoi, Vietnam. Central office of the association is in Tokyo, Japan.
- the **African Association of Remote Sensing of the Environment, AARSE** (http://www.itc.nl/aarse/).

The agreement aims at bringing together EARSeL members and experts from Asia, Africa and Latin America, with the objective to promote international coordination and cooperation in the various fields of remote sensing.

We welcome Konstantinos Nikolakopoulos as new Chairman of the Special Interest Group "Geological Applications".

In this issue of the newsletter, we would like to direct your attention to papers recently published in the EARSeL eProceedings (volume 9) and herein we include the abstracts of volume 9 (issues 1 and 2).

We invite you to submit you papers to be considered for publication in EARSeL eProceedings and also for Feature article in the next EARSeL NEWSLetters

Finally, there is always the list of relevant meetings, conferences, symposia and workshops that you can attend in the near future.

We hope to meet you at future EARSeL events.

Wishes for a productive autumn,

Sincerely,

Editorial Team

2.NEWS FROM EARSeL

2.1 MEMORANDUM OF UNDERSTANDING SIGNED

In the framework of the ISPRS Centenary Celebrations held in Vienna on 3 to 4 July 2010 an agreement for close cooperation was signed with three international remote sensing associations outside Europe. These are:

- the **"Sociedad de Especialistas Latinoamericanos en Percepcion Remota", SELPER**. The association, situated in Bogotá, Colombia, represents 13 national remote sensing organisations in Central and South America. The XIV Simposio Internacional de SELPER will be organised on 8-12 November 2010 in Guanajuato, Mexico.
- the Asian **Association on Remote Sensing, AARS**. 30 national organisations in Asia and Australia are members, and seven European and American institutes and societies are associated members. AARS organises annual conferences on remote sensing; the 31st Asian Conference on Remote Sensing will be held on 1-5 November 2010 in Hanoi, Vietnam. Central office of the association is in Tokyo, Japan.
- the **African Association of Remote Sensing of the Environment, AARSE**. 70 institutes from 37 African countries and are members of AARSE, and individuals and societies from 16 non-African countries are associated. The 8th AARSE Conference will be held on 25-29 October 2010 in Addis Ababa, Ethiopia. Central office is in Enschede, The Netherlands.

The memorandum, initiated by our Honorary President Gottfried Konecny, aims at bringing together EARSeL members and experts from Asia, Africa and Latin America, with the objective to promote international coordination and cooperation in the various fields of remote sensing. This will be achieved by regular meetings during symposia, bringing together researchers interested in an exchange of information and in initiating multilateral projects in areas of common expertise. This will cover all relevant topics from the development of new sensors up to their application in remote sensing programmes.

It has been agreed to prepare, as a result of a first meeting at the 31st EARSeL Symposium 2011 in Prague, a Work Programme which will report on joint projects for the coming years. EARSeL members are invited to join this initiative which offers an excellent chance for fruitful cooperation in future!

More information on our partner associations can be found on the following websites:

- SELPER: http://www.selper.org/
- AARS: http://www.a-a-r-s.org/acrs/
- AARSE: http://www.itc.nl/aarse/

Ceremony of MoU signature at the ISPRS Centenary Celebration in Vienna, 3 July 2010. From left to right: Orhan Altan, ISPRS President; Rainer Reuter, EARSeL Chairman; Gottfried Konecny, Initiator of the Memorandum; Tsehaie Woldai, President of AARSE; Kohei Cho, General Secretary of AARS; and Myriam Ardila Torres, Vice Chairman of SELPER.

Tsehaie Woldai (AARS) and Rainer Reuter (EARSeL) signing the MoU. On the left: Orhan Altan and Ian Dowman (ISPRS) are in the background.

Memorandum of Understanding

On July 3, 2010 the undersigned representatives of the four largest regional remote sensing organisations met during the 100th Anniversary of the International Society of Photogrammetry and Remote Sensing in Vienna, Austria.

These institutions are:

1) The European Association of Remote Sensing Laboratories, EARSeL, founded in 1977

2) The Latin American "Sociedad de Especialistas Latinoamericanos en Percepcion Remota", SELPER, founded in 1980

3) The Asian Association on Remote Sensing, AARS, founded in 1981

4) The African Association of Remote Sensing of the Environment, AARSE, founded in 1992

The meeting in Vienna has been suggested during the International Congress for Photogrammetry and Remote Sensing in Beijing in July 2008, because

a) these four institutions are the largest research institutions of a regional nature in existence

b) they are focal points for regional research and technology developments operating in an independent bottom up environment

c) they unite national activities in their regions with annual meetings

d) they realize the large potential of uses of remote sensing technology for their member countries and for the solution of global problems

e) because of their local backgrounds these four organisations can particularly benefit from interchanges of experiences by creating a stronger and more effective global network in remote sensing science and technology

The representatives of these four organisations have discussed these common interests, and they have agreed to the following:

1. Their representatives will meet annually at scientific and technical events of remote sensing.

2. They will develop a work programme for suggestions on how to improve the international standing of remote sensing.

3. The organisations will establish a small secretariat to follow up these activities to promote the standing and the contributions together with other institutions, including the international scientific societies or bodies, such as FIG, IAG, ICA, ISPRS and others.

4. They will furthermore investigate the possibility for the establishment of an International Scientific Academy of Remote Sensing to promote these efforts.

Signed in Vienna on July 3, 2010

Dr. Rainer Reuter,
Chairman of EARSeL,
University of Oldenburg
Institute of Physics
D-26111 Oldenburg, Germany

Dr. Myriam Ardila Torres
Vice President of SELPER
Carrera 30 No. 48-51 Edificio IGAC-CIAF
Bogotá D.C., Columbia

Prof. Kohei Cho
General Secretary of AARS
Research and Information Center
Tokai University
Tokyo, 151-0063, Japan

Dr. Tsehaie Woldai
President of AARSE
ITC, University of Twente
7500 AA Enschede, The Netherlands

Prof. Orhan Oltan
President of ISPRS as witness
Department of Geomatic Engineering
Istanbul Technical University
34469 Ayazaga-Istanbul, Turkey

Rainer Reuter

2.2 ABSTRACTS OF EARSeL'S ePROCEEDINGS VOL.9 (2010)

A multi-temporal analysis of vegetation dynamics in the Iberian peninsula using MODIS-NDVI data.

Ana Pérez-Hoyos, Beatriz Martínez, María Amparo Gilabert, and Francisco Javier García-Haro

The aim of this study is to characterise the vegetation dynamics of the Iberian Peninsula using MODIS-NDVI time series (2000-2008) at 1 km resolution. For this purpose, *NDVI* profiles are analysed using filtered data derived from a spectral technique, a multi-resolution analysis (MRA) based on the wavelet transform (WT). The MRA results in an additive decomposition of the time series into several components associated with variations on a particular temporal scale. First, the functional diversity of the Iberian Peninsula is described by using several metrics derived from the first component of the MRA (filtered time series). Second, a trend analysis is performed with the fifth component of the MRA having a semi-period around a year (inter-annual component) in order to detect potential vegetation changes over the considered period. The 3-month scale Standard Precipitation Index (*SPI*-3) was used to better identify changes. As a result of the functional diversity a characterisation of the Ecosystem Function Types (EFT) of the Iberian Peninsula with 30 representative classes is obtained. The EFT present a decreasing northwest to southeast biomass gradient. An exploratory analysis with the CORINE land cover classification revealed the importance of land cover in explaining the functioning of particular ecosystems, particularly for ecosystems showing a strong seasonal dynamics, such as rice and non-irrigated crops. Finally, the trend analysis indicates that most vegetation changes over the considered period are due to forest fires and are connected to the *SPI* trend.

Tracing Wadden Sea water masses with an inverse bio-optical and endmember model

Annelies Hommersom, Steef Peters, Hendrik Jan van der Woerd, Marieke A. Eleveld, Marcel Wernand, and Jacob de Boer

With its 500 km length the Wadden Sea is the largest mudflat area in the world. Discharges from various rivers mix here with water from the North Sea. Due to surfacing tidal flats during low tide, the variation in source water, resuspension and extremely high concentrations of Chlorophyll-a (Chl-a), Suspended Particulate Matter (SPM), and Coloured Dissolved Organic Matter (CDOM), large temporal and spatial differences in watercolour can be seen.

To visualise the horizontal mixing of water masses with different colours from MERIS data, two approaches were followed. The first approach was an inverse bio-optical model called HYDROPT, in which the absorption and scattering properties of the water constituents (Specific Inherent Optical Properties or SIOPs) can be adapted to regional values. This approach can be used to determine 'water types': water masses in which the SIOPs of the constituents are similar. The second approach was an endmember model, based on spectral reflectance shapes. This approach can be used to determine 'water classes': water types in which certain constituents are predominant. The predicted water types and water classes were compared with knowledge on (tidal) distributions of water types in the Wadden Sea.

In the data of March '07 (winter) and May '06 (summer) differences in water types between the North Sea, the Wadden Sea and water originating from the large rivers were seen in the German Bight. The endmember approach was able to visualise mixing between water classes. Results of this method showed dominance by SPM in winter and much higher concentrations of Chl-a and CDOM in summer. A combination of the two methods would probably lead to the best tracing of water masses.

