



Committee on Earth Observation Satellites

Living Planet Symposium Prep – Reframing the K12 Strategy

ESA, DLR et al.

WGCapD-5 Agenda Item #35

Working Group on

Capacity Building & Data Democracy

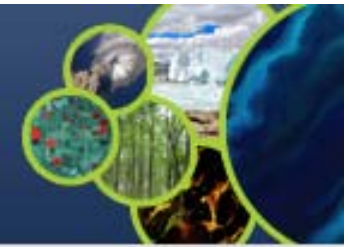
Hampton, Virginia, USA

March 29th – April 1st, 2016





WGCapD-5
 Hampton, Virginia, USA
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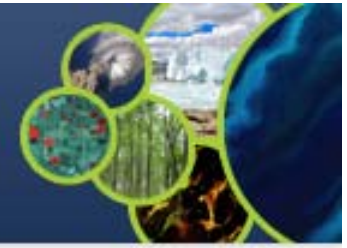


EO School Lab - General Concept

	Institution	Recipient	Instructor	Process	Product
Education	School	School Student	Teacher	Learning	Knowledge
Capacity Formation	School Lab	Sec. School Student Teacher	University Student Scientist	Attraction Stimulation Motivation	Interest Study Decision
Capacity Building	University Vocational Education	University Student Scientist Administrator	Expert	Training	Expertise & Application



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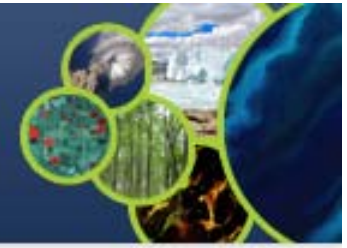


Main efforts

- Increase awareness for EO data at the secondary school level
- Provide practical educational tools addressing remote sensing techniques and methods to analyse and process remote sensing data
- Provide access to practical Earth observation education facilities managed by participating Agencies
- Establish practical education showcases at international conferences
- Create and deliver educational toolboxes, including software, Earth observation data, and tutorials for user-friendly image processing at the secondary school level, as well as the lower university level
- Provide practical demonstrations for schools based on real experiments (e.g. use of spectrometers, radiometers, radar devices)
- Educate the general public about the benefits/applications of EO



