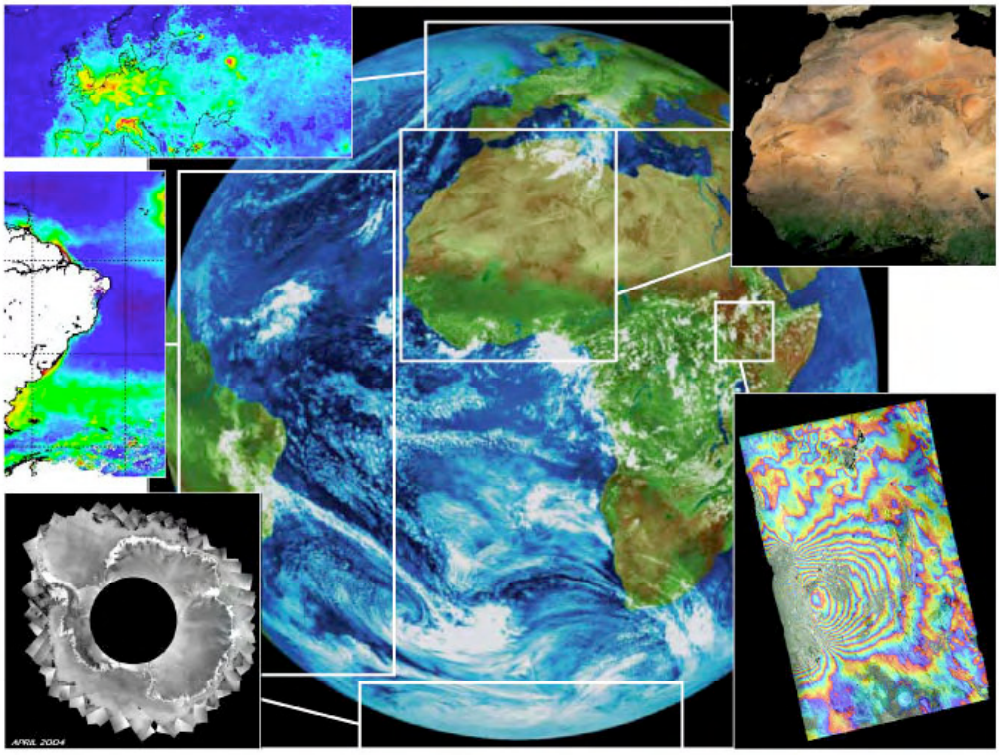
European Geosciences Union



GIFT - 2009

The Earth from Space

Geosciences Information for Teachers Workshop

Vienna, Austria, 19-22 April 2009

References for cover figures :

- top left: NO2 concentration measured by Sciamachy in 2006
- middle left: Chlorophyll as measured by MERIS in 2005
- bottom left: ASAR Global Monitoring Mode mosaic showing sea ice extent for April 2004
- middle Earth: ESA Publication, The changing Earth, pp.20
- top right: ESA Globcover 2005/2006 product
- bottom right: ASAR interferogram, Afar dyking episode in 2005

European Geosciences Union
GEOPHYSICAL INFORMATION FOR TEACHERS (GIFT) WORKSHOP
Austria Center Vienna
19-22 April 2009

The Earth from Space

Dear Teacher,

Welcome to the seventh EGU GIFT Workshop, that will begin with our traditional visit to the Museum of Natural History, through the courtesy of Mathias Harzhauser and Herbert Summesberger!

Seventy-five teachers from 20 countries will attend the GIFT-2009 workshop including for the first time Australia and Turkey: We hope that this will result in international collaborations among teachers and schools in the different nations.

The general theme of the 2009 GIFT workshop is **"The Earth from Space"**. The importance of observations of the Earth from Space is increasing every day. We are all more or less familiar with meteorological and communication satellites. We are maybe less familiar with other application of Earth observation from Space. Satellites provide a huge variety of global, repetitive and homogeneous observations that increase our knowledge of the solid Earth and its fluid envelopes. Moreover the near-real-time data delivery, of the order of a few hours, makes it possible to use them for natural resources management, environmental monitoring and disaster management…. In this GIFT-2009 workshop, we try to give you a general overview of all these different aspects of space observation of our planet.

Needless to say, we could never have succeeded in this task, without the close collaboration and general support of the European Space Agency (ESA) and also, on a smaller scale, of the French Centre National d'Etudes Spatiales (CNES) at every step of the preparation of this workshop. The team of the Education and Training Activities at the Directorate of Earth Observation Program at the European Space Research Institute (ESRIN) of ESA in Frascati (Italy), has been from the very beginning a key actor, suggesting different potential speakers among ESA scientists or other scientists who are Principal Investigators (PI) of ESA supported programs. Therefore, all of our speakers are leading research scientists participating in these different projects. Their presentations will make the most recent developments regarding the use of satellites in the observation of the Earth available to the teachers.

ESA has also provided each teacher with a copy of the School Atlas with the associated DVDs allowing to extract and process the satellite data used for the Atlas illustrations, and with a copy of the secondary level teacher's pack. The hands-on activities, also suggested by the ESA/ESRIN team, will use these two invaluable documents and will occupy two full afternoons of the workshop.

Another highlight of the GIFT-2009 workshop will be the visit of the United Nation Office for Outer Space Affairs (UNOOSA). The mandate of this Office is to promote greater cooperation in space science between the different countries. UNOOSA conducts

international workshops, training courses and pilot projects on topics that include remote sensing, satellite navigation, satellite meteorology, tele-education and basic space sciences for the benefit of developing nations. It also maintains a 24-hour hotline, as the United Nations focal point, for satellite imagery requests during disasters and manages the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER).

As in the preceding GIFT workshops, we have reserved time not only for scientists by also for poster and oral presentations by teachers to their fellow teachers. It is our opinion that this is the best way to start collaborations between teachers in the different nations! A highlight on this argument will be the report by the 3 European teachers who have participated to the GIFT workshop in December 2007 at San Francisco, invited by the American Geophysical Union.

As every year, we ask you to consider seriously the GIFT agreement we have asked you to endorse. The GIFT workshop is kindly sponsored by the EGU and several other science organizations. We would like to continue offering teachers the opportunity to attend EGU and the GIFT workshop, but this depends upon our being able to show our sponsors that teachers have used the new GIFT information and science didactics in their daily teaching, or as inspiration for new ways to teach science to students in their community schools. We would be very pleased that you make a presentation of your experiences at GIFT to a group of your teaching colleagues sometime soon after you return from EGU, and inform us of where, when and how many teachers attended your presentation, as well as telling us about how you have used the GIFT information in your classrooms. We also encourage you to write reports on the GIFT workshop in the publication specifically intended for geosciences teachers.

Information on past and future GIFT workshop is available on the EGU homepage. Look at http://gift.egu.eu
where you can find the brochure (pdf) and also the slides of the different presentations for the preceding 5 years.

Also, look at "The Eggs", the EGU newsletters also on the EGU homepage. Kostas Kourtidis, the Editor of the newsletter invites all teachers to look at:
http://www.the-eggs.org/

with a dedicated Education column, where you can write reports on your own work and submit them at http://www.the-eggs.org/submit/ and also use the archive at http://www.the-eggs.org/archive.php to read about other teachers' work!

The Committee on Education of the European Geosciences Union welcomes you in Vienna for the GIFT-2009 workshop!

Carlo Laj
On behalf of the Committee on Education of EGU

Acknowledgements

The GIFT-2009 workshop has been organized by the Committee on Education of the European Geosciences Union. EGU has supported the major share of the expenses, but the workshop has also benefited of the generous help of:

The European Space Agency

The American Geophysical Union, in the USA

The Direction des Sciences de la Matière of the "Commissariat à l'Energie Atomique" in France

Le Centre National d'Etudes Spatiales (CNES) in France

The Associazione per la Geofisica « Licio Cernobori » in Trieste, Italy.

The Institute of Geology and Geophysics, Chinese Academy of Sciences, China

CataGIFT, Generalitat de Catalunya, Agència de Gestio d'Ajuts Universitaris I de Recerca, Barcelona

And we thank all the speakers who have contributed to this educational workshop and their institutions!