The "blue shift" of emission maximum and the fluorescence quantum yield as quantitative spectral characteristics of dissolved humic substances

Daria Shubina, Elena Fedoseeva, Olga Gorshkova, Svetlana Patsaeva, Vera Terekhova, Mikhail Timofeev, and Viktor Yuzhakov

Humic substances (HS) play important roles in a variety of biogeochemical processes. Fluorescence spectra can be used for quantitative and qualitative characterisation of water-soluble humic substances (HS) and, in particular, of dissolved organic matter (DOM) in water. In this study, we measured the fluorescence spectra of natural HS (riverine, lake, marine water, and soil aqueous extractions) and commercial water-soluble HS under excitation from 270 to 355 nm. Natural water samples were filtered in two stages by micro- and ultra-filtration. After ultrafiltration, DOM was separated into two fractions depending on the size of the particles, for which fluorescence spectra were also obtained. The comparative analysis was made with a focus on the so-called "blue shift" (emission maximum shifts towards shorter wavelengths with increasing excitation wavelength) and the fluorescence quantum yield (QY) of samples of different origin. The fluorescence quantum yield under excitation at 355 nm for commercial HS (QY=0.008) was less than that for natural water DOM (QY=0.028), but more than for soil HS (QY=0.003). The low molecular weight fraction quantum yield was bigger than that for the colloidal fraction by 20-30%. The fluorescence quantum yield for natural water and for soil extractions HS increased with excitation wavelength, but the quantum yield did not depend on the excitation wavelength for commercial HS samples. Natural HS differed from commercial HS in higher heterogeneity of fluorophore composition as evidenced by the larger "blue shift" value and QY dependence on excitation wavelength.

2.3 NEW CHAIRMAN FOR EARSeL SIG ON GEOLOGICAL APPLICATIONS

It is a great honour, and a very big responsibility to accept the proposal of the EARSeL Council to chair the Special Interest Group “Geological Applications”. All the more because I will be succeeding Professor Dr. Freek van der Meer, having to continue the very successful work he performed during the last eleven years. EARSeL's Special Interest Group "Geological Applications" started its mission in January 1999. It was formed to act as a forum for international discussions amongst Earth scientists. The SIG “Geological Applications” promotes geologic remote sensing and Earth observation and attempts to bridge the gap between technology and applications by bringing together experts from universities, institutes and commercial enterprises at scientific meetings.

Working at the Greek Geological Survey (IGME) for the last five years I had the opportunity to collaborate with many Greek and foreign colleagues and to realize the great number of possibilities of remote sensing in all the sections of geology (geological mapping, tectonic geology, hydrogeology, geomorphology, mine monitoring etc). Also in the field of geohazards (landslides monitoring, earthquakes, floods etc), the contribution of remote sensing data (optical, radar, thermal) is very important. Under this perspective, one of the main objectives of the SIG “Geological Applications” should be to have as many geoscientists as possible be familiarized with the possible remote sensing applications. In order to achieve that objective the SIG will continue to organize specific sessions at EARSeL- and non-EARSeL conferences and events, workshops in the framework of EARSeL Symposia, and training courses. The first goal for the near future is to reorganize the webpage of the SIG “Geological Applications” and the members’ mailing list in order to promote its activities.

If you are interested in joining the activities of SIG “Geological Applications” and would like to be included in the SIG mailing list, please contact Dr. Konstantinos Nikolakopoulos via: knikolakopoulos@igme.gr or the EARSeL Secretariat.

Konstantinos Nikolakopoulos

2.4 JOINT EARSeL SIG WORKSHOPS

The joint workshop between the SIG's:

- Urban remote sensing
- 3D remote sensing
- Radar remote sensing
- Developing Countries
- Thermal remote sensing

take place in Gent on 22-24 September 2010. The preliminary program of the workshops are as follows:

Wednesday 22 September

8.30-10.00: Registration with coffee
10.00-11.00: Opening Session
Welcome address from EARSeL
R. Goossens, ex-President of EARSeL
Welcome address from the Ghent University
H. De Jonghe – Dean Faculty of Science
Keynote presentation
Integrating Multiple Satellite Sensors for Urban Climatology in Developing Countries
E. Parlow

11.00-11.30: Coffee break

11.30-12.15: Tutorial
Acquiring Moderate Resolution Remote Sensing Data from Nasa: What, Where, How, How much?
M. Abrams, Director of the ASTER Program

12.15-14.00: Lunch

14.00-15.30: Urban Remote Sensing(1) - Chair: *C. Jurgens*
Comparison of Two Classification Techniques for Urban Impervious Surface Mapping and the Impact on Simulated Runoff
Eva M. Ampe, et al.
Identifying the Poor in the Cities - How can Remote Sensing help to Profile Poverty (slum dwellers) in Megacities?
Maik Netzband
Spatio-Temporal Analysis of Informal Settlements Development. A Case Study in Istanbul, Turkey
Olena Dubovyk, et al.

14.00-15.30: Radar Remote Sensing (1) - Chair: *U. Sörgel*
State of the Art of 3D-Model Extraction Using in SAR
U. Sörgel
Definition of a Radar Grammetric Model and Application with Cosmo-Skymed Imagery
Paola Capaldo, et al.
Building Detection in Urban Areas from Combined Optical and Insar Data Exploiting
Context
Jan Dirk Wegner

15.30-16.00: Coffee break

16.00-18.00: Special Session on the Mamud Project – Urban Remote Sensing Topics
Chair: *J. Vandenabeele*
Inferring Urban Morphology for the Greater Dublin Area from Continuous Sealed Surface Data: a Metric-Based Approach
Tim Van de Voorde et al.
Using information on Urban Morphology derived from a Time-Series of Medium Resolution Remote Sensing Data for the Calibration of the MOLAND Urban Growth Model)
Johannes van der Kwast et al.
Estimating the Impact of Urbanisation on Hydrology in Dublin, Ireland
Boud M.G. Verbeiren, et al.
Use of Multi-Angle High-Resolution Imagery and 3D Information for Urban Land-Cover Classification
Marc Binard, et al.

16.00-17.30: Thermal Remote Sensing (1) - Chair: *C. Kuenzer*
Aerodynamic Resistance for Flux Estimation in an Urban Area
Corinne M Frey, et al.
Thermal Remote Sensing of Urban Surface Parameters for Use in Urban Climate Models
Koen De Ridder, et al.
Urban Heat Island of Munich, Germany – A Multisensoral and Multiscale Approach
Wieke Heldens, et al.

18.00: Welcome's Drink

Thursday 23 September

9.00-10.30: Remote Sensing for Developing Countries (1) - Chair: *G. Büyüksalih*
Ontology for Slums
Divyani Kohli
Imagery, in the Western Desert of Egypt
Mohammed Abd El-Fattah Ghadiry, et al.
The Role of Remote Sensing in an Urban Observatory for Developing Countries
Cristina D Henriques

9.00-10.30: 3D-Remote Sensing (1) - Chair: *K. Jacobson*
The ASTER Global Topographic Data Set
Michael Abrams, et al.
Assessment of Surface Model Extraction of an Urban Scene from VHR Multisensor Spaceborne Imagery
Frederik MR Tack, et al.

Matching Strategies for DSMS Extraction in Urban Area from High Resolution Satellite Imagery
Paola Capaldo, et al.

10.30-11.00: Coffee break

11.00-12.30: Interactive Poster Session
Further Advances in Automatic Mapping of Seismic Damage Based on Very High Resolution SAR Images
Fabio Dell'Acqua, et. al
The Changes of the Ecological Significance of Wetlands in the Red River Coastal Zone, Vietnam
Nguyen Tien Cong
Spectral Discrimination of Healthy Corals on Spermode Archipelago, Indonesia
Nur Jannah nurdin, et al.
Capabilities Test of Alos AVNIR 2 and LANDSAT 7 ETM SLC – Off Images for Coral Reefs Ecosystem Detection on Sperùp,de Archipelago, Indonesia
Nur Jannah Nurdin
Forests Destruction Asses by Using Remote Sensing Data and Field Study
(case study :Khuzestan, ALBAJI'S DESERT)
Hamid reza Matinfar
Evaluation of Effects of Multiresolution Segmentation Parameters on the Accuracy of Object-Oriented Classification of Satellite Images for Land Use\Cover (case study in Tehran)
Ali Ghadiri
Application of Integrating Thermal Remote Sensing Data with other Satellite Imageries to examining Changes in Global LST
Seyed Kazem Alavipanah, et al.
Remote Sensing for Physical Protection of the Pipeline Network
Mansour Ahamdi Foroushani, et al.
A Software for Agricultural and Drought Monitoring in Morocco, using Vegetation Indexes
Jose L Casanova, et al.
Monitoring the Drought Status in the Western Forest covered Regions of Algeria with Remotely Sensing Landsat ETM+ data
Hamimed Abderrahmane, et al.
Study on the Effect of Sediment Transport on the Displacement of the Estuaries (Case study: Rivers of Gilan Province)
Mohammad Ebrahim Banihabib, et al.
Evaluation of Methods efficiency Kriging and IDW Method for Simulation of Rain Parameters
Shahram Khalighi Sigaroodi, et al.
Assessment Efficiency Linear Regression and Longbin Method to Reconstruction of Hydrometric Data
Shahram Khalighi, et al.
Landscape Change and Desert Land Monitoring and Assessment
Gholamreza zehtabian, et al.
Dimensionality Reduction of Hyper Spectral Data using Area Based Feature
Jayanta K. Ghosh, et al.
Accuracy Assessment of a LIDAR Digital Terrain Model by using RTKGPS and Total Station
Coen Stal, et al.

12.30-14.00: Lunch

14.00-15.30: Urban Remote Sensing (2) - Chair: *D. Maktav*
Semi-Automated Analysis of Remote Sensing Data – An Aproach for Supporting Urban Planning Authorities
Carsten Jürgens, et al.
Multiple Endmember Unmixing of Chris/Proba Data for Mapping of Sealed Surfaces in the Brussels Capital Region
Luca Demarchi, et al.
Capabilities of and Requirements for Urban Remote Sensing
Hannes Taubenboeck, et al.