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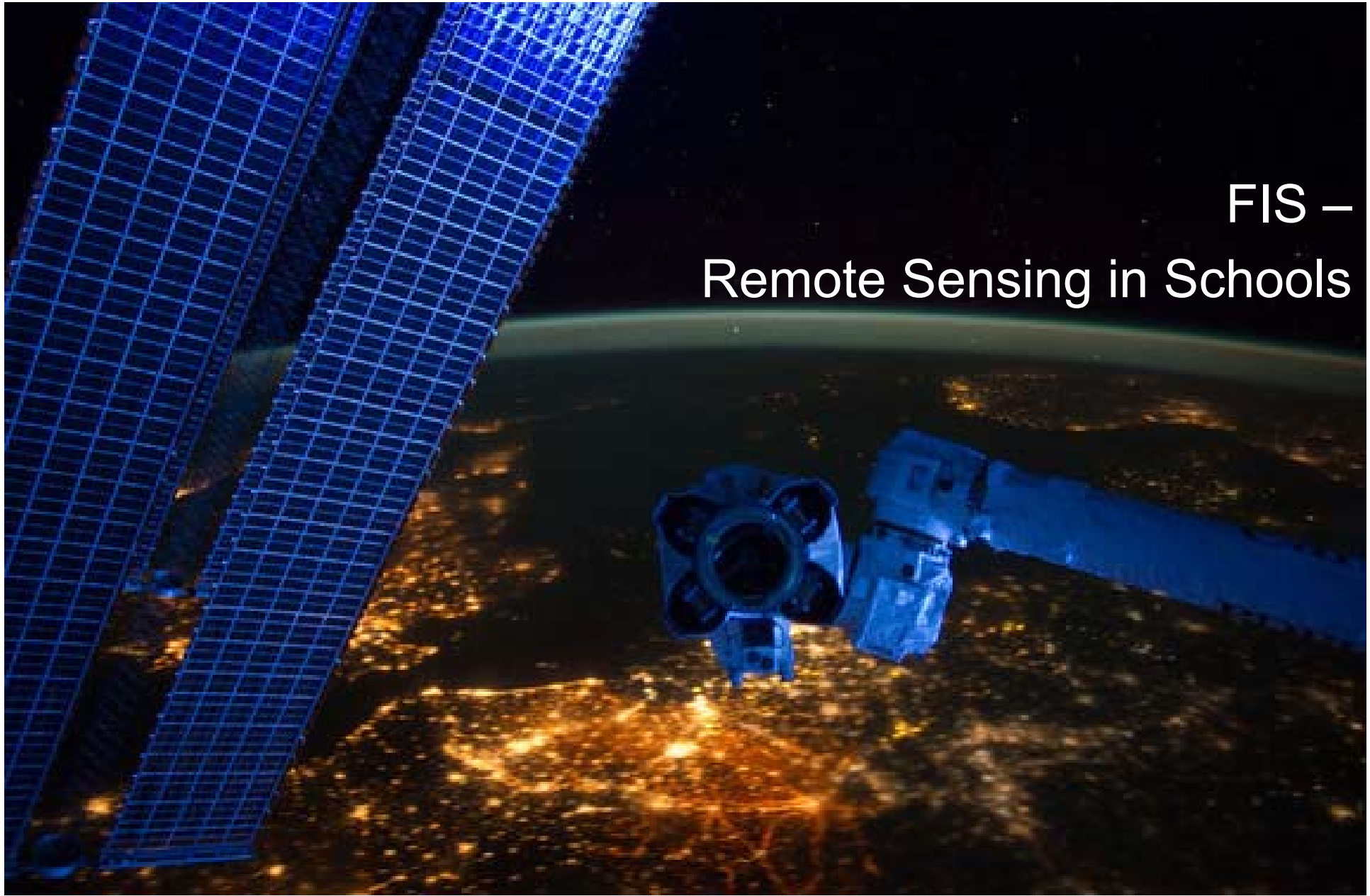


Realization #1

EO @ School
in Germany
- supported by
DLR Space Directorate



FIS – Remote Sensing in Schools



FIS – Remote Sensing in School Lessons

Learning Portal on Remote Sensing

The screenshot shows the FIS Learning Portal website. At the top left is the FIS logo. The navigation bar includes 'Login', 'Kontakt', and a search box labeled 'Suche'. A 'Logout Lehrer' link is also present. The main menu features 'About FIS', 'What Is Remote Sensing?', 'Teaching Material', 'Research Tools', 'Analysis Tools', and 'Evaluation'. The main content area is titled 'Lernen mit Satellitenbildern' and 'Remote Sensing in Schools'. It includes a 'Welcome...' section with a paragraph about the project's origin at the University of Bonn. Below this is a 'Learning with digital images.' section with a paragraph about the available digital materials. A sidebar on the right contains a satellite illustration and a 'My Class' section with links for 'My Account', 'My Profile', 'View All my Classes', and 'Logout'. Three satellite images of Earth are shown in a vertical column on the left side of the main content area.