European Geosciences Union
Committee on Education

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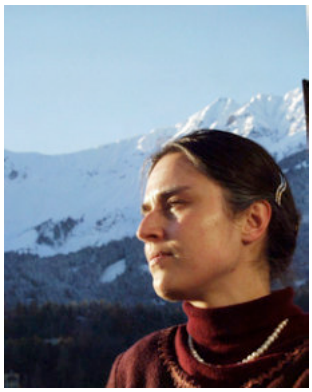
Committee on Education



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Angelo Camerlenghi

Steve Macko

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Francesca Cifelli

Eve Arnold

Elmar Uherek

Barbara Donner

Francesca Funiciello

Jean-Luc Berenguer

Phil Smith

Friedrich Barnikel

Program

European Geosciences Union – General Assembly
GEOSCIENCE INFORMATION FOR TEACHERS (GIFT) WORKSHOP
Austria Center Vienna

The Earth from Space

Sunday April 19, 2009

16:30 - **GUIDED TOUR OF THE VIENNA MUSEUM OF NATURAL HISTORY**
Herbert Summesberger and Mathias Harzhauser
Vienna Museum of Natural History

Distribution of documents
&
Ice breaker reception

Monday April 20, 2009

08:30 - 08:50 **WELCOME !**
Tujia Pulkkinen
Vice-Precident EGU

PRACTICAL INSTRUCTIONS FOR THE WORKSHOP
Carlo Laj
EGU Committee on Education
Laboratoire des Sciences du Climat et de l'Environnement
Gif-sur-Yvette, France

08:50 – 09:20 **THE EARTH OBSERVATION PROGRAMME OF ESA**
Francesco Sarti
Scientific Coordinator of the Education and Training Activities
Directorate of Earth Observation Programmes
ESA/ESRIN Frascati (Italy)

09:15 – 10:00 **CURRENT AND FUTURE SATELLITE RADAR ALTIMETRY MISSIONS FOR HYDROLOGY AND THE RIVER&LAKE PROJECT**
Jérôme Benveniste
ESA/ESRIN Frascati (Italy)

10:00 – 10:30 **COFFEE BREAK**

10:30 – 11:00 **VIEW TEACHERS' POSTER PRESENTATIONS**

11:00 – 12:00 **OBSERVATION OF THE CHANGING EARTH FROM SPACE**
Hartmut Grassl
Max Planck Institute for Meteorology,
Hamburg, Germany

12:00 – 13:30 **LUNCH** (SANDWICHES)

13:30 – 14:15 **OBSERVING THE SOLID EARTH, OCEANS AND LAND WATERS FROM SPACE**
Anny Cazenave:
Laboratoire d'Etudes en Géophysique et Océanographie Spatiale (LEGOS)
Centre **N**ational d'**E**tudes **S**patiales (CNES)
Toulouse - France

14:15 – 19 :00 **HANDS-ON ACTIVITIES WITH GPS**
F. Sarti, L. Moser, J. Lichtenegger, S. Dransfeld, C. Stewart
European Space Agency

Tuesday, April 21, 2009

08:30 – 09:15 **THE VIEW FROM AFAR : SPACE OBSERVATION OF GLACIERS AND RELATED HAZARDS**
Andreas Kääb
Department of Geosciences
University of Oslo, Norway

9:15 – 10:00 **VOLCANO MONITORING FROM SPACE**
Pierre Briole
Department of Geology
Ecole Normale Supérieure, Paris

10:00 – 10:30 **COFFEE BREAK**

10:30 - 10:45 **REPORT ON THE AGU GIFT WORKSHOP IN SAN FRANCISCO**
Friedrich Barnikel (Germany, Heldér Pereira (Portugal)
Petr Pudivitr (Czech Republic)
:

10:45 - 12 :15 **VISIT TO THE UNITED NATION OFFICE FOR OUTER SPACE AFFAIRS (UNOOSA)**
Werner Balogh

12 :15- 13 :30 **LUNCH**

14:00 19 :00 **HANDS-ON ACTIVITIES**
F. Sarti, L. Moser, J. Lichtenegger, S. Dransfeld, C. Stewart
European Space Agency
& Andreas Kääb**,** University of Oslo , Norway

Wednesday April 22 , 2009

08:30 - 09:15 **REDD PILOT PROJECT IN CAMEROON : METHOD DEVELOPMENT AND FIRST RESULTS**
Manuela Hirschmugl,
JOANNEUM RESEARCH
Institute of Digital Image Processing
Graz, Austria

09:15 – 09 :45 **LEARNING FROM SATELLITE OCEAN COLOR: BIO-PHYSICAL INTERACTIONS AT SMALL-SCALE**
Laure Resplandy
Laboratoire d'Océanographie et du Climat: Expérimentation et Approche Numérique (LOCEAN), Paris, France.

09 :45 – 10 :00 Teacher-to-teachers communication

SATELLITES IN THE CLASSROOM !
Mehdi Rajade
Collège André Lahaye
Andernos-les-bains, France

10:00 – 10:30 COFFEE BREAK

Teacher-to-teachers communications

10:30 - 10:45 **A WEB SITE FOR TEACHING PURPOSES**
Laurence Durand
Lycée Camille Saint Saens
Rouen, France

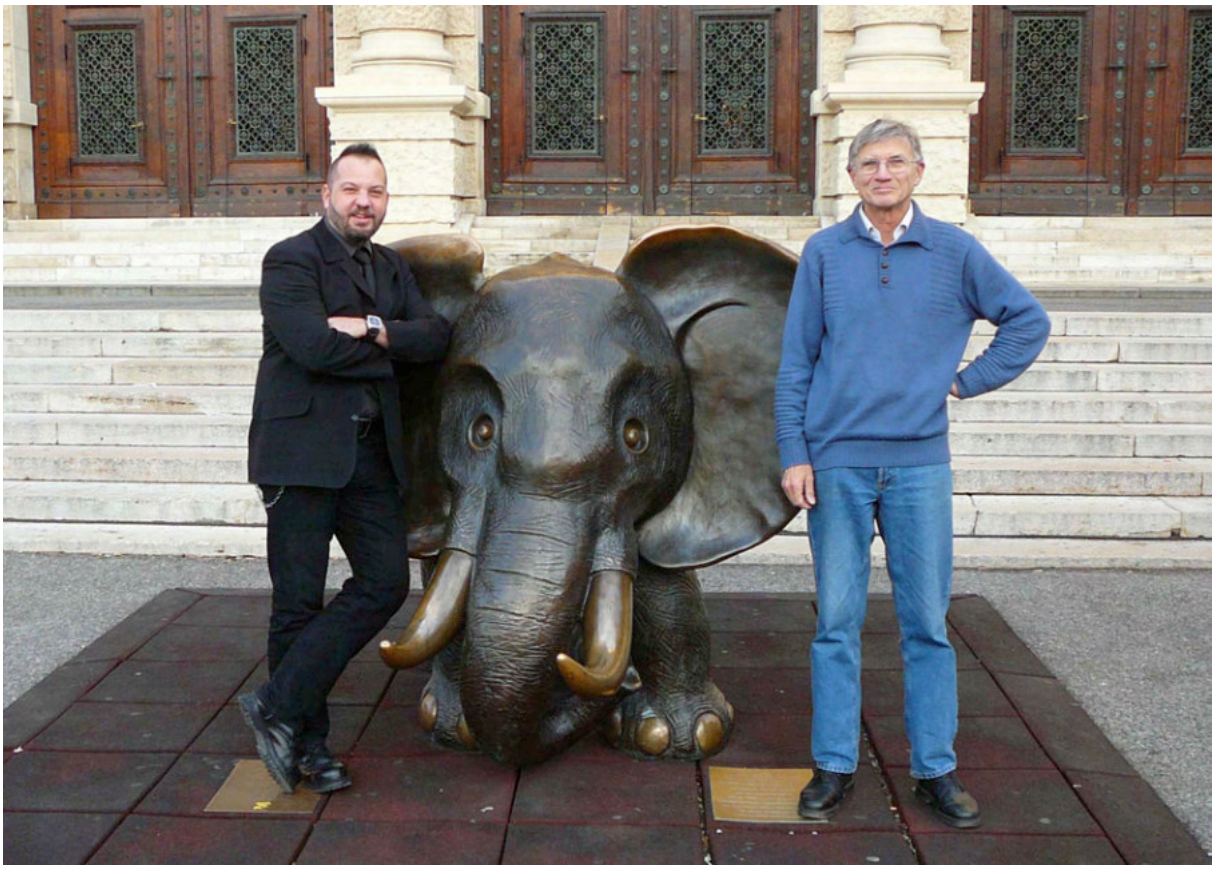
10 :45 - 11 :00 **BRINGING SCIENCE TO LIFE FOR STUDENTS, TEACHERS AND THE COMMUNITY**
Kimberly Pratt , Alisha Valine, Keith Guernsey
Alvarado Elementary School, Union City, CA USA

11 :00 - 11 :50 **SATELLITE IMAGES FOR SCIENCE EDUCATION IN HIGH SCHOOLS**
Christina Klose
University of Oldenburg
Oldenburg, Germany

11 :50 - 12 :00 **FINAL REMARKS AND GOODBYE !**

12 :00 LUNCH

Speakers



Standing on each side of the bronze elephant (an artwork of the Viennese artist Gottfried Kumpf) in front of the entrance, our two hosts for the visit to the Vienna Museum of Natural History :

Mathias Harzhauser, on the left, Head of the Department of Geology and Palaentology, has earned his degrees from the University of Vienna and has been employed by the NHM after his Master's thesis. His PhD thesis deals with the « Paleoceanography of the Oligocene and Lower Miorece Gastropoda of the Eastern Mediterranean and the Western Indo-Pacific.

Herbert Summesberger, on the right, has earned his degrees from the University of Vienna. His PhD thesis deals with structural geology, stratigraphy and palaentology in the Northern Calcareaou Alps. He has organized several international symposia and is the leader of the Worksing Group on Geosciences, School and Public Relations of the Austrian Geologica Society. Retired since 2004, he is a member of the Board of the Friends of the Museum of Natural History, and organizes exhibitions and seminars for High School teachers. He has also written highschool books and a Vienna city guide for building and decoration stones.