14.00-15.30: Radar Remote Sensing (2) - Chair: *F. Dell'Aqua*
Comparison of High Resolution InSAR and Optical DEMs
Umut Günes Sefercik, et al.
A Comparative Analysis of the Results achieved by the Spinua and Delf Psi Techniques: Ground Deformation Monitoring of the Gulf of Gdansk Coastal Area (Poland)
Marek Graniczny, et al.
Ground-Based SAR Interferometry: Analysis of some Experimental Observations
Guido Luzi, et al.

15.30-16.00: Coffee break

16.00-18.00: Miscellaneous (1) - Chair: *M. Abrams*
Mapping, Monitoring and Re-Constructing Historical Evolution of Eruptive Activity at Nyamulagira, DRC, and its Implications for Hazards
Benoît Smets, et al.
Improvement of the Knowledge in a VHR Image: Detection of Damaged Buildings on a VHRimage in Peri-Urban Milieu(The case of an earthquake with QUICKBIRD images)

Benachir Aniss Hadj, et al.
3D THz-Imaging on Simulated Data with a First Test on Real Radar VNA Data in the GHz Domain.
Roel Heremans, et al.

16.00-17.30: Thermal Remote Sensing (2) - Chair: *C. Hecker*

Modelling Air Temperature via Assimilation of Satellite derived Surface Temperature within the Urban Heat Island Project.
Koen De Ridder, et al.
Ground Surface Temperatures (GST) Modeling in the Russian Altay Mountains by Using MODIS Land Surface Temperatures (LST).
Ruben Van De Kerchove, et al.
The Advantages of Thermal Remote Sensing Data for Surface and Subsurfaces Soil Properties Mapping in Desert Environments
Seyed Kazem Alavipanah

19.00: Workshop Dinner: Typical Flemish Cuisine.

Friday 24 September

9.00-10.30: Miscellaneous (2) - Chair: *F. Canters*
Influence of Spatial Resolution and Distribution of Remotely Sensed Impervious Surface Cover on Runoff Prediction in Urbanized Catchments
Tomasz Berezowski, et al.
LIDAR Data for Urban Land Cover Mapping Based on Decision Tree
Yuchu Qin, et al.
The use of stereoscopical images taken from a micro-drone for the documentation of Heritage – an example from burial mounts in the Russian Altaï.
Marijn Henderick, et al.

9.00-10.30: Thermal Remote Sensing (3) - Chair: *E. Parlow*
Evaluation of DisTrad Downscaling of MODIS Thermal Products over Dublin
Wiesam A. A. Essa, et al.
Post-Fire Changes in Land Surface Temperature and Surface Albedo assessed with MODIS
Sander Veraverbeke, et al.
Dependence of Thermal Infrared Emissivity on Soil Moisture. Field and Laboratory Measurements
Maria Mira, et al.

10.30-11.00: Coffee Break

11.00-12.30: Remote Sensing for Developing Countries (2) - Chair: *E. Parlow*
Cairo - The Growing of a Mega-City
Eberhard Parlow, et al.
Using GEOBIA to assess Crown Diameter Classes of Acacia Tortilis in Bou Hedma, Tunisia
Kevin Delaplace, et al.
Object-Based Classification of a Sclerophyllous Oak Forest in Northwest Yunnan (China) based on High Resolution Satellite Imagery
Flore R. Devriendt, et al.

11.00-12.30: 3D Remote Sensing - Chair: *M. Crespi*
Digital Surface Models in Urban Areas based on Satellite Imagery
Karsten Jacobsen, et al.
Accuracy Evaluation of DEM extracted from a GeoEye Stereo Pair of Flat Rural Areas for Hydraulic Hazard Analysis
Alessio Furini, et al.

12.30-14.00: Lunch

14.00-15.30: Remote Sensing for Developing Countries - Chair: *R. Goossens*
ENDELEO, a Web-based Tool to Monitor Vegetation Dynamics in Kenya
Flore R. Devriendt, et al.
Analyzing Vegetation Change in Relation to Environmental and Socio Economic Factors in Lower Lancang Watershed, China
Zhiming Zhang, et al.
Urban Expansion and its Impact on Urban Agriculture – Remote Sensing based Change Analysis of Kizinga and Mzinga Valley – Dar Es Salaam, Tanzania
Sandra Eckert

14.00-15.30: Radar Remote Sensing (3) - Chair: *C. Frey*
Image Fusion Techniques for the Integration of High Resolution SAR Data and Multispectral Imagery in an Urban Environment – A Statistical Comparison
Christian Berger, et al.
Identification of Structural Changes caused by Different Type of Damages in Agriculture by Synergistic Use of Optical and Radar Data
Gizella Nádor, et al.
GPR Time Lapse to Quantify the Subsidence Degree in an Urban Area
Giovanni Leucci, et al.

15-30-16.00: Coffee Break

16.00-16h30: Special Presentation on Education in 3D-Remote Sensing SEOS:3D-Module and Geomobiel

Thérèse Ongena

16.30-17.00: Closing of the workshops

3. NEWS ITEMS

3.1 JUST PUBLISHED

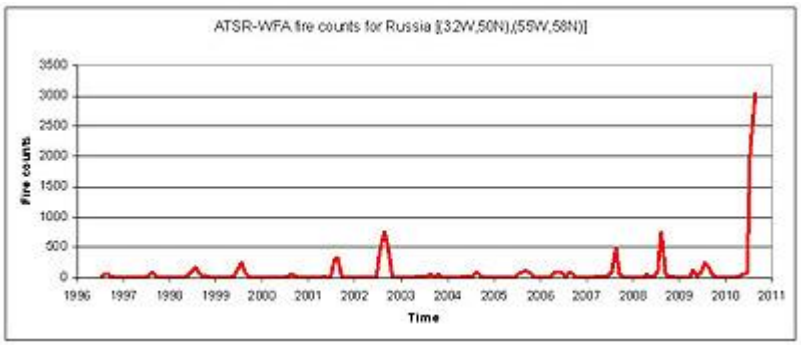
"Remote Sensing of Vegetation; Principles, Techniques and Applications" by Hamlyn G Jones and Robin A Vaughan, Oxford University Press, July 2010, 353pp. £29.99.

This new book is aimed at senior undergraduates and new postgraduates to help them appreciate ways in which remote sensing can be used for the study and monitoring of vegetation. The authors believe that, in order to be able to obtain the most benefit from a technique such as remote sensing, it is essential for the user to have a thorough understanding of the principles involved, rather than just apply procedures and techniques by rote. Correct interpretation of RS data to provide useful information requires a good understanding of the ways in which these data are obtained and especially of the inherent limitations.

Consequently, the first part of the book covers fundamental principles of RS, biological properties and detecting systems. Then follow several chapters that consider how to extract useful information from, mainly, spectral data. Then, after a consideration of possible ways in which errors may creep in, a number of applications are considered in depth. Topics covered include basic radiation physics, radiative properties of vegetation, soils and water, plant and canopy function, earth observation systems, basic image processing and image classification, multiangular sensing and modelling of radiation transfer properties, canopy mass and heat exchange, and sampling, error and scaling. Even though a quantitative approach is used, the emphasis throughout is on the key underlying principles and mathematical derivations are kept to a level accessible to most upper undergraduates, emphasizing the meaning rather than the mathematics. A number of useful appendices are included.

3.2 RUSSIAN FIRES

Satellites reveal Russian fires worst in 14 years

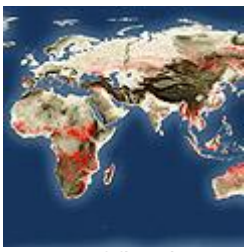


More wildfires have burned around the Russian capital this year than in the last decade and a half, according to sensors aboard ESA's observation satellites. The forest and peat bog fires ignited this summer amid an unprecedented heat wave of up to 40ºC.
Working like thermometers in the sky, the Along Track Scanning Radiometer and the Advanced Along Track Scanning Radiometer on ESA's ERS-2 and Envisat satellites measure thermal-infrared radiation to take the temperature of Earth's land surface.

Flames reach temperatures that are detected by these sensors and confirm the presence of fire.

Data gathered from fires across Russia from July 1996 to the present were used to plot the number of fires occurring monthly. The region near Moscow showed around six times the number of fires this August compared to previous years.

Data from these sensors are compiled to create ESA's ATSR World Fire Atlas which is available online to users within six hours. The atlas – the longest worldwide fire record available – also provides the time, date, longitude and latitude of the hot spots.


Extent of fire damage seen in red

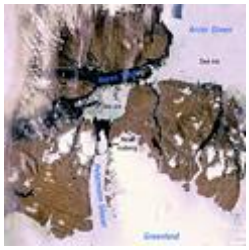
The atlas is an important scientific resource because fires have a significant impact on global atmospheric pollution, with biomass burning contributing to the global budgets of greenhouse gases such as carbon dioxide.

The data are used for research in atmospheric chemistry, land-use change, global change ecology, meteorology and fire prevention and management.