FIS – Remote Sensing in School Lessons

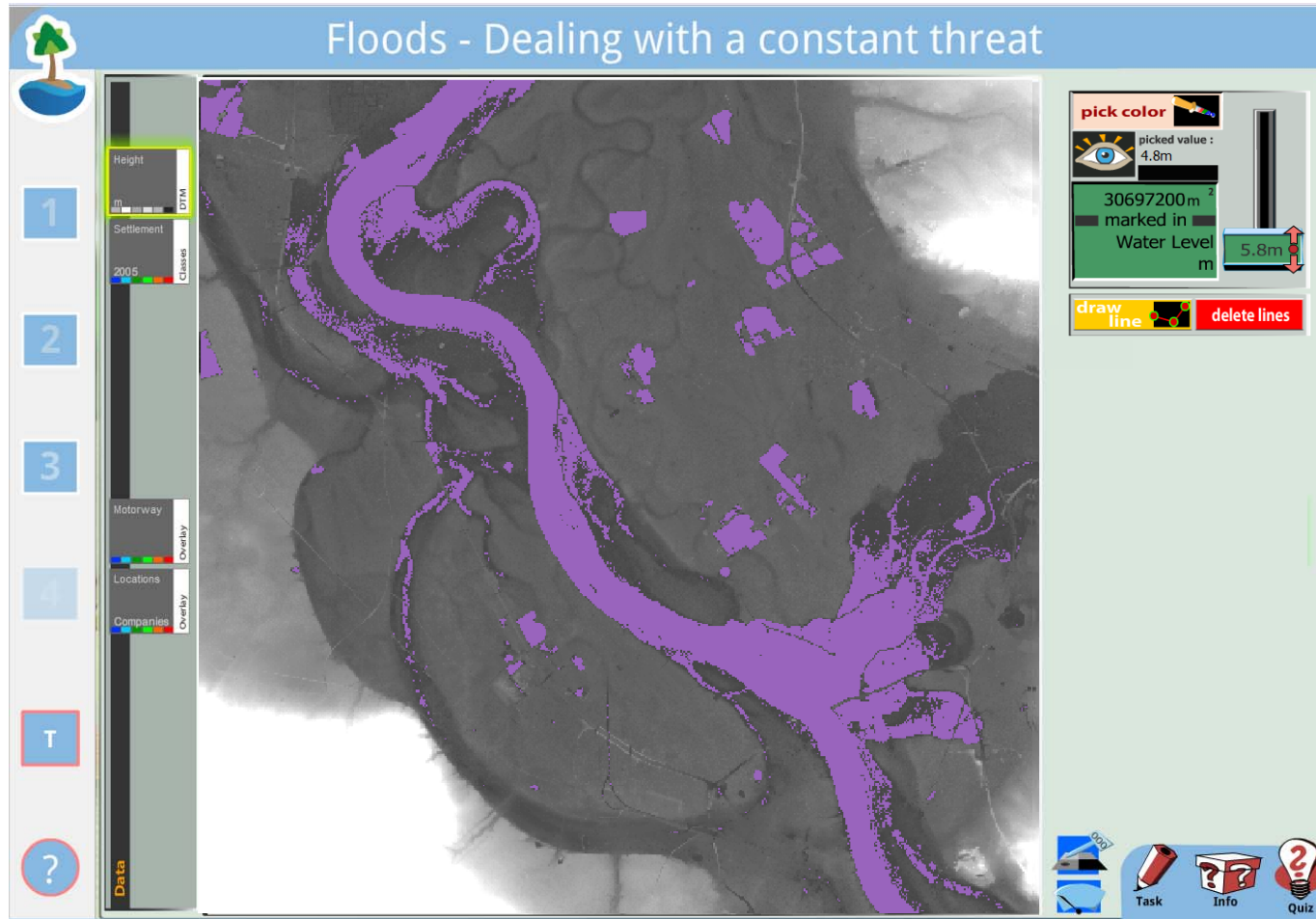
Teaching Materials

The screenshot shows the FIS website's 'Teaching Materials' page for Geography. The page has a navigation bar with tabs for 'About FIS', 'What is Remote Sensing?', 'Teaching Materials', 'Research Tools', 'Analysis Tools', and 'Evaluation'. Under 'Teaching Materials', there are sub-tabs for 'Biology', 'Geography', 'Computer Science', 'Mathematics', and 'Physics'. The 'Geography' sub-tab is selected, and the page title is 'Geography'. A large satellite image of a city is shown on the left. To the right of the image is a text block: 'Satellite images are more and more easily accessible. The increasing number of different sensors is paralleled by the spatial and temporal resolution of remote sensing data. Therefore, current topics such as natural disasters, climate change or urbanisation can be illustrated by informative imagery. Our learning modules and analysis tools help the pupils analyse these images in a problem-oriented and active fashion.' Below the text is a list of learning modules in blue buttons: 'Atmospheric Circulation', 'Brown Coal – Land Use Change through Surface Mining', 'Floods', 'From Satellite Images to Maps', 'Haiti – Emergency Aid from Space', 'Oases – explored from near and far', 'Traces of Fire in Satellite Images (Geography)', 'Tsunami – When waves change everything', and 'Earth at Night – disparities are becoming visible'. On the right side of the page, there is a graphic of a tree on a globe with the word 'Geography' next to it, and a large satellite image of a forest.