The Museum of Natural History was established during the years 1872 to 1889 by emperor Franz Joseph I. In 1758 Francis Stephen of Lorraine, the husband of Maria Theresia bought the world's most famous natural history collection at his time from Johann Ritter von Baillou and is celebrated as the founder of the museum's collections. This was the basis of one of the largest Natural History Museums of the world equally important as a centre of natural sciences as well as a cornerstone of national education.

The Geological and Palaentological Department has about 20 millions of fossils in its scientific collections, only a small part of them is on display in the exhibition halls. Most important exhibits in the halls are the largest turtle of the world, a fine pterosaur collection and the famous collection of eocene fish from Bolca near Verona (Italy).

Also remarkable is the collection of the Department of Mineralogy and Petrology including famous gemstones and Austrian minerals from the « Hohen Tauern ». The most important specimen on display is the bouquet of flowers made of more than thousand diamonds and an equal number of coloured gemstones. Three easter eggs are made of topaze an citrine by Carl Fabergé, the Russian czar's jeweller. The meteorite collection including a 900 kg iron meteorite from Australia is among the most celebrated in the world. On display is also a piece of rock brought back from the moon by Apollo 17 astronauts.

In the Department of Prehistory several rooms are dedicated to excavations from Austria, dating from the Stone Age to the Early Middle Ages. One of the jewels is the world-famous statuette of the « Venus of Willendorf » dating from about 25,000 years B.C.

.

Address: 1, Maria-Theresien-Platz - Vienna 1010

Francesco Sarti

PhD, Scientific Coordinator of the Education
and Training Activities
Directorate of Earth Observation Programmes
ESA/ESRIN
V.Galileo Galilei, C.P. 64
00044 Frascati (Italy)

Francesco was born in Rome, Italy.

After his Master Degree in Electrical Engineering at the University of Rome *La Sapienza* and a first research contract at the CNR, he was hired in 1990 at the Operation Center of the European Space Agency in Germany (ESA/ESOC) in the area of mission analysis and orbit control manoeuvre optimization. He then moved to precise orbit determination and to orbit and attitude control and continued his career at ESA/ESTEC in The Netherlands.

After attending the SSP 1996 of the International Space University in Vienna, he moved to Toulouse, France, in 1997, where he got a Post-graduate Master in Applied Remote Sensing and Image Processing followed by a PhD on the subject of optical-radar remote sensing for the monitoring of surface deformation (University of Toulouse *Paul Sabatier*). In France, he was first employed by CESBIO (1998) and later by the French Space Agency, CNES (1999-2001), working as a Project Manager for the *International Charter on Space and Major Disasters*, conducting R&D activities for remote sensing applications to disaster management and natural risk monitoring, interferometric monitoring of several seismic areas and providing training courses in Earth Observation.

After a short period at Italian Space Agency (2001) as a technical interface ASI-CNES for the cooperation COSMO-SkyMed / Pléiades, he joined ESA/ESRIN, in Italy, working in Earth Observation applications; since 2007, he coordinates the Education and Training Activities in Earth Observation.

His publications are mainly in the area of application of radar and optical remote sensing to damage mapping, tectonics, and disaster management.

His hobbies are music, classical piano, painting, and sport.

GIFT 2008 - The Earth Observation Programme of ESA

Francesco Sarti
Education and Training Activities
Directorate of Earth Observation Program
European Space Research Institute (ESRIN) of ESA
Frascati, Italy

Earth Observation (EO) from satellites is increasingly important for the understanding of the Earth's system and its processes, especially within the context of climate change.

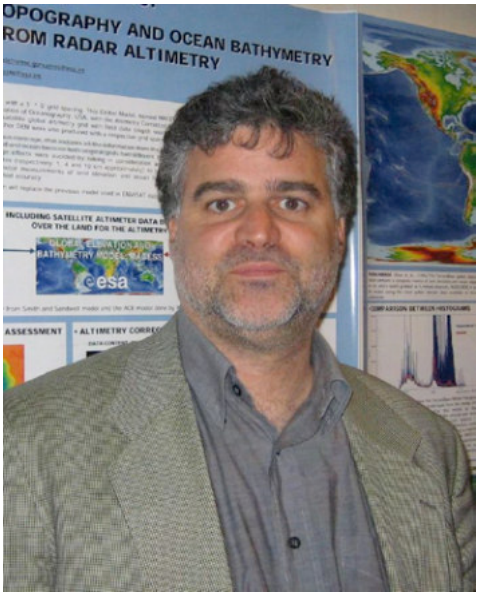
The European Space Agency (ESA) is an international organization consisting of 18 Member States developing and executing space programmes in cooperation with European industry. In the area of EO, after the first successful launch of Meteosat in 1977, ESA designed, developed and launched a series of meteorological satellites, including Meteosat Second Generation and METOP (all operated by EUMETSAT). In 1991, ESA launched its first EO satellite with a synthetic aperture radar payload, ERS-1, followed by ERS-2 (1996) and Envisat (2002), the former being the largest EO satellite ever launched and with a variety of different sensors for the observation of land, ocean, cryosphere and atmosphere. Data issued by ERS-2 and ENVISAT payload are presently transferred to ground stations, collected and distributed worldwide to around 1200 scientific teams, as well as to an increasingly larger number of operational and commercial users.

On top of these, ESA is preparing some scientific Earth Observation missions called Earth Explorers, dedicated to the study of scientific challenges identified by the science community. GOCE (measuring the Earth's gravity field), SMOS (determining soil moisture and ocean salinity), CryoSat (observing continental ice sheets and marine ice cover) are the next satellites of this series.

Other important issues are the observation and fast response in case of natural disasters and all environmental hazards. In this context, GMES (Global Monitoring for Environment and Security), a joint initiative of the European Space Agency ESA and the European Union, aims to monitor the state of the environment on land, at sea and in the atmosphere and to deliver policy-relevant EO information that can be used to improve the security of the citizens. The success of this initiative will be achieved largely through a well-engineered Space Component for the provision of Earth-observation data to turn into services for monitoring the environment and supporting civil security. This Space Component comprises five types of new missions called Sentinels, so-called Contributing Missions from Member States and other organisations, with their associated Ground Segment infrastructure, developed by ESA specifically to meet the needs of GMES. The Sentinel missions include radar and super-

spectral imaging for land, ocean and atmospheric monitoring. The first three Sentinels are currently under industrial development, with Sentinel-1 planned to launch in 2011.

Associated to this challenging programme of Earth Observation, ESA is carrying out a programme of EO Education, in cooperation with other national space agencies and with international bodies, like UNESCO or the Committee on Earth Observation Satellites (CEOS) and its Working Group for Education. In this frame, dedicated tools for schools, such as Eduspace, have been developed with the objective to create awareness about the potential of Earth Observation from space among young generations and to bring 'space' closer to youngsters. A variety of different tools have been developed and a series of training courses at different levels (university, post-doc, scientific or professional-oriented) are provided by ESA and other institutes cooperating with ESA.



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Dr. Jérôme Benveniste received the Ph. D. degree from the University Paul Sabatier in Toulouse France, in 1989, for his work done at the CNES-GRGS Laboratory on Large Scale Ocean Circulation as Observed by Satellite Altimetry.

He then was granted a two-year fellowship by ESA and the Massachussets Institute of Technology (M.I.T.) Cambridge, Massachusetts, USA,to perform Postdoctoral research on Assimilation of Radar Altimeter Data into an Ocean General Circulation Model using a Steady State Kalman Filter. These activities were in preparation of ERS-1 and Topex-Poseidon launches.

In 1992, he returned to Europe to join the European Space Agency where He was first in charge of the ERS-1 Radar Altimeter and Microwave Radiometer Off-Line Precision Product Quality Enhancement and interfacing with the Principal Investigators using ERS-1 Altimetry. He was subsequently given the responsability to lead the ERS-2 Radar Altimeter and Microwave Radiometer Commissioning Calibration and Validation Working Group.
He is now in charge of the ERS-1 ERS-2 and ENVISAT radar altimeter data exploitation, and of the interaction with ESA EO Principal Investigators. He also organizes scientific symposia and manages Research & Development projects, including CryoSat, GOCE and SMOS data exploitation and establishing science requirements for the Sentinel-3 Radar Altimetry. He has been elected Chair of COSPAR Oceanography sub-commission in July 2008.

Current and Future Satellite Radar Altimetry Missions for Hydrology and the River&Lake Project

Jérôme Benveniste
European Space Agency, Via Galileo Galilei, Frascati, RM 00044, Italy

Since the launch of the altimeters on-board ERS-1 and TOPEX/POSEIDON 17 years ago, significant advances in all facets of Radar Altimetry have resulted in a height accuracy over the open ocean to the cm level. Thanks to advances in the processing of Radar Altimetry data, results are now obtainable over surfaces for which the instruments were not designed.

The Radar Altimeter was designed to operate over the oceans and continental ice caps; however echoes are now successfully being processed from within the continental landmasses. Over inland water bodies such as Rivers and Lakes, the measurements of both the Radar Altimeter and Radiometer are degraded by the presence of land; however it is recognized by the global community that useable results can be obtained in Continental Hydrology by dedicated reprocessing of the raw altimeter measurements and careful use of environmental corrections.