Source: ESA hompage September 2010
(http://www.esa.int/esaEO/SEMGQSJOXDG_index_0.html)

3.3 GREENLAND GLACIER GIVES BIRTH TO GIANT ICEBERG

Envisat has been observing a rare event in the Arctic since early August - a giant iceberg breaking off the Petermann glacier in North-West Greenland.
The Petermann glacier is one of the largest glaciers connecting the Greenland inland ice sheet with the Arctic Ocean. Upon reaching the sea, a number of these large outlet glaciers extend into the water with a floating 'ice tongue'.
The ice tongue of the Petermann glacier was the largest in Greenland, with an extension of about 70 km until early August. This tide-water glacier regularly advances towards the ocean at about 1 km per year. During the previous months, satellite images revealed that several cracks had appeared on the glacier surface, suggesting to scientists that a break-up event was imminent.
In the Envisat radar image taken on 3 August, the ice tongue was still intact but, on 4 August, a large part of the floating ice tongue was separated from the glacier, giving birth to what is currently the largest iceberg in the northern hemisphere. Such a process of detachment, called 'calving', occurs regularly on the Petermann glacier, with smaller calving events in summer 2008 and 2009. However large calving events are rare, with the last such significant event being documented in 1991 by ESA's ERS-1 satellite.



MERIS image after iceberg calving

An animation was created by combining three Envisat Advanced Synthetic Aperture Radar (ASAR) acquisitions (31 July, 4 August and 7 August 2010) taken over the same area, which can be viewed on the ESA website below. The breaking of the glacier tongue and the movement of the iceberg can be clearly seen in this sequence.

Petermann glacier as seen by ERS-1 in August 1991

The detached iceberg is now about 30 km by 14 km in size with an area of about 245 sq km. It is floating away from Petermann glacier and will enter into the Nares Strait, which separates Greenland from the Ellesmere Island in Canada.
The Nares Strait connects the Lincoln Sea and Arctic Ocean with the Baffin Bay. The strait is usually navigable by icebreakers during August/September, when sea ice extent is at its minimum after the summer melt period. Envisat ASAR images will be used in the coming days to monitor the movement of the giant iceberg in support of icebreaker navigation.
The radar imaging system used by Envisat and other satellites is particularly suited to observe polar areas, as it can acquire images through cloud or fog, and night and day.

Source: ESA hompage August 2010
(http://www.esa.int/esaEO/SEMYXY4OJCG_index_0.html)

4. FEATURE ARTICLE

On the use of satellite remote sensing data to characterize and map fuel types

Lanorte Antonio and Lasaponara Rosa

alanorte@imaa.cnr.it

lasaponara@imaa.cnr.it

Abstract

Satellite remote sensing can successfully cope with different aspects of fire management problems, such as danger estimation, fire detection, burned area mapping and post-fire vegetation recovery. In particular, remote sensing can provide valuable data on type (namely distribution and amount of fuels) and status of vegetation in a consistent way at different spatial and temporal scales. The characterization and mapping of fuel types is one of the most important factors that should be taken into consideration for wildland fire prevention and pre-fire planning. In this paper, we provide a brief overview on the use of satellite data for the characterization and mapping of fuel type. Such research activities are part of the FUELMAP project, funded by JRC and focused on the development of fuel models for European ecosystems.

Introduction

Wildland fires are considered one of the most important ecological factors in natural ecosystems (Moreno and Oechel, 1994). For millennia fires were recognized as a historic but infrequent element of natural ecosystems, but, currently, the number of wildfires and burned areas have increased dramatically (FAO; 2001) throughout the world. This increase has also occurred in the fragile ecosystems of the Mediterranean basin (Portugal, Spain, Italy, Greece) that are known to be at high risk of desertification (see, for example, United Nations Convention to Combat Desertification (UNCCD) reports).

In the Mediterranean regions, fires are considered a major cause of land degradation. Every year, around 45,000 forest fires break out in the Mediterranean basin burning about 2,6 million hectares (FAO, 2001). Several studies (see, for example, Vila et al. 2001) dealing with the effects of fires on the vegetation within the Mediterranean basin found that fires induce significant alterations in short as well as long-term vegetation dynamics (see, for example, Perez and Moreno, 1998).

Prevention measures, together with early warning and fast suppression, are the only methods available that can support fire fighting and limit damages caused by fires, especially in regions with high ecological value or dense populations. In order to limit fire damage, fire agencies need to have effective decision support tools that are able to provide timely information for quantifying fire risk. In particular, fire managers need information concerning the distribution, amount, and condition of fuels in order to improve fire prevention and to model fire spread and intensity.

In the past, fuel were generally typed in the field thought long and expensive field reconnaissance campaigns Today, it is recognized that remote sensing can provide valuable data on type (namely distribution and amount of fuels) and status of vegetation in a consistent way at different spatial and temporal scales.

Obviously, field surveys are still indispensable for fuel type mapping either as the basic source of data or for assessment of products generated at a lower level of detail or to param-

eterise each fuel type (Arroyo et al. 2008). Field surveys are also recommended to create field reference datasets (i.e. groundtruth) to validate maps created from remotely sensed data products (Keane et al. 2001).

Aerial photos have been the most common remote sensing data source traditionally used (Morris, 1970; Muraro, 1970; Oswald et al., 1999) for mapping fuel types distribution.

Satellite multispectral data can be an effective data source for building up fuel type maps from global, regional down to a local scale.

Satellite based fuel MAPPING: from coarse to fine spatial Scales

Fuel maps are essential to fire management at many spatial and temporal scales (Keane et al. (2001).

Coarse scale fuel maps are integral to global, national, and regional fire danger assessment to more effectively plan, allocate, and mobilize suppression resources at weekly, monthly and yearly evaluation intervals (Deeming et al., 1972, 1977; Werth et al. 1985; Chuvieco and Martin 1994; Simard 1996; Burgan et al. 1998; Klaver et al. 1998; de Vasconcelos et al. 1998; Pausas and Vallejo, 1999). Broad area fuel maps are also useful as inputs for simulating regional carbon dynamics, smoke scenarios, and biogeochemical cycles (Running et al.1989; Leenhouts 1998; Lenihan et al.1998). Mid-scale or regional-level digital fuel maps are important in (1) rating ecosystem health; (2) locating and rating fuel treatments; (3) evaluating fire hazard and risk for land management planning; and (4) aiding in environmental assessments and fire danger programs (Pala and Taylor 1989; Ottmar et al. 1994; Salas and Chuvieco 1994; Wilson et al. 1994; Hawkes et al. 1995; Cohen et al. 1996; Sapsis et al. 1996; Chuvieco et al. 1997). Fine scale or landscape-level fuel maps are essential for local fire management because they also describe fire potential for planning and prioritizing specific burn projects (Chuvieco and Congalton 1989; Pala et al. 1990; Maselli et al. 1996). More importantly, such maps can be used as inputs to spatially explicit fire growth models to simulate planned and unplanned fires to more effectively manage or fight them (Stow et al. 1993; Hardwick et al. 1996; Gouma and Chronopoulou-Sereli 1998; Grupe 1998; Keane et al. 1998a).

Fuel maps	*Spatial scale*		
	Coarse	*Mid*	*Fine*
Primary application	*Fire danger*	*Fire risk and hazard*	*Fire growth*
Fire uses	*Plan and allocate resources*	*Locate and prioritize treatment areas*	*Simulate fire behaviour, predict fire effects*
Other possible uses	*Global carbon budgets*	*Forest health assessment*	*Simulate ecosystem and fire Dynamics*
Most probable mapping approach	*Indirect, gradient model*	*Direct, indirect, gradient model*	*Field reconnaissance, direct, indirect, gradient model*
Mapping entities	*Land use types*	*Fuel models*	*Fuel models, fuel loadings*
Possible pixel sizes	*500 m–5 km*	*30–500 m*	*5–30 m*
Imagery	*AVHRR, MODIS*	*MODIS, MSS, TM*	*TM, ASTER, SPOT, AVIRIS, IKONOS, QuickBird, MIVIS, LiDAR, SAR, aerial photos*

Summarized table (Keane et al. 2001 mod.)

Satellite based fuel mapping approach

Several satellite sensors have been used in last decades, applying direct or indirect mapping strategies: (i) direct mapping strategies extract fuel classifications directly from imagery; (ii) indirect fuel mapping strategies use ecosystem characteristics as surrogates for fuels. Direct fuel mapping using remote sensing refers to the direct assignment of fuel characteristics to the results of image classification (Keane et al..2001).

The main advantage of the direct approach is its simplicity: by classifying fuels directly from imagery, compounding errors from biomass calculations, translation errors from vegetation classifications and image processing steps are minimized. Also the ground references are simplified. However, the main disadvantage is that it is difficult to classify all fuel characteristics in a way useful to fire management in many forested ecosystems. Passive sensors cannot get information about understory (Belward et al. 1994), therefore it is not possible to discriminate understory in forest areas. Moreover, a direct remote sensing mapping often distinguishes vegetation types rather than fuel attributes.

An approach based on a direct fuel mapping (using remote sensing) provides high performances in grasslands and shrub-land (Friedl et al. 1994; Millington et al. 1994; Chladil and Nunez 1995), but meets serious difficulties when used in forested ecosystems because of passive sensors are usually unable to detect understory under close canopies (Arroyo et al. 2008).

According to Keane et al. (2001), indirect fuel mapping based on remote sensing uses ecosystem characteristics as surrogates for fuels to overcome the limitations of imagery to directly map fuel characteristics. This approach assumes that biophysical or biological properties can be accurately classified from remotely sensed imagery. These properties are often related to the vegetation and well correlate with fuel characteristics or fuel models.

The indirect approach is the most commonly used for mapping fuels. At coarse scale AVHRR images have been often used to discriminate broad vegetation types or land cover classes (McGinnis and Tarpley, 1985; Maselli et al., 2003).

Burgan et al. (1998) used Omernik's (1987) ecoregions and the Loveland et al. (1991) AVHRR land cover classification in order to develop the NFDRS (National Fire danger Rating System) fuel model map (Deeming et al. 1978) of the conterminous United States.

Klaver et al.(1998) developed the NFDRS fuel map of California and surrounding areas from a combination of vegetation types from the North American Land Characteristics data base (Loveland et al. 1993), Omernik's (1987) ecoregion map and field sampling. A knowledge-based system approach based on land-use, vegetation, satellite imagery, and elevation information was used to develop a regional fuel mapping in Portugal (de Vasconcelos et al. 1998).

Willis (1985) extracted fuels models developed by Mallot (1984) in Alaska using Landsat imagery.

Fire fuel model maps of the North Cascades National Park were developed by Root et al. (1985) from plant community maps created from 1979 Landsat MSS imagery and environmental relationships; in this work both NFDRS and the Anderson fuel models are assigned to each classified vegetation type.

In an analogous way Miller and Johnston (1985) assigned NFDRS fuel models to vegetation maps created from classifications of Landsat MSS and AVHRR imagery.

In Canada, Kourtz (1977), Dixon et al.(1985) and Wilson et al.(1994) extracted fuel types maps from Landsat MSS data on the base of Canadian Forest Fire Behaviour Prediction System (FBP, Forestry Canada Fire Danger Group 1992).

Hawkes et al. (1995) used rigorous expert systems approach to assign FBP fuel types to combinations of stand structure and composition information obtained from forest surveys. Yool et al. (1985) used MSS imagery to describe brushy fuels in southern California.

Roberts et al. (1998b) used AVIRIS (Airborne Visible and Infrared Imaging Spectrometer) imagery to classify vegetation fraction, cover, and water content in California, which were then related to fuel loadings directly sampled on the ground.

For the Lassen National Forest in California, Hardwick et al. (1996) assigned Anderson fuel models to vegetation categories from the TM-derived vegetation map

The combined use of Landsat images with ancillary data (i.e. NDVI, slope, texture, illumination) was used to generate fuel type map adapted to the ecological characteristics of the European Mediterranean basin (Riano et al., 2002; Francesetti et al., 2006). Fuel type maps account for structural characteristics of vegetation related to fire behaviour and fire propagation.

More recently, advanced spaceborne thermal emission and reflection radiometer (ASTER) imagery has proved useful for the characterization and mapping of fuel types and fire risk at finer scales (Guang-xiong et al., 2007; Lasaponara and Lanorte, 2007b).

Very high resolution multispectral satellite data, such as QuickBird and IKONOS have been widely applied in vegetation characterization (Wang et al., 2004; Hyde et al., 2006; Kayitakire

et al., 2006; van Coillie et al., 2007; Mallinis et al., 2008) and they may well become a valuable input for the development of local fuel management plans, particularly for the urban–wildland interface (Andrews and Queen, 2001). Lasaponara and Lanorte (2007a) applied a maximum likelihood algorithm to VHR QuickBird image in complex ecosystems of Southern Italy.

In the Mediterranean basin, Giakoumakis et al. (2002) and Gitas et al. (2006) employed an object-oriented approach to map the Prometheus fuels types using IKONOS and QuickBird imagery, respectively. In this approach, pixels are aggregated before classification which is performed on groups of pixels (''objects''), rather than on single pixels.

Arroyo et al. (2006) implemented an object-oriented approach to map forest fuels in central Spain. These authors developed a multi-scale segmentation approach with a hierarchical three-level network of image objects: objects were classified using a nearest neighbour classifier.

Promising results were also obtained when VHR data were combined with LiDAR information (Mutlu et al. 2008), indicating that the integration of different sensors may further improve fuel discrimination.

Fuel mapping accuracy

Quantitative accuracy assessments are very important for realistic predictions of fire growth (Keane et al., 1998b; Finney, 1998, Congalton and Green, 1999). Fire growth predictions should, for example, identify those fuel types that generate high fire intensities but are mapped inaccurately (Keane et al., 2001).

Improving the accuracy of mapping fuel models is essential for fuel management decisions and explicit fire behaviour prediction for real-time support of suppression tactics and logistics decisions. For example accuracy assessments should indicate if additional sampling or fuel type aggregation is needed for the fuel types mapped with a low level of reliability (Congalton 1991).

Accuracy assessments are even more critical in fuel mapping because most projects use indirect techniques where the fuel bed is not the mapped entity. Therefore, accuracy assessment protocols should be explicitly built into any standardized fuel mapping approach (Keane et al., 2001).

Low fuel map accuracies could be mainly a consequence of 1) improper use of vegetation or fuels classifications, 2) erroneous field identification of a mapped attribute; 3) mistakes in field data entry; 4) scale differences in field data and mapped elements; 5) improper georegistration.

However also the map consistency is just as important as accuracy level and, therefore, low map accuracies do not always mean that the fuel map is worthless, considering the high variability and complexity of fuels (Keane et al., 2001).

Keane et al. (2000) hierarchically assessed accuracy of vegetation and fuel maps by quantifying error in the field data, vegetation and fuel classifications, and resultant maps so that major sources of error could be identified and controlled. They found that over 20% of map error resulted from the inherent variability of ecological attributes sampled at the stand-level.

References

Adams, J.B., Sabol, D.E., Kapos, V., Filho, R.A., Roberts, D.A., Smith, M.O., Gillespie, A.R., 1995. Classification of multispectral images based on fractions of endmembers: Application to land cover change in the Brazilian Amazon. Remote Sensing of Environment 52, 137–154.

Andersen, H.-E., McGaughey, R.J., Reutebuch, S.E., 2005. Estimating forest canopy fuel parameters using LIDAR data. Remote Sensing of Environment 94, 441–449.

Anderson HE (1982) Aids to determining fuel models for estimating fire behavior. USDA Forest Service, Intermountain Forest and Range Experiment Station General Technical Report INT-122. Ogden, UT. 22 pp.

Andrews, P.L., Queen, L.P., 2001. Fire modeling and information system technology. International Journal of Wildland Fire 10, 343–352.

Arroyo, L.A., Healey, S.P., Cohen, W.B., Cocero, D., 2006. Using object-oriented classification and high-resolution imagery to map fuel types in a Mediterranean region. Journal of Geophysical Research 111, G04S04 doi:10.1029/2005JG000120

Arroyo, LA; Pascual, C; Manzanera, JA, 2008. Fire models and methods to map fuel types: The role of remote sensing. Forest ecology and management 256 (6): 1239-1252

Belward AS, Kennedy PJ, Gregoire JM (1994) The limitations and potential of AVHRR GAC data for continental scale fire studies. International Journal of Remote Sensing 15(11), 2215–2234.

Burgan, R., Klaver, R., Klaver, J., 1998. Fuel model and fire potential from satellite and surface observations. International Journal of Wildland Fire 8, 159–170.

Campbell J, Weinstein D, Finney M (1995) Forest fire behaviour modeling integrating GIS and BEHAVE. In ‘Analysis in support of ecosystem management’. (Compiler JE Thompson) pp. 184–192.

USDA Forest Service Ecosystem Management Center Report, Washington D.C.

Chladil, M.A., and Nunez, M. (1995). Assessing grassland moisture and biomass in Tasmania - the application of remote sensing and empirical models for a cloudy environment. International Journal of Wildland Fire 5(3):165-171

Chuvieco E, Congalton RG (1989) Application of remote sensing and geographic information systems to forest fire hazard mapping. Remote Sensing of the Environment 29, 147–159.

Chuvieco E, Martin MP (1994) Global fire mapping and fire danger estimation using AVHRR images. Photogrammetric Engineering and Remote Sensing 60(5), 563–570.

Chuvieco E, Salas J, Vega C (1997) Remote sensing and GIS for longterm fire risk mapping. In ‘A review of remote sensing methods for

the study of large wildland fires’. (Ed. E Chuvieco) pp. 91–108. Megafires Project ENV-CT96-0256. Alcala de Henares, Spain.

Chuvieco, E., Rian o, D., van Wagtendonk, J., Morsdof, F., 2003. Fuel loads and fuel type mapping. In: Chuvieco, E. (Ed.), Wildland Fire Danger Estimation and Mapping. The Role of Remote Sensing Data. World Scientific, Singapore, pp. 119–142.

Chuvieco, E., Kasischke, E.S., 2007. Remote sensing information for fire management and fire effects assessment. Journal of Geophysical Research-Biogeosciences 112.

Cohen WB (1989) Potential utility of the TM tasseled cap multispectral data transformation for crown fire hazard assessment. In ‘ASPRS/ACSM annual convention proceedings: Agenda for the 90s’.

Volume 3, pp. 118–127. (Baltimore Maryland)

Cohen WB, Harmon ME, Wallin DO, Fiorella M (1996) Two decades of carbon flux from forests of the Pacific Northwest: estimates from a new modeling strategy. Bioscience 46(11), 836–844.

Congalton RG (1991) A review of assessing the accuracy of classifications of remotely sensed data. Remote Sensing of theEnvironment 37, 35–46.

Congalton, R. G., & Green, K. (1999). Assessing the accuracy of remotely sensed data. Principles and practices, vol. 65 (pp. 1−137). Boca Raton FL: Lewis Publishers.

Deeming, J.E., Burgan, R.E., Cohen, J.D., 1977. The National Fire Danger Rating System. Rep. No. GTR INT-39. USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT.

Deeming, J.E., Lancaster, J.W., Fosberg, M.A., Furman, R.W., Schroeder, M.J., 1972. The National Fire-Danger Rating System. Rep. No. RM-84. USDA Forest Service, Ogden, UT.

Deeming JE, Burgan RE, Cohen JD (1978) The National Fire Danger Rating System. USDA Forest Service General Technical Report.

de Vasconcelos JJP, Paul JCU, Silva S, Pereira JMC, Caetono MS, Catry FX, Oliveira TM (1998) Regional fuel mapping using a knowledge based system approach. In 'Proceedings: III international conference on forest fire research and 14th conference on fire and forest meteorology'. Vol. II, pp. 2111–2123.