The European Space Agency has launched a research initiative, "River&Lake", focused on developing two special user products, one aimed at hydrologists and the other at altimeter specialists. This paper will report upon the strategic outlook for exploiting the current and future potential of Radar Altimetry missions. Particular attention is paid to their support to Hydrology, their mission requirements and the potential evolution of the River&Lake products, currently at the stage of a pilot demonstration experiment. Important progress have been made recently in using Satellite data for Hydrology, juxtaposed with in-situ data and the modelling effort.

http://earth.esa.int/riverandlake , http://earth.esa.int/hydrospace07

Hartmut Graßl

Max Planck Institute for Meteorology
Bundesstrasse 53
D-20146 Hamburg, Germany

Hartmut Grassl was born 18 March 1940 in Salzberg near Berchtesgaden, Bavaria, Germany, he is married and has one daughter

Present position:

- Director emeritus at the Max Planck Institute for Meteorology, Hamburg, and retired Professor of the University of Hamburg, Germany)

Scientific Functions:

- Director at the Max Planck Institute for Meteorology, Hamburg,10/1999-30 September 2005
- Professor for General Meteorology at the Meteorological Institute, University of Hamburg 10/1999-31 March 2005
- Director of the World Climate Research Programme, World Meteorological Organization (WMO), Geneva (Switzerland), 1994-1999
- Director at the Max Planck Institute for Meteorology, Hamburg, 1989-1994
- Professor for General Meteorology at theMeteorological Institute, University of Hamburg, 1988-1994
- Head of the Institute of Physics at the GKSS-Research Centre (GKSS), Geesthacht (Germany), 1984-1988
- Professor for Theoretical Meteorology at the Institute of Marine Sciences, Christian Albrecht University, Kiel (Germany), 1981-1984
- Head of a Research Group at the Max Planck Institute for Meteorology, Hamburg, 1976-1981
- Scientist, Johannes Gutenberg University, Mainz, 1971-1976

Scientific Education:

- Habilitation in Meteorology, University of Hamburg June 1978
- Ph.D. in Meteorology, University of Munich, June 1970

Diploma in Physics, University of Munich, November 1966

Research Areas:

Satellite-supported remote sensing ; remote sensing of the lower atmosphere with lidar and radar, aerosols and climate, global climate change

Board Functions:

- Chair of the Advisory Council on Climate of the Government of the Federal Free State of Bavaria, 2007
- Member of the Advisory Council on Climate Protection of the Government of the Federal State of Hamburg, 2007
- Vice-Chair of the Panel on World Data Centres (Geosciences) of the International Council for Science (ICSU),2006-
- Member of the Board of the Munich Re Foundation, 2004
- Chair of the Scientific Advisory Board of the Leibniz Institute for Marine Sciences in Kiel (Germany) and Member of the Institute's Council, 2004
- Vice-President of the Nansen International Environment and Remote Sensing Centre (NIERSC) Foundation in St. Petersbur (Russia), 2001
- Chair of the Society Assembly of the Potsdam Institute of Climate Impact Research 2001
- Board of Trustees, Scintec AG, Tübingen (Germany), 2000
- Chair of the Global Change Advisory Council to the German Government, 1992-1994; 2001-2004

Awards:

Großes Bundesverdienstkreuz der Bundesrepublik Deutschland (German Order of Merit), 2002
German Environmental Prize (Deutsche Bundesumwelt-stiftung), 1998
Bundesverdienstkreuz 1. Klasse (German Order of Merit), 1995
Member of the Academia Europaea, 1994
Max Planck Prize, 1991
Scientific Member of the Max Planck Society, 1988
Young Scientist Award of the German Meteorological Society, 1971

Observation of the Changing Earth from Space

Hartmut Grassl

Max Planck Institute for Meteorology, Hamburg

One of the best examples of the impact of Earth Observation from space is that the skill of weather forecasts for up to one week is now as high in the Southern Hemisphere than in the Northern Hemisphere, despite the lack of any in situ observation over large parts of the Southern Hemisphere. In many cases even a global or regional trend analysis is now possible for meteorological, hydrological and land use parameters using observations from operational or even experimental satellite series. In addition, we also expect that soon Earth Observation from space will contribute to the implementation and control of binding conventions and protocols of the United Nations.

My overview will concentrate on climate change observation results or prospects, as they support political adaptation and mitigation efforts needed to reduce the threat of this key global environmental problem. Sub-sections will deal with solar irradiance, sea level rise, ozone depletion and recovery, ocean warming, aerosol impact on cloud properties and cover, the net freshwater balance at the ocean surface, and trace gas monitoring from space, including the carbon dioxide columncontent.

A final section will deal with the need for global co-ordination of research programmes.

Anny CAZENAVE

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e-mail: anny.cazenave@cnes.fr

Education
Doctorat d'Etat (Ph.D Thesis) in Geophysics - *University of Toulouse, 1975*

Professional experience
Senior Scientist at the *'Laboratoire d'Etudes en Géophysique et Océanographie Spatiale'* (LEGOS), *Groupe de Recherche de Géodésie Spatiale* (GRGS), *Centre National d'Etudes Spatiales* (CNES), Toulouse, France. Deputy Director of LEGOS between 1996 and 2007. Member of several national and international committees for research assessment .

Research interest :Application of Satellite Geodesy to Earth Physics :

Satellite Geodesy and space research : Gravity field and marine geoid; Earth rotation and polar motion; Tides; Precise positioning by space geodesy techniques (tectonic motions, vertical motions, geocenter motions); Temporal changes of the Earth gravity field; Sea level variations at regional and global scales from satellite altimetry and tide gauges; Climatic causes of sea level change; Land hydrology from space.

Publications:

>160 articles in refereed international journals, Several Monograph chapters**,** Editor of 5 books, among them : 'Satellite Altimetry and Earth Sciences. A handbook of Techniques and Application, Lee-L. Fu & A. Cazenave Editors, Academic Press, International Geophysics Series, Vol. 69, San Diego, USA, 463 pages, 2001'**.,** Co-Author of 2 popular books: '*Formes et Mouvements de la Terre*', Belin Editions, Paris, 1994 (with Kurt Feigl) and '*La Terre vue de l'espace'* , A. Cazenave et D. Massonnet, Bibliothèque Pour la Science, Belin Editions, Paris, 2004.

International responsibilities (recent and present)
Member of the panel 'Earth system sciences' of the *European Research Council* (2008-), Member of the scientific panel of GGOS (*Global Geodetic Observing System*) (2006-), Member of the evaluation panel of the Hadley Center/ MetOffice (UK) (2007-), Lead Author

of the *Intergovernmental Panel for Climate Change* (IPCC) Working Group I for 'Ocean climate and sea level' (2004-2007), International Secretary of the *American Geophysical Union* (AGU) (2002-2006), Member of the panel on '*Water Resources and the Global Hydrological Cycle of Earth Science and Applications from Space*' of *National Research Council* (The National Academies, USA) (2005-2006), President of the Geodesy section of the *European Geosciences Union* (EGU) (1999-2004)

Others

Scientific advisor of 25 PhD theses, P.I. of several space missions, Editor of EOS (Journal of the American Geophysical Union); Editor in Chief of 'Earth and Planetary Science Letters', EPSL, (1997-2002), Member of the editorial board of Survey in Geophysics (2003-), Co-editor of PAGEOPH (1989-1994) and of Journal of Geodynamics (1994-1997). Teaching: 'Satellite Geodesy' in DEA classes at Toulouse University

Honors and Awards

Member of the *French Academy of Sciences* (since 2004; formerly corresponding member since 1994), Foreign member of the *National Academy of Sciences* (USA) (since 2008), Foreign member of the *National Academy of Sciences of India* (since 2008), Fellow of the *American Geophysical Union* (since 1996), Member of the *Academia Europaea* (since 1990), Member of the *Académie de l'Air et de l'Espace* (since 1986), Bronze Medal of CNRS (1980), Prize Doisteau-Blutet of the *French Academy of Sciences* (1979; 1990), Prize Kodak-Pathé-Landucci of the *French Academy of Sciences* (1996), Vening-Meinesz Medal of the *European Geophysical Society* (1999), Arthur Homes Medal of the *European Geosciences Union* (2005), Prize Manley Bendall, Medal 'Albert 1er de Monaco' , Insitut Océanographique (2008).

Ordre National du Merite (Commandeur: 2007, Officier: 1997, Chevalier: 1981), Legion d'Honneur (Legion of Honour) (Chevalier: 2000)

Observing the solid Earth, oceans and land waters from space

Anny CAZENAVE

Laboratoire d'Etudes en Géophysique et Océanographie Spatiale (LEGOS)
Centre **N**ational d'**E**tudes **S**patiales
18 Avenue Edouard Belin, 31401 Toulouse Cedex 4 - France

We present a number of significant results related to the solid Earth and its fluid envelopes obtained in the recent years/decades using remote sensing techniques. We first discuss measurement of the Earth gravity field at different spatial scales and the recovery of seafloor topography from satellite altimetry. We briefly mention precise positioning results based on GPS and other space techniques, and applications to tectonic motion and crustal deformation measurements. Next we discuss recent advances in ocean dynamics based on high-precision satellite altimetry missions, and focus on sea level rise. We also discuss how remote sensing techniques, including space gravimetry, inform on the mass balance of the ice sheets, and corresponding contribution to sea level rise. As a final example, we briefly report on the monitoring of surface water levels (lakes, rivers, floodplains) by satellite altimetry and on total land water storage change at river basin scale, using space gravimetry observations.