Dixon R, Shipley W, Briggs A (1985) Landsat—a tool for mapping fuel types in the boreal forest of Manitoba: A pilot study. In 'Proceedings of the Pecora X symposium'. pp. 392–393. (American Society for Photogrammetry and Remote Sensing: Falls Church, VA)

Dubayah, R.O., Drake, J.B., 2000. Lidar remote sensing of forestry. Journal of Forestry 98, 44–46.

Finney, M.A., 1998. FARSITE: Fire Area Simulator Model development and evaluation. Research Paper RMRS-RP-4. USDA Forest Service, Rocky Mountain Research Station, Ogden, UT, p. 47.

Forestry Canada Fire Danger Group (1992) 'Development and structure of the Canadian Forest Fire Behavior Prediction System.' Ontario Information Report ST-X-3. (Forestry Canada, Science for Sustainable Development: Ottawa) 12 pp.

Francesetti, A., Camia, A., Bovio, G., 2006. Fuel type mapping with Landsat TM images and ancillary data in the Prealpine region of Italy. Forest Ecology and Management 234S, S259.

Friedl MA, Michaelsen J, Davis FW, Walker H, Schimel DS (1994) Estimating grassland biomass and leaf area index using ground and satellite data. International Journal of Remote Sensing 15(7), 1401–1420.

Giakoumakis, N.M., Gitas, I.Z., San-Miguel, J., 2002. Object-oriented classification modelling for fuel type mapping in the Mediterranean, using LANDSAT TM and IKONOS imagery—preliminary results. In: Viegas (Eds.), Forest Fires Research & Wildland Fire Safety. Millpress, Rotterdam.

Gitas, I.Z., Mitri, G.H., Kazakis, G., Ghosn, D., Xanthopoulos, G., 2006. Fuel type mapping in Annapolis, Crete by employing QuickBird imagery and object-based classification. Forest Ecology and Management 234 (S1), S228 doi:10.1016/j.foreco. 2005.08.255

Gouma V, Chronopoulou-Sereli A (1998) Wildland fire danger zoning—a methodology. International Journal of Wildland Fire 8(1), 37–43.

Grupe MA (1998) Assessing the applicability of the Terrestrial Ecosystem Survey for FARSITE. Master's Thesis, University of New Mexico, Albuquerque, New Mexico, 95 pp.

Guang-xiong, P., Jing, L., Yun-hao, C., Abdul-patah, N., 2007. A forest fire risk assessment using ASTER images in peninsular Malaysia. Journal of China University of Mining & Technology 17, 232–237.

Hall, S.A., Burke, I.C., Box, D.O., Kaufmann, M.R., Stoker, J.M., 2005. Estimating stand structure using discrete-return lidar: an example from low density, fire prone ponderosa pine forests. Forest Ecology and Management 208, 189–209.

Hardwick PE, Lachowski H, Forbes J, Olson R, Roby K, Fites J (1996) Fuel loading and risk assessment for Lassen National Forest. In 'Proceedings of the seventh Forest Service remote sensing applications conference. Nassau Bay, Texas, 6–10 April 1998'. (Ed. JD Greer) pp. 328–339. (American Society for Photogrammetry and Remote Sensing: Bethesda, MD)

Hawkes B, Niemann O, Goodenough D, Lawson B, Thomson A, Sahle W, Fuglem P, Beck J, Bell B, Symington P (1995) Forest fire fuel type mapping using GIS and remote sensing in British Columbia. In 'Proceedings of the symposium GIS Applications in Natural Resources 2—The 9th symposium on Geographic Information Systems, Vancouver, British Columbia'. (Eds M Heit, HD Parker and A Shortreid) pp. 290–299.

Hornby, L.G., 1935. Fuel type mapping in region one. Journal of Forestry 33, 67–72.

Hornby LG (1936) Fire control planning in the northern Rocky Mountain region. Northern Rocky Mountain Forest and Range Experiment Station Progress Report Number 1. Missoula, MT. 180 pp.

Hyde, P., Dubayah, R., Walker, W., Blair, J.B., Hofton, M., Hunsaker, C., 2006. Mapping forest structure for wildlife habitat analysis using multi-sensor (LiDAR, SAR/InSAR, ETM+, Quick-bird) synergy. Remote Sensing of Environment 102, 63–73.

Hyyppa, H., Hallikainen, M., 1993. A helicopter-borne 8-channel ranging scatterometer for remote-sensing 2. Forest inventory. IEEE Transactions on Geoscience and Remote Sensing 31, 170–179.

Hyyppa, H., Hallikainen, M., 1996. Applicability of airborne profiling radar to forest inventory. Remote Sensing of Environment 57, 39–57.

Hyyppa, J., Hyyppa, H., Leckie, D., Gougeon, F., Yu, X., Maltamo, M., 2008. Review of methods of small-footprint airborne laser scanning for extracting forest inventory data in boreal forests. International Journal of Remote Sensing 29, 1339–1366.

Jia, G.J., Burke, I.C., Goetz, A.F.H., Kaufmann, M.R., Kindel, B.C., 2006. Assessing spatial patterns of forest fuel using AVIRIS data. Remote Sensing of Environment 102, 318–327.

Kayitakire, F., Hamel, C., Defourny, P., 2006. Retrieving forest structure variables based on image texture analysis and IKONOS-2 imagery. Remote Sensing of Environment 102, 390–401.

Keane RE, Long DG, Schmidt KM, Mincemoyer S, Garner JL 1998a Mapping fuels for spatial fire simulations using remote sensing and biophysical modeling. In ‘Proceedings of the seventh Forest Service remote sensing applications conference. Nassau Bay, Texas, 6–10April 1998’. (Ed. JD Greer) pp. 301–316. (American Society for Photogrammetry and Remote Sensing: Bethesda, MD)

Keane, R.E., Garner, J.L., Schmidt, K.M., Long, D.G., Menakis, J.P., Finney, M.A. 1998b. Development of the input data layers for the FARSITE fire growth model for the Selway–Bitterroot wilderness complex, USA. USDA Forest Service General Technical Report RMRS-GTR-3, p. 121.

Keane RE, Mincemoyer SA, Schmidt KA, Long DG, Garner JL (2000) Mapping vegetation and fuels for fire management on the Gila National Forest Complex, New Mexico. USDA Forest Service General Technical Report RMRS-GTR-46-CD.

Keane, R.E., Burgan, R.E., van Wagtendonk, J., 2001. Mapping wildland fuel for fire management across multiple scales: Integrating remote sensing, GIS, and biophysical modeling. International Journal of Wildland Fire 10, 301–319.

Keramitsoglou, I., Kontoes, C., Sykioti, O., Sifakis, N., Xofis, P., 2008. Reliable, accurate and timely forest mapping for wildfire management using ASTER and Hyperion satellite imagery. Forest Ecology and Management 255, 3556–3562.

Klaver JM, Klaver RW, Burgan RE (1998) Using GIS to assess forest fire hazard in the Mediterranean

Region of the United States. http://proceedings.esri.com/library/userconf/proc97/proc97/to300/pap286/p286.htm 12pp

Kotz, B., Schaepman, M., Morsdorf, F., Bowyer, P., Itten, K., Allgower, B., 2004. Radiative transfer modeling within a heterogeneous canopy for estimation of forest fire fuel properties. Remote Sensing of Environment 92, 332–344.

Kourtz PH (1977) An application of Landsat digital technology to forest fire fuel mapping. In ‘Fire ecology in resource management: A workshop’. (Ed. DE Dube) pp. 79–81. (Northern Forest Research Centre: Edmonton, Alberta) Information Report NOR-X-21.

Lasaponara, R., Lanorte, A., 2006. Multispectral fuel type characterization based on remote sensing data and Prometheus model. Forest Ecology and Management 234S, S226.

Lasaponara, R., Lanorte, A., 2007a. On the capability of satellite VHR QuickBird data for fuel type characterization in fragmented landscape. Ecological Modelling 204, 79–84.

Lasaponara, R., Lanorte, A., 2007b. Remotely sensed characterization of forest fuel types by using satellite ASTER data. International Journal of Applied Earth Observation and Geoinformation 9, 225–234.

Leenhouts B (1998) Assessment of biomass burning in the conterminous United States. Conservation Biology (Online) 2(1), 1–24.

Lefsky, M.A., Cohen, W.B., Parker, G.G., Harding, D.J., 2002. Lidar Remote Sensing for Ecosystem Studies. BioScience 52.

Lenihan JM, Daly C, Bachelet D, Neilson RP (1998) Simulating broadscale fire severity in a dynamic global vegetation model. Northwest Science 72(4), 91–101.

Loveland TR, Merchant JW, Ohlen DO, Brown JF (1991) Development of a land-cover characteristics database for the conterminous U.S. Photogrammetric Engineering and Remote Sensing 57(11), 1453–1463.

Loveland TR, Ohlen DO, Brown JF, Reed BC, Merchant JW (1993) Prototype 1990 conterminous United States land cover characteristics data set CD-ROM. EROS Data Center, US Geological Survey CD-ROM 9307. 1 disk.

Mallinis, G., Koutsias, N., Tsakiri-Strati, M., Karteris, M., 2008. Object-based classification using Quickbird imagery for delineating forest vegetation polygons in a Mediterranean test site. ISPRS Journal of Photogrammetry and Remote Sensing 63, 237–250.

Mallot N (1984) Alaska fuels fact sheet summary. S-390 Immediate Fire Behavior, State of Alaska, Department of Natural Resources, Division of Forestry Special Report No. 3. 3 pp.