Steffen Dransfeld, from Jever in Germany, obtained an M.Eng in electrical and electronic engineering from the University of Surrey, UK He then went to the Laboratory of Satellite Oceanography at the University of Southampton for his PhD on ocean colour algorithm development. Before his ESA fellowship he managed the German project office in support of ESA's Soil Moisture and Ocean Salinity (SMOS) mission at the Institute of Oceanography at Hamburg University.

Steffen is now working at ESRIN inside ESA's Earth Observation Directorate for the Science Strategy, Coordination and Planning Office (EOP-SA), where he is contributing to research on oil spill detection in support of the GMES Service MarCoast. He also supports the EO Education programme by helping to organise ESA courses and other events for education in Earth Observation.

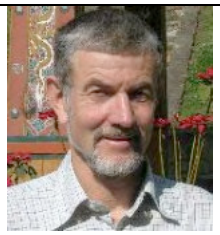
Linda Moser, from Graz in Austria, obtained a Master's degree in Environmental System Sciences with the main focus on remote sensing from the University of Graz in 2008, where she was also a tutor in remote sensing. During her studies she also attended the Space Studies Program of the International Space University (ISU) in 2007, hosted by the Beijing University of Aeronautics and Astronautics (BUAA) in Beijing, China.

Linda works at ESRIN in ESA's Earth Observation Directorate for the Science Strategy, Coordination and Planning Office (EOP-SA), where she develops remote sensing case studies for ESA Earth Observation educational projects. In Summer 2009 she will again be among the team of the ISU as a Teaching Associate of the satellite applications department, hosted by NASA Ames Research Center (ARC), California.

Chris Stewart, from Southampton in the UK, studied mathematics at Stirling University and then undertook an MSc in remote sensing and image processing at Edinburgh University.

In 2005 he began working as a scientific consultant for the UK based company Remote Sensing Applications Consultants (RSAC) Ltd. At RSAC Chris has been involved in various Earth Observation projects including the JRC Monitoring of Agriculture with Remote Sensing (MARS) project for which Chris carried out most of the UK image processing in 2005 and 2006.

In 2007 Chris began working at ESRIN, ESA's establishment in Italy, as an RSAC consultant contracted to ESA's Earth Observation Directorate. Here Chris has been providing support to a number of Earth Observation projects mainly in education and training.



Juerg Lichtenegger, of Swiss nationality, studied at the Department of Geography University Zurich in Switzerland and did his PhD thesis on Multitemporal Landsat MSS analysis in an agricultural area. From 1982 to 2003 he served as an Engineer and Senior Engineer for Earth Observation in ESA/ESRIN, Frascati, Italy. Since June 2003 retired from ESA, he continues as a freelance remote sensing expert and ESA consultant for Earth observation for ESA and other national and international organizations in application development and in education projects and teaching courses nationally and worldwide. He is assisting very actively in the continuation of the ESA educational website Earth observation for secondary schools EDUSPACE. He has also been a major contributor to the ESA School atlas and is currently reviewing the new edition.

Introduction to the hands-on activities

F.Sarti, L. Moser, J. Lichtenegger, S. Dransfeld, C. Stewart
European Space Agency

The objective of these activities is **not** to cover all the possible themes/exercises developed and made available to schools by ESA, but rather to let teachers understand **what type of tools** are provided by ESA for their practical lectures and hands-on exercises at schools. In particular, the practicals will be based on a few case studies and computer exercises extracted from Eduspace (www.eduspace.esa.int), using the free ESA image processing SW Leoworks, including new case studies currently under development.
Two afternoons are dedicated to different practical sessions as described in the following paragraphs.

The first afternoon session on Monday 20.4. will combine an outdoor exercise with some computer practicals inside. An essential exercise for the processing of satellite imagery is to precisely geolocate an image on the globe. This is done by the use of so-called Ground Control Points (GCPs) that satellite images are 'anchored' to. The outdoor part of the exercise will hence allow the participants to go into the field with a GPS receiver and to collect the geographical coordinates of some selected sites that are also visible on a selected satellite image of the Vienna Danube area around the conference centre. In the computer room these GCPs can be used to perform a satellite image geolocation using the LEOWorks software. Geolocation is one of the most fundamental aspects of satellite image processing and participants are provided with the opportunity to combine fieldwork with image processing to gain an insight into the difficulty and importance of accurately relating an image to its real location on the ground. Moreover during the afternoon a short introduction of the LEOWorks satellite image processing software will be given followed by a LEOWorks exercise in which participants will learn more about one of the most common applications of satellite images: classifying the earth's surface into different groups of landcover. Having precise knowledge of the types of surfaces portrayed on a satellite image is of utmost importance for interpreting images correctly and this exercise will allow a basic overview on how this may be achieved.

The second afternoon session on Tuesday 21.4. provides the participants with specific examples of using the LEOWorks software to process sample imagery from volcanoes and glaciers with the aim of extracting specific geophysical information and to show how satellite images can be used in the classroom to learn about the observed features. The exercises are a combination of new developments for the Eduspace Website and of material from the ESA School Atlas, its associated Teacher's Handbook and from ESA's Secondary Level Teacher's Pack that all participants receive as part of the workshop. Using specific sample imagery of Mount Etna and Mount St. Helens the exercises allow the extraction of information to study the dynamics of volcanoes and to show how they are best monitored from space. Satellite

images will be used to detect the lava flow and changes that occur during volcanic eruptions, and how threats to human population may be assessed. The aspect of near-real-time (NRT) is a key issue for natural disasters and will be considered in terms of monitoring of volcanic plumes and thermal hot-spots by operational services using satellite data. The second part of the exercises will be focusing on the use of remote sensing for glacier monitoring by means of examples from glaciers in the Andes, Svalbard and the Himalaya to study changes of glacial extent over time and also how the velocity at the surface of a flowing glacier may be assessed from satellite. Participants will be given an overview on the importance of these measurements also with regards to changes of glaciers due to climate change and the natural hazards that may arise from such changes.

Monday April 20th 14:15 – 19:15

Activity		Time	Trainers
Group A + Group B: Introduction to GPS, LEOWorks and the afternoon practicals *Room 9*		1/2 hour 14:15-14:45	C. Stewart
Group A:	**Group B**:		
Collection of GCPs (ground control points) with GPS around premises (about 5 or 6) *Open-air (Vienna Danube area around the Conf center)*	LEOWorks classification, image interpretation of Landsat and MERIS *Room 9*	1.45 hours 14:45-16:30	F. Sarti, L. Moser (GCP) J. Lichtenegger S. Dransfeld C. Stewart (Leoworks)
LEOWorks classification, image interpretation of Landsat and MERIS *Room 9*	Collection of GCPs (ground control points) with GPS around premises (about 5 or 6) *Open-air (Vienna Danube area around the Conf center)*	1.45 hours 16:30-18:15	F. Sarti, L. Moser (GCP) J. Lichtenegger S. Dransfeld C. Stewart (Leoworks)
Georeferencing of Ikonos image with LEOWorks using GCPs (ground control points) collected previously. *Room 9*		1 hour 18:15-19:15	F. Sarti, J. Lichtenegger, S. Dransfeld, L. Moser, C. Stewart

Imagery used for previous exercise:

Sensor	Image format	Date of acquisition
IKONOS or preferably Quickbird	Pan-sharpened, un-geocoded TIFF format or JPG	1 x April
Landsat	Geotiff format, already geocoded	1 x April, 1 x June, 1 x late Nov (no snow)
MERIS	Geotiff format, already geocoded	1 x April, 1 x June, 1 x late Nov (no snow)

Andreas Kääb
Professor
Department of Geosciences
University of Oslo, Norway
http://folk.uio.no/kaeaeb

Andreas Kääb is a professor at the Department of Geosciences, University of Oslo, Norway since 2005. His research interests are in remote sensing, glacier and permafrost science, and geohazards. After studying geomatics at the Technical University of Munich, Germany, he received his PhD in 1996 from the ETH Zurich, Switzerland, where he worked about early recognition and management of glacier- and permafrost-related hazards. From 1997 until 2005 he served as a lecturer at the University of Zurich, Switzerland.

He is much engaged in the World Glacier Monitoring Service (WGMS) and the Global Glacier Measurements from Space project (GLIMS) in order to map and monitor glaciers worldwide. Andreas Kääb is developing new remote sensing algorithms for facilitating the observation of glaciers from air and space, in particular glacier flow and glacier changes due to climate change. For that purpose he is closely working together with space agencies such as ESA and NASA.

Andreas Kääb is also chair of the international working group on glacier and permafrost hazards in mountains. In a number of projects he aims at monitoring and early recognizing hazards such as glacier lake outbursts and ice avalanches, mainly using air and space technology. He is also involved in a number of hazard management and mitigation projects, and served in related crisis management groups.

Current projects of his research group include mapping of glacier and permafrost distribution in the Brahmaputra river basin for water management purposes, deriving glacier volume changes and ice flow for a worldwide set of representative glaciers, and developing new algorithms for measuring glacier flow and permafrost creep from air and space with high precision.