Maselli F, Rodolfi A, Bottai L, Conese C (1996) Evaluation of forest fire risk by the analysis of environmental data and TM images. International Journal of Remote Sensing 17(7), 1417–1423.

Maselli, F., Romanelli, S., Bottai, L., Zipoli, G., 2003. Use of NOAA-AVHRR NDVI images for the estimation of dynamic fire risk in Mediterranean areas. Remote Sensing of Environment 86, 187–197.

McGinnis, D.F., Tarpley, J.D., 1985. Vegetation cover mapping from NOAA/AVHRR. Advances in Space Research 5, 359–369.

McKinley RA, Chine EP, Werth LF (1985) Operational fire fuels mapping with NOAA-AVHRR data. Pecora X symposium proceedings, pp. 295–304. (American Society for Photogrammetry and Remote Sensing: Falls Church, VA)

Miller, J.D., Danzer, S.R., Watts, J.M., Stone, S., Yool, S.R., 2003. Cluster analysis of structural stage classes to map wildland fuels in a Madrean ecosystem. Journal of Environmental Management 68, 239–252.

Miller W, Johnston D (1985) Comparison of fire fuel maps produced using MSS and AVHRR data. Pecora X symposium, pp. 305–314. (American Society for Photogrammetry and Remote Sensing: Falls Church, VA)

Millington AC, Critchley RW, Douglas TD, Ryan P (1994) 'Estimating woody biomass in sub-Saharan Africa.' (The World Bank: Washington, D.C.) 191 pp.

Morris WG (1970). Photo inventory of fine logging slash. Photogrammetric Engineering 36: 1252-1256.

Muraro SJ (1970). Slash fuel inventories from 70 mm low-level photography. Ottawa, Ontario, Canadian Forest Service: 63.

Mutlu, M., Popescu, S.C., Stripling, C., Spencer, T., 2008. Mapping surface fuel models using lidar and multispectral data fusion for fire behavior. Remote Sensing of Environment 112, 274–285.

Omernik JM (1987) Ecoregions of the conterminous United States. Annals of the Association of American Geographers 77(1), 118–125.

Oswald BP, Fancher JT, Kulhavy DL, Reeves HC (1999). Classifying fuels with Aerial Photography in East Texas. International Jurnal of Wildland Fire 9 (2):301-319.

Ottmar RD, Vihnanek R, Alvarado E (1994) Forest health assessment: Air quality tradeoffs. In 'Proceedings of the 12th international conference on fire and forest Meteorology, 26–28 October 1993,

Jekyll Island, Georgia'. pp. 47–62. (Society of American Foresters: Bethesda, MD)

Pala, S, Taylor D (1989) The foundation for province-wide forest fuel mapping. Proceedings, 12th Canadian symposium on remote sensing, Vancouver, B.C., July 1989.

Pala S, Taylor D, Holder G (1990) Integrating satellite-derived forest fuel data into fire management decision support models. Proceedings, 2nd National GIS conference, Ottawa, 5–8 March 1990.

Pausas, J.G., Vallejo, V.R., 1999. The role of fire in European Mediterranean ecosystems. In: Chuvieco, E. (Ed.), Remote Sensing of Large Wildfires. Springer, Berlin, pp. 3–16.

Riano, D., Chuvieco, E., Salas, F.J., Palacios-Orueta, A., Bastarrica, A., 2002. Generation of fuel type maps from Landsat TM images and ancillary data in Mediterranean ecosystems. Canadian Journal of Forest Research 32, 1301–1315.

Riano, D., Meier, E., Allgower, B., Chuvieco, E., Ustin, S.L., 2003. Modeling airborne laser scanning data for the spatial generation of critical forest parameters in fire behavior modeling. Remote Sensing of Environment 86, 177–186.

Riano, D., Chuvieco, E., Condes, S., Gonzalez-Matesanz, J., Ustin, S.L., 2004. Generation of crown bulk density for Pinus sylvestris L. from lidar. Remote Sensing of Environment 92, 345–352.

Roberts, D.A., Green, R.O., Adams, J.B., 1997. Temporal and spatial patterns in vegetation and atmospheric properties from AVIRIS. Remote Sensing of Environment 62, 223–240.

Roberts, D.A., Gardner, M., Church, R., Ustin, S., Scheer, G., Green, R.O., 1998a. Mapping chaparral in the Santa Monica Mountains using multiple endmember spectral mixture models. Remote Sensing of Environment 65, 267–279.

Roberts D, Gardner M, Regelbrugge J, Pedreros D, Ustin S (1998b) Mapping the distribution of wildfire fuels using AVIRIS in the Santa Monica Mountains.

ftp://popo.jpl.nasa.gov/pub/docs/workshops/98_docs/56.pdf 6pp

Roberts, D.A., Dennison, P.E., Gardner, M.E., Hetzel, Y., Ustin, S.L., Lee, C.T., 2003. Evaluation of the potential of Hyperion for fire danger assessment by comparison to the airborne visible/infrared imaging spectrometer. IEEE Transactions on Geoscience and Remote Sensing 41, 1297–1310.

Root RR, Stitt SCF, Nyquist MO, Waggoner GS, Agee JK (1985) Vegetation and fire fuel models mapping of North Cascades National Park. ACSM-ASPRS Annual Convention Technical Paper 3, 78–85.

Root RR, van Wagtendonk JW (1999) Hyperspectral analysis of multi-temporal Landsat TM data for mapping fuels in Yosemite National Park. In 'Annual ASPRS Conference, Portland, OR, 17-21 May 1999'. (Society of American Photogrammeters: Bethesda, MD) pp. 399–408.

Running SW, Nemani RR, Peterson DL, Band LE, Potts DF, Pierce LL, Spanner MA (1989) Mapping regional forest evapotranspiration and photosynthesis by coupling satellite data with ecosystem simulation. Ecology 70(4), 1090–1101.

Saatchi, S., Halligan, K., Despain, D.G., Crabtree, R.L., 2007. Estimation of forest fuel load from radar remote sensing. IEEE Transactions on Geoscience and Remote Sensing 45, 1726–1740.

Salas J, Chuvieco E (1994) Geographic information systems for wildland fire risk mapping. Wildfire 3(2), 7–13.

Sapsis D, Bahro B, Spreo J, Gabriel J, Jones R, Greenwood G (1996) An assessment of current risks, fuels, and potential fire behavior in the Sierra Nevada. Sierra Nevada Ecosystem Project Final Report to Congress: Status of the Sierra Nevada Volume II, Assessment and scientific basis for management options. Centers for Water and Wildland Resources Report 37, pp. 759–785. (University of California: Davis)

Simard AJ (1996) Fire severity, changing scales, and how things hang together. International Journal of Wildland Fire 1(1), 23–34.

Skowronski, N., Clark, K., Nelson, R., Hom, J., Patterson, M., 2007. Remotely sensed measurements of forest structure and fuel loads in the Pinelands of New Jersey. Remote Sensing of Environment 108, 123–129.

Slatton, K.D., Crawford, M.M., Evans, B.L., 2001. Fusing interferometric radar and laser altimeter data to estimate surface topography and vegetation heights. IEEE Transactions on Geoscience and Remote Sensing 39, 2470–2482.

Stow D, Hope A, McKinsey D, Pray H (1993) Deriving dynamic information on fire fuel distributions in southern Californian chaparral from remotely sensed data. Landscape and Urban Planning 24, 113–127.

Suarez, J.C., Ontiveros, C., Smith, S., Snape, S., 2005. Use of airborne LiDAR and aerial photography in the estimation of individual tree heights in forestry. Computers & Geosciences 31, 253–262.

van Coillie, F.M.B., Verbeke, L.P.C., De Wulf, R.R., 2007. Feature selection by genetic algorithms in object-based classification of IKONOS imagery for forest mapping in Flanders, Belgium. Remote Sensing of Environment 110, 476–487.

van Wagtendonk JW (1999) Use of Thematic Mapper imagery to map fuel models. In 'Proceedings of the 13th Conference on fire and forest meteorology. Lorne, Australia'.

van Wagtendonk, J.W., Root, R.R., 2003. The USE of multitemporal Landsat normalized difference vegetation index (NDVI) data for mapping fuels models in Yosemite National Park, USA. International Journal of Remote Sensing 24, 1639–1651.

Wang, L., Sousa, W.P., Gong, P., Biging, G., 2004. Comparison of IKONOS and QuickBird images for mapping mangrove species on the Caribbean coast of Panama. Remote Sensing of Environment 91, 432–440.

Werth LF, McKinley RA, Chine EP (1985) The use of wildland fire fuel maps produced with NOAA AVHRR scanner data. In 'Proceedings of the Pecora X symposium'. pp. 326–331. (American Society for Photogrammetry and Remote Sensing: Falls Church, VA)

Willis JM (1985) Applications of Landsat imagery for fire fuels mapping projects covering large geographic areas. In 'Proceedings of the Pecora X symposium'. pp. 394–395. (American Society for Photogrammetry and Remote Sensing: Falls Church, VA)

Wilson BA, Ow CFY, Heathcott M, Milne D, McCaffrey TM, Ghitter G, Franklin SE (1994) Landsat MSS classification of fire fuel types in Wood Buffalo National Park. Global Ecology and Biogeography Letters 4, 33–39.

Yool SR, Eckhardt DW, Estes JE, Cosentino MJ (1985) Describing the brushfire hazard in Southern California. Annals of the Association of American Geographers 75, 417–430.

5. FUTURE EVENTS

5.1 EARSEL EVENTS

22-24 September 2010:Second joint EARSeL SIG workshop, GHENT UNIVERSITY

EARSeL is organising its second joint workshop between the SIGs:

- Urban remote sensing
- 3D remote sensing
- Radar remote sensing
- Developing Countries
- Thermal remote sensing

The workshop will take place 22-24 of September 2010.

The aim of this joint workshop is to bring the members of the different SIGs together in one joint meeting in order to meet each other and to find common grounds and complementary items in their research. Many times research topics are not only related to one specific SIG, but in most cases there is a certain overlap. This joint workshop aims to channel these overlaps. This broader forum allows and encourages more interdisciplinary contacts among remote sensing scientists.

Weblink:

http://www.geoweb.ugent.be/data-acquisition-3d/earsel-workshop

7-9 FEBRUARY, 2011: 6TH WORKSHOP ON REMOTE SENSING OF LAND ICE AND SNOW. BERNE, SWITZERLAND. ORGANISED BY UNIVERSITY OF BERNE

30 MAY - 3 JUNE 2011: 31ST EARSEL SYMPOSIUM AND 34TH GENERAL ASSEMBLY, PRAGUE TECHNICAL UNIVERSITY, CZECH REPUBLIC

20-24 SEPTEMBER, 2011: 2ND WORKSHOP ON REMOTE SENSING FOR ARCHAEOLOGY. POZNAN, POLAND.

5.2 FORTHCOMING CONFERENCES

1. Conferences, Symposia and Workshops organized by ESA

Date	Event
21-23 Sep-2010	5th ESA Workshop on Tracking, Telemetry and Command Systems for Space Applications *ESTEC (Netherlands)*
21-23 Sep-2010	UN/Austria/ESA Symposium on Small Satellite Programmes for Sustainable Development: Payloads for Small Satellite Programmes *Graz (Austria)*
27-28 Sep-2010	Workshop on Mitigation Techniques Against Radiation on Integrated Circuits *ESTEC (Netherlands)*
28-30 Sep-2010	11th International Workshop on Simulation and EGSE facilities for Space Programmes - SESP 2010 *ESTEC (Netherlands)*
28-30 Sep-2010	NASGRO - ESACRACK training course *ESTEC (Netherlands)*
04-08 Oct-2010	ICSO 2010 - International Conference on Space Optics *Rhodes Island (Greece)*
05-08 Oct-2010	32nd ESA Antenna Workshop *ESTEC (Netherlands)*
13-15 Oct-2010	4th International Workshop on System & Concurrent Engineering for Space Applications - SECESA 2010 *Ecole Polytechnique Federale de Lausanne (Switzerland)*
14-15 Oct-2010	4th Coastal Altimetry Workshop *Porto (Portugal)*
14-Oct-2010	Future Launchers Preparatory Programme (FLPP) Workshop *Space Expo (Netherlands)*
19-21 Oct-2010	4th European Space Cryogenics Workshop *ESTEC (Netherlands)*
28-29 Oct-2010	2nd International Workshop on On-Board Payload Data Compression - OBPDC 2010 *CNES, Toulouse, France*
02-04 Nov-2010	ESA Workshop on Avionics Data, Control and Software Systems (ADCSS) *ESTEC (Netherlands)*
03-05 Nov-2010	Earth Observation for Land-Atmosphere Interaction Science ESRIN (Italy)
15-17 Nov-2010	4th International Workshop on Remote Sensing of Vegetation Fluorescence *Valencia (Spain)*
16-17 Nov-2010	24th European Workshop on Thermal & ECLS Software *ESTEC (Netherlands)*

08-10 Dec-2010	5th ESA Workshop on Satellite Navigation Technologies (NAVITEC) *ESTEC (Netherlands)*
15-17 Feb-2011	ISU 15th Annual International Symposium: The International Space Station: Maximizing the Return from Extended Operations *Strasbourg (France)*
11-13 Apr-2011	JURSE 2011 - Joint Urban Remote Sensing Event *TUM, Munich (Germany)*
15-17 March-2011	ESCCON 2011 *ESTEC (NETHERLANDS)*
22-25 March-2011	Sentinel scientific products for Land, Ocean and Cryosphere - Assessment & Consolidation Workshop *ESRIN (Italy)*
12-15 Apr-2011	11th Symposium on Advanced Space Technologies in Robotics and Automation - ASTRA 2011 *ESTEC (Netherlands)*
09-12 May-2011	7th Aerothermodynamics Symposium *Site Oud Sint-Jan, Brugge (Belgium)*
18-20 May-2011	4th International Conference on Spacecraft Formation Flying Missions & Technologies *St-Hubert, Québec (Canada)*
22-26 May-2011	20th ESA Symposium on European Rocket and Balloon Programmes and Related Research *Hyères (France)*
05-09 Jun-2011	GNC 2011 - 8th International ESA Conference on Guidance, Navigation & Control Systems *Carlsbad, Czech Republic*
08-10 Jun-2011	International Workshop of Planning and Scheduling for Space - IWPSS 2011 *ESOC (Germany)*
11-15 July-2011	4th International Symposium on Physical Sciences in Space - ISPS 4 *Bonn, Bad-Godesberg, Germany*

2. ASPRS Meetings & Workshops

November, 2010
ASPRS 2010 Fall Conference
Doubletree Hotel at Entrance to Universal Orlando
Orlando, Florida
November 15-18
http://www.asprs.org/orlando2010/

May 2011
ASPRS 2011 Annual Conference
Midwest Airlines Center/Hyatt Hotel

Milwaukee, Wisconsin
May 1 - 5, 2011
http://www.asprs.org/milwaukee2011/

November 2011
ASPRS 2011 Fall Pecora Conference
Hilton Hotel at Washington Dulles Airport
Herndon, Virginia
November 14-17

March 2012
ASPRS 2012 Annual Conference
Sacramento Convention Center (TBD),
Sacramento, California
March 19-23, 2012

October 2012
ASPRS/MAPPS Fall Specialty Conference
Marriott Tampa Waterside Hotel Tampa, FL
October 29 - November 1, 2012

March 2013
ASPRS 2013 Annual Conference
Baltimore Marriott Waterfront Hotel
Baltimore, Maryland
March 24-28, 2013

May 2015
ASPRS 2015 Annual Conference
Tampa Bay Marriott Waterside Hotel
Tampa, Florida
May 4-8, 2015

11th International Circumpolar Remote Sensing Symposium
September 20-24, 2010.
Cambridge's Scott Polar Research Institute.
http://alaska.usgs.gov/science/geography/CRSS2010/

AEG Annual Meeting
September 20-25, 2010.
Charleston, South Carolina
http://www.aegweb.org

GEOTECH 2010: Spectrum of Visions
Premier Mid-Atlanic Imagery and GIS Conference
George Mason University (Fairfax Campus)
George W. Johnson Center, Dewberry Hall
September 27-28, 2010

www.asprspotomac.org/geotech2010/index.html

LARS 2010 - Latin American Remote Sensing Week
October 4-8, 2010.
Fuerza Aérea de Chile (Chilean Air Force)
http://www.lars.cl/

GEOSS Workshop XXXIX – Forest and Bio-energy
October 4-21, 2010.
Santiago, Chile.
http://www.ieee-earth.org/

Illinois GIS Association (ILGISA)
October 20-21, 2010.
Fall 2010 Conference,
Northern Illinois University, Naperville Campus.
www.ilgisa.org

October 20-21, 2010.
2010 Geospatial Conference, GIS – Partnering for Success
Athens, Georgia
http://www.geospatialconference.com/abs.asp.

Fifth Session of the International Conference Geotunis 2010.
November 29 - December 03, 2010.
The use of GIS and remote sensing for sustainable development, Tunisia
www.geotunis.org

The European LiDAR Mapping Forum 2010 (ELMF10)
November 30 - December 1, 2010.
The Hague in the Netherlands
http://www.lidarmap.org/ELMF/conference/submit_papers.aspx.

May 1-5, 2011.
ASPRS 2011 Annual Conference,
Milwaukee, Wisconsin
www.asprs.org.

May 3-8, 2011.
Gi4DM 2011 - GeoInformation for Disater Management
Talya Convention Center, Antalya, Turkey.
www.gi4dm2011.org.

June 26-27, 2011
ISPRS Joint Workshop on 3D City Modelling & Applications
Wuhan University, P.R. China.
Jointly organized by ISPRS WG V/4, III/2, III/4, IV/4, IV/8, LIESMARS of Wuhan University and Urban Planning Information Center of Wuhan

March 19-23, 2012
ASPRS 2012 Annual Conference, Sacramento Convention Center (TBD)
Sacramento, California.

October 9-12, 2011
Archean to Anthropocene – the past is the key to the future
Minneapolis Convention Center, Minneapolis, Minnesota USA.
http://www.geosociety.org/meetings/2011/

3. GRSS EVENTS

International Conference on Indoor Position and Indoor Navigation
15-17 September 2010
Campus Science City
http://www.grss-ieee.org/international-conference-on-indoor-position-and-indoor-navigation/

SPIE Remote Sensing 2010
20-23 September 2010
Centre de Congrés Pierre Baudis, Toulouse - France
http://spie.org/remote-sensing-europe.xml?WT.mc_id=Cal-ERS

URSI Commission F Microwave Signatures 2010
04-08 October 2010
Florence, Italy
http://www.ursif2010.org/

Back Cover – From left to right pictures: true-colour image from the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite; MERIS image after iceberg calving (see http://www.esa.int/esaEO/SEMYXY4OJCG_index_0.html); ENVISAT image image covering the area east of Moscow, source ESA; Iceberg breaking off Petermann glacier in Greenland (available on http://www.esa.int/esaEO/SEMYXY4OJCG_index_0.html)

)

EARSeL Sponsoring Agencies:

Council of Europe European Space Agency

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/