The view from afar: Space observation of glaciers and related hazards

Andreas Kääb

Department of Geosciences
University of Oslo, Norway

Good reasons to monitor glaciers:

There are a number of good reasons to monitor glaciers: glaciers are one of the best terrestrial indicators of climatic changes and related glacier changes have global, regional and local consequence. The IPCC regards glaciers as one of the best climate indicators on Earth because glacier changes reflect climatic changes in a comparably clear and exceptionally well visible way. Glaciers are therefore very well suited to explain climate change impacts to the public. Such impacts from glaciers range from global to local effects. Loss of worldwide glacier mass contributes significantly to global sea level rise, largely independent of the location of the glacier location and the sea level measurement. Glacier area and mass loss has also severe consequences in the downstream regions of the glaciers. During periods of pronounced glacier retreat the runoff contribution by glacier melt is larger than on average. However, once the glaciers have significantly lost area and volume, the runoff contribution from glacier melt declines to lower than average. In arid and semi-arid regions such as Central Asia or the Andes, glaciers are particularly important contributors to dry-season runoff. A massive reduction of dry-season glacier melt would (and already does) heavily impact on water availability in the downstream regions. Glacier changes, both retreat and advance, change the local and regional hazard conditions. Even if glacier hazards, such as glacier lake outbursts or ice avalanches, have often only local impact, related disasters can kill hundred of peoples and cause severe damages.

Good reasons to observe glaciers *from space*:

Most glaciers worldwide are situated in very remote areas, which are often difficult and dangerous to access. This fact and the huge number of glaciers makes it impossible to monitor glaciers from ground alone. Spaceborne observations are the only sustainable way to observe glacier changes for a large number of glaciers worldwide. In fact, glacier observations from space are therefore an important part of worldwide glacier monitoring strategies and programs. Space observation technologies are employed to globally monitor the changes in glacier area, changes in glacier mass and volume, and ice flow. Satellite sensors in the optical and microwave regions are equally important for these tasks and often complement each other.

In this presentation, we demonstrate using a large number of examples why glaciers are important, how they impact human life and activities, and with which satellite sensors and technologies they are observed in order to better understand their changes.

Manuela Hirschmugl
JOANNEUM RESEARCH
Institute of Digital Image Processing
Graz, Austria

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Manuela Hirschmugl obtained her Master's degree in Environmental Sciences from the Karl-Franzens-University (KFU) Graz in 2002. After project work at the Institute of Digital Image Processing of JOANNEUM RESEARCH and at the Institute of Remote Sensing and Photogrammetry, Technical University (TU) Graz, she was awarded a DOC-FFORTE grant of the Austrian Academy of Sciences for her Ph.D. entitled "Derivation of Forest Parameters from UltracamD Data". In the course of her doctoral studies she also worked at the Finnish Geodetic Institute in Masala, Finland. She finally received her PhD degree from the Technical University Graz in 2008. Since 2006, she is working at the Institute of Digital Image Processing of JOANNEUM RESEARCH.

She has been teaching Remote Sensing at both KFU and TU Graz.

Her main research interests are in the field of remote sensing based forestry, alpine applications and general land cover classification. The main tasks are the extraction of forest parameters from different remote sensing data (digital airborne and spaceborne), integration of 2d and 3d components, segmentation and GIS applications.

Current projects include the assessment of land cover change in relation to climate issues ('REDD' pilot project in Cameroon); the assessment of biomass potential in Europe (CEUBIOM); and local projects such as classification of urban trees in Graz.

The REDD pilot project in Cameroon
(method development and first results)

Manuela Hirschmugl
JOANNEUM RESEARCH
Institute of Digital Image Processing
Graz, Austria

At the UNFCCC and Kyoto Protocol Conference of Parties (COP) meeting in Montreal, 2005, the governments of Papua New Guinea and Costa Rica, supported by Latin American and African countries, submitted a proposal for the consideration of reducing emissions from deforestation and degradation in developing countries (REDD) as a mechanism for the post-Kyoto reporting. Avoiding deforestation is considered to be a contribution to the reduction of green house gas (GHG) emissions. Parties agreed to a two-year process of evaluation of the issue by initiating REDD pilot projects to better understand the REDD process. Under the auspices of the European Space Agency (ESA) GMES Service Element on Forest Monitoring a pilot project was developed for REDD implementation and testing in Bolivia and Cameroon with user consultation and endorsement. The overall aim of the REDD pilot in Cameroon is to establish baseline projections of emissions caused by deforestation (using Earth Observation) combined with regional projections of degradation nested in a wall-to-wall approach. The methodology for such a monitoring program based on EO is described and initial results of the pilot project in Cameroon are shown.

Multi-temporal optical data is used for the mapping: two Landsat scenes from around 1990 and 2000 respectively and one DMC scene from 2005. For the subsequent roll-out phase on the whole area of Cameroon, altogether 78 satellite images are already available.The method involves a series of processing steps which are equally important for its success. They can be divided into three groups: (1) pre-processing steps; (2) forest masking and (3) land cover classification of the deforested areas. In the first part, the problem of clouds and cloud shadows is tackled, which is done in a semi-automatic way. To ensure geometric congruence between the images, a sophisticated method of fully automatic fine-registration between the multi-temporal images is performed after eventual topographic normalization. Radiometric adjustment finally allows the processing of larger blocks instead of individual images.The aim of the second part, as already mentioned, is the derivation of the forest masks for the three dates. A segment-based approach was chosen in order to avoid problems with remaining slight geometric shifts and gray level changes at individual pixel level caused by natural phenomena such as phenology, health status, etc. Furthermore, segments allow easier manual interaction. Based on the segmented image, classification of forest and non-forest segments is performed employing a thresholding procedure with subsequent manual corrections.

Future investigations will include more detailed studies on the issue of degradation, which is an equally important issue in Cameroon and the applicability of the method for the rollout in the whole country of Cameroon as well as in other countries in the Congo Basin region.

GIFT workshop at the AGU Fall Meeting, San Francisco, 2008

European team at AGU GIFT Workshop 2008, together with Inés Cifuentes (Manager of Committee on Education and Human Resources, AGU)
from left to right: Friedrich, Carlo, Inés, Petr, Hélder

Friedrich Barnikel (*1970)
barnikel@geographie.uni-muenchen.de
a teacher of English, Geography, History, and Bilingual Studies at Adolf-Weber-Gymnasium Munich, Germany
PhD in Geography on "Natural Hazards in the Alps", University of Goettingen

Hélder Pereira (*1974)
hpereira@es-loule.edu.pt
a teacher of Biology and Geology at Escola Secundária de Loulé, Algarve, Portugal
MSc degree in "Nature Conservation and Management", University of Algarve

Petr Pudivítr (1978*)
pudajr@gmail.com
a teacher of Maths, Physics, and Astronomy at Gymnázium Christiana Dopplera, Prague, Czech Republic
PhD in "Teaching Astronomy at High Schools", Charles University, Prague

Thanks to AGU we had a great opportunity to participate in the GIFT workshop for teachers that was held as a part of AGU Fall Meeting in San Francisco, USA (Dec 15th – 19th, 2008). The workshop was dedicated to the International Polar Year, and we learned how to take all scientific information collected from all places of our Earth to our students in classrooms (topics were ice cores, Antarctic geological drilling, or global changes seen in Arctic regions). We also met other teachers from different countries, and shared teaching experiences during hands-on-activities, discussions, poster sessions, speeches, and coffee-breaks.
During the AGU Meeting we (according to our interests) attended other conference sessions on latest developments in different topics of geoscience research (from climate research via latest models of Earth interior to Mars probe explorations), and updated our scientific knowledge.
Hopefully some international collaboration will follow-up. It was a truly impressive experience!

BRINGING THE BENEFITS OF SPACE TO HUMANITY

UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS

(UNOOSA)

Space tools offer solutions to numerous areas in the developmental agenda, including food security, disease monitoring, natural resource management, disaster management and tele-education. The peaceful uses of outer space is therefore an important agenda in the United Nations, which works to bring the benefits of outer space to every corner of the Earth.

In support of that agenda, the United Nations Office for Outer Space Affairs (UNOOSA) implements the decisions of the General Assembly and of the Committee on the Peaceful Uses of Outer Space and its two Subcommittees: the Scientific and Technical Subcommittee and the Legal Subcommittee. These intergovernmental fora focus on promoting international cooperation in the peaceful uses of outer space for social and economic development, particularly for the benefit of developing countries. Some other issues on the agenda include space debris, the use of nuclear power sources in outer space, and international response to the threat of asteroid impact.

The Office carries out the United Nations Programme on Space Applications in support of Member States, in particular developing countries, to share the benefits of space science and technology and their application to achieve sustainable development. Within the framework of the Programme, the Office organizes capacity-building activities to increase awareness of space benefits and to strengthen the capacity of developing countries in space applications in areas such as natural resource management, tele-epidemiology/tele-health and climate change.

Given the inherent global nature and reach of space activities, space science and technology play an ideal role in providing solutions to global problems. In that context, the work of the Office include implementing the global platform for disaster management (UN-SPIDER), established by the General Assembly, promoting the global search and rescue system (COSPAS-SARSAT), addressing the issues of interoperability and compatibility of global navigation satellite systems, through the International Committee on Global Navigation Satellite Systems (ICG), and overseeing the global array of instruments for studying space weather and the profound impact of the Sun on the Earth.

The Office discharges the Secretary-General's responsibility under international space law, including the maintenance of the Register of Objects Launched into Outer Space, which serves as the central depository of information provided by Member States and international organizations on their satellites. As part of its advocacy role, the Office organizes workshops on space law and policy, and is developing a curriculum in space law. The Office prepares and distributes reports, studies and publications on various

fields of space science and technology and their application, as well as on international space law.

The United Nations Office for Outer Space Affairs has been committed for almost half a century to bringing the benefits of space to humanity and will continue doing so in the years to come.

The homepage of the United Nation Office for Outer Space Affairs can be accessed on www.unoosa.org

Hands-on activities

F.Sarti, L. Moser, J. Lichtenegger, S. Dransfeld, C. Stewart
European Space Agency
&
Andreas Kääb
Department of Geosciences
University of Oslo, Norway

Tuesday April 21st 14:00 – 19:10

Activity		Time	Trainers
Introduction to Eduspace and the School Atlas and Teacher's Handbook *Room 9*		1/2 hour 14:00-14:30	J. Lichtenegger
Group A: *Room 9*	**Group B**: *Room SM29*		
Glacier monitoring exercise (A. Kääb)	Volcano monitoring exercises: Etna Mount Saint Helen	2,20 hours 14:30 – 16:50	F. Sarti (Volcano monitoring) J. Lichtenegger (Volcano monitoring) S. Dransfeld (Glacier monitoring) L. Moser (Volcano monitoring) C. Stewart (Glacier monitoring) A. Kääb (Glacier monitoring)
Volcano monitoring exercises: Etna Mount Saint Helen	Glacier monitoring exercise (A. Kääb)	2,20 Hours 16:50-19:10	F. Sarti (Volcano monitoring) J. Lichtenegger (Volcano monitoring) S. Dransfeld (Glacier monitoring) L. Moser (Volcano monitoring) C. Stewart (Glacier monitoring) A. Kääb (Glacier monitoring)

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Education

- Habilitation à diriger des recherches, 2000, University Paris VII
- Ph.D., 1990, University Paris VI, France
- M.S., 1984, University Paris VI, France
- Agregation (Physics), 1983
- B.S., 1982, Ecole Normale Supérieure de Cachan and University Paris XI

Appointments

- 2004 – present : Directeur de Recherche, CNRS
- 1990 – 2004 : Chargé de Recherche, CNRS

Research interests

- Study of the ground deformation of volcanoes (Etna, Campi Flegrei, Vulcano (Italie), Piton de la Fournaise (France), Nisyros (Grèce), Sakurajima (Japon)) and seismic areas (Rift d'Asal (Djibouti), Golfe de Corinthe (Grèce), Nord Chili, Umbrie (Italie))
- Use of various geodetic and remote sensing techniques (GPS, SAR intereferometry, correlation of high resolution visible imagery)
- Modelling of ground deformation.

Volcano monitoring from space

Pierre Briole,
Ecole Normale Supérieure,
Paris, France

,

More than fifteen hundred volcanoes on the Earth are potentially active. One third of them have been active during the last century and about seventy are presently erupting. Ten percent of the world population is living in areas directly threatened by volcanoes, without considering the effects of eruptions on climate or air–traffic for example. There is a wide range of volcanic hazards, direct (projections, flows, flank instabilities) and induced (earthquakes and tsunamis).

The understanding of volcanic eruptions, a major challenge in geosciences, demands continuous monitoring of active volcanoes. Presently, in spite of the efforts of many countries, only a few volcanoes are monitored by modern observatories. Even in the best equipped of them, real-time data acquisition on the very active parts of the edifices during crisis is still an extremely difficult and risky task. The only way to provide global, continuous, real–time and all–weather information on volcanoes is to monitor them from space and closely connect space and ground data.

Several characteristics of volcano activities can be potentially monitored from space with the currently exiting space missions and sensors: the volcanic plumes (location, temperature, chemistry); the surface temperature of the volcanoes which can be high (lava flows) or moderate (fumaroles); the ground deformations; the land cover changes.

Several space missions carried out in the last decade have permitted the constitution of significant data bases that are an important for the analysis of the events occurred in this period, for the design of the future missions, and for education.

Efforts are currently made by the space agencies to set up more systematic acquisition and data processing procedures. The time delay between space data acquisition and data (or product) delivery decreases and data and products become more and more accessible not only to the science community but to all. Some space observations and products can already be available in near real time and already contribute to the security of air traffic.

Laure Resplandy

Laboratoire d'Océanographie et du Climat: Expérimentation et Approche Numérique (LOCEAN),
Paris, France.

Laure at the scientific base 'Esperanza' (Antarctica)

Laure Resplandy is a PhD student at the LOCEAN (Paris, France) working under the direction of Marina Lévy on bio-physical modeling, with a special interest for small-scale dynamics and their possible impact on biogeochemistry.

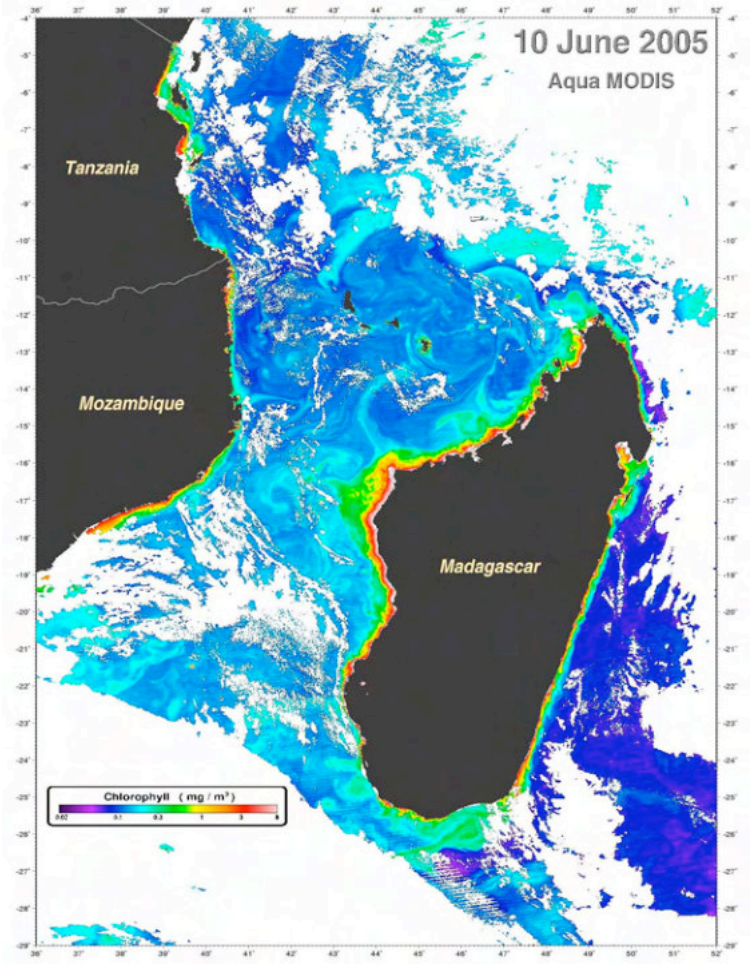
She studied geophysics with a focus on marine biogeochemistry at the Ecole Normale Supérieure, Paris. Her master thesis was dedicated to analyzing Coccolithophores blooms in the South Atlantic and Antarctic Ocean comparing data from in-situ sampling and remote sensing acquisition.

She is involved in several teaching activities such as geophysics classes at the University of Paris and at the ENSG (Ecole nationale supérieure de géologie, Nancy) and takes part in the program '1000 Ambassadrices pour les Sciences' promoting the orientation towards scientific careers in high schools.

Learning from satellite ocean color:
bio-physical interactions at small-scale

Laure Resplandy
Laboratoire d'Océanographie et du Climat: Expérimentation et Approche Numérique (LOCEAN), Paris, France

The photosynthesis of phytoplankton represents roughly half of the biological production on the planet and supports almost all marine life.
From an observation point of view, direct measurements of phytoplankton activity are sparse because they involve long and costly techniques. However, as can be seen on the figure below, satellite retrieved ocean color allow us to observe the distribution of chlorophyll (phytoplankton pigment) at high resolution and reveal considerable variability in the small-scale range i.e. mesoscale (~ 20-100 km) and sub-mesoscale (~ 1-20 km). We will focus here on interactions between dynamics and observed spatial phytoplankton structure and do not discuss biological processes at play in phytoplankton distribution (growth, grazing, behaviour etc.).
Modelling studies suggest that the misrepresentation of the small-scale dynamics can result in errors of about 30-50% in phytoplankton estimates. Therefore, small-scale representation in ocean models seems crucial to predict the evolution of the oceanic carbon cycle at climatic scales.
In this presentation, we will go through the current state-of-the-art regarding the impact of small-scale dynamics on phytoplankton distribution but we will also address how satellite ocean color observations can help identifying and understanding physical processes.



Teacher to teachers communication:

Mehdi Rajade
Collège André Lahaye
Andernos-les-bains

I'm a 35 year old biology-geology teacher and I live in a typical sea-side area near the atlantic ocean, I live in a small town named Andernos-les-bains. My wife is a teacher tooo and we live with a 3 and 9 years sons . I'm a middle-school teacher, for 7 to 9 th grade students.

I've been involved in the international Globe Program since 2006 with some 9th grade students in a scientific workshop. It's a kind of extra sciences time in their curriculum. We try to understand weather and climate complex machinery, using satellites data, pictures and classroom activities. Our main subject is the atmosphere, but last year we participated to the Globe POP project (POP for persistant organic pollutants) …Each year, we 're involved in more and more projects, and partnerships with NASA, CNES, INRA,…and with other international schools (in USA, Scotland,…).

I went to several workshops in France for the Calisphair program, with Globe. I was selected for an international workshop in Anchorage, Alaska in 2007, for the AIM satellite program (and CLOUDSAT), and I went to the GAC 2008 (Globe annual conference) for Europe in Warsaw last year during april. I'm a teachers trainer for Globe, Calisphair, AIM and cloudsat protocols, and I would like to try to be a European master trainer for Globe Europe teachers…

Each workshop is a real intensive and powerful moment in life, sharing ideas, learning so much from everyone and being involved in a unique experience…

Satellites in the Classroom!

My presentation will show how to use satellite data in classrooms, including some original "easy-use tools" like Dapple and websites like Giovanni, my NASA data, ESA and local websites made by French teachers…

From the nursery school to highschool, teachers could use satellites pictures and data of the earth to explain, to compare. With 9th and higher levels students, analyzing data and using them in presentations could be options in teaching ways.

A part of the presentation will be about different projects like Globe POP and Argonimaux (animals survey with satellites and argos tools)

My presentation will be illustrated with experiences pictures, useful satellites data and sciences workshop pictures…

With the increasing available data, our knowledge of the earth is growing using different tools, and school system could play its part with next generations.

Laurence Durand
Biology and Geology teacher,
Lycée Camille Saint Saens,
Rouen, France

A web site for teaching purposes

For teenagers, Internet is a world of wonder: chatting with friends, searching information, … Internet is an open gate to relationship.

As a teacher, I use this attraction to make my pupils work.

In the presentation, I will show my web site, the pedagogical projects I did with my pupils and all the applications I have as a teacher for the pupils and for the relationship with parents.

Left to right : Keith, Kimberly and Alisha

Bringing Science to Life for Students, Teachers and the Community

Kimberly Pratt , Alisha Valine, Keith Guernsey

Alvarado Elementary School, 31100 Fredi Street, Union City, CA 94587 USA

Prior to 2008, 5th grade students at two schools of the New Haven Unified School District consistently scored in the bottom 20% of the California State Standards Test for science. Teachers in the upper grades reported not spending enough time teaching science, which is attributed to lack of time, resources or knowledge of science. A proposal was written to the National Oceanic and Atmospheric Administration's Bay Watershed Education Grant program and funding was received for Bringing Science to Life for Students, Teachers and the Community to address these concerns and instill a sense of stewardship in our students. This program engages and energizes students in learning science and the protection of the SF Bay Watershed, provides staff development for teachers, and educates the community about conservation of our local watershed. The project includes a preparation phase, outdoor phase, an analysis and reporting phase, and teacher training and consists of two complete units: 1) The San Francisco Bay Watershed Unit and 2) the Marine Environment Unit. At the end of the two-year program, teachers were teaching more science, the community was engaged in conservation of the San Francisco Bay Watershed and most importantly, student scores increased on the California Science Test at one site by over 50% and another site by 120%.

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Born in Hamburg, Christina was awarded a Diploma in Physical Geography from the University of Goettingen, Germany. This included a one-year course at Trinity College Dublin in Ireland. In her diploma thesis Christina studied the hazard potential of moraine lakes in the Himalayas. She then went to Freie Universitaet Berlin to carry out research for her PhD on landscape and climate development in the high mountains of Taiwan.

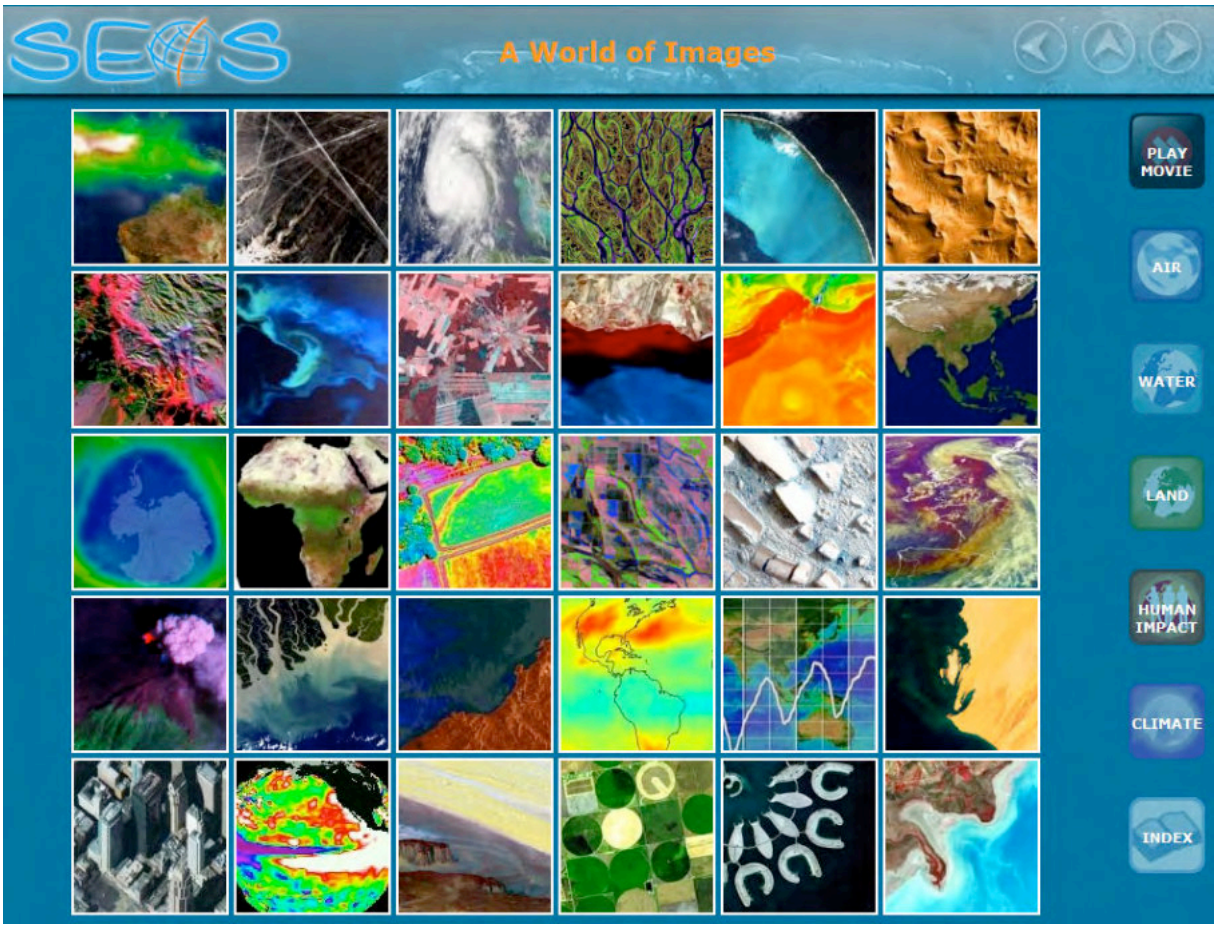
Christina has lectured in Earth Science and Physical Geography at BSc and Msc level. She is now working in the *Science Education through earth Observation for High Schools* (SEOS) project where she is developing web based tutorials on science and earth observation topics.

Satellite Images for Science Education in High Schools

SEOS is an initiative for using remote sensing in science education curricula in high schools, funded under the 6th Framework Programme of the European Commission (EC). Eleven different partners and high school teachers from several European countries are working in cooperation with the European Space Agency (ESA).

The project covers many disciplines such as physics, biology, geography, mathematics and engineering, emphasising the interdisciplinary character of remote sensing. Based on real examples, the modules use remote sensing images and data to involve students in different aspects of current environmental research and demonstrate how information from satellites can be directly relevant to everyday life. They cover a broad range of topics, from daily weather data to long-term climatic conditions, landcover changes, marine pollution and environmental hazards, and emphasise the importance of environmental awareness.

Several previews are available from the SEOS website; the final modules will be available in late 2009. Initially the tutorials will be available in English, but following testing and review they will be translated into other European languages.



www.seos-project.eu/modules/

Satellite Images for Science Education in High Schools

Remote Sensing for Earth Observation
Module 0 Introduction to Remote sensing
Module 1 A World of Images

Geography and Biology
Module 2 Conservation of natural and cultural heritages
Module 3 Coral reefs
Module 4 Remote sensing and geo-information in agriculture
Module 5 Landcover / landuse change and land consumption

Physics and Monitoring Technology
Module 6 Understanding spectra from the earth
Module 7 Ocean colour in the coastal zone
Module 8 Ocean currents measured from space
Module 9 Remote sensing using lasers

Environmental Sciences
Module 10 3D models based upon stereoscopic satellite data
Module 11 Natural resources management
Module 12 Marine pollution

Mathematics, Statistics & Modelling
Module 13 Classi_cation, algorithms and methods
Module 14 Modelling of environmental processes
Module 15 Time series analysis