FIS – Remote Sensing in School Lessons

Teaching Materials – Floods-Dealing with a Constant Threat



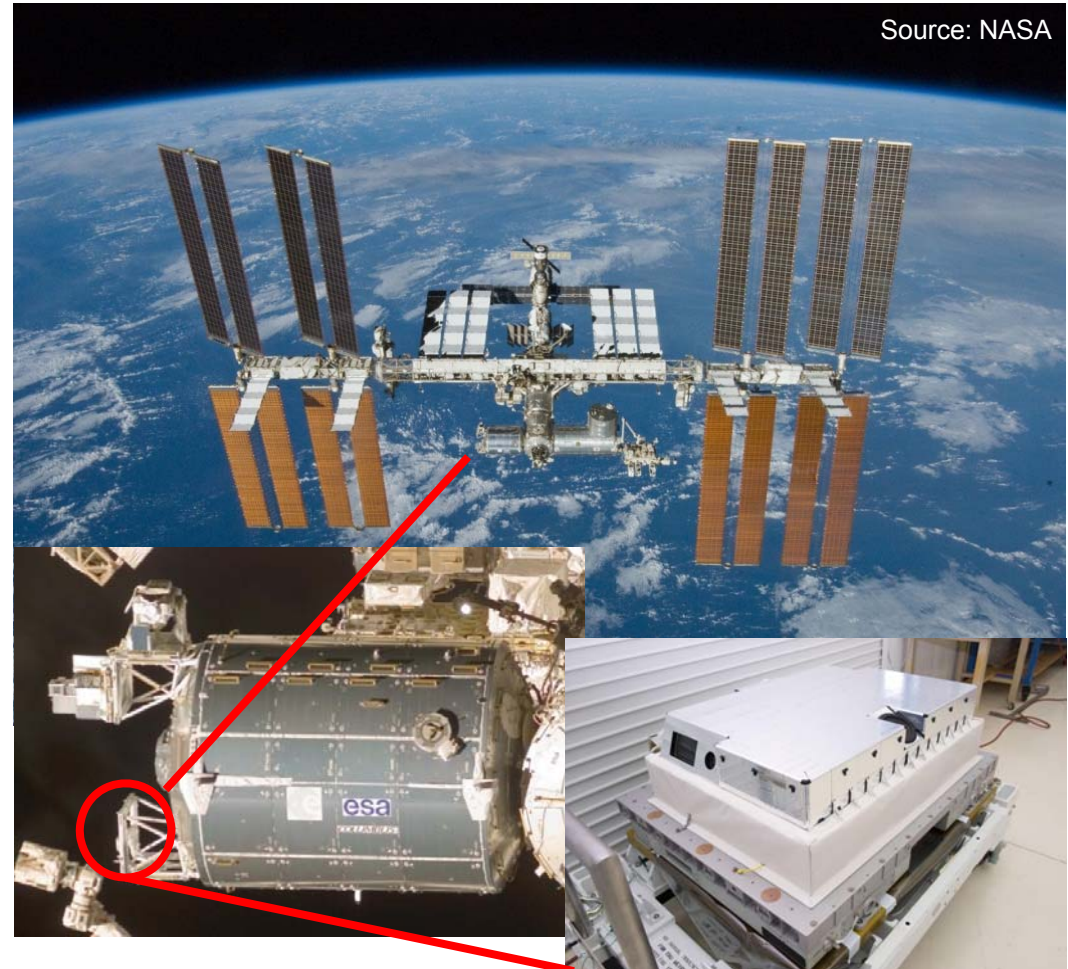
Columbus Eye – Live Videos of the ISS in Schools



HDEV – High Definition Earth Viewing

4 HD-Video-Cameras on the Columbus External Payload Adapter

- Mounted on ESA Columbus Laboratory on 30 April 2014
- Ground resolution: ~ 280m
- On-Orbit-Test of 4 commercial HD-Video-Cameras
- During operating time the cameras are tested according to image quality
- 2 backward-, 1 forward- and 1 nadir-looking



HDEV – High Definition Earth Viewing

Four Cameras – Three Perspectives



Panasonic – Aft View (Florida)



Sony – Aft View (overexposed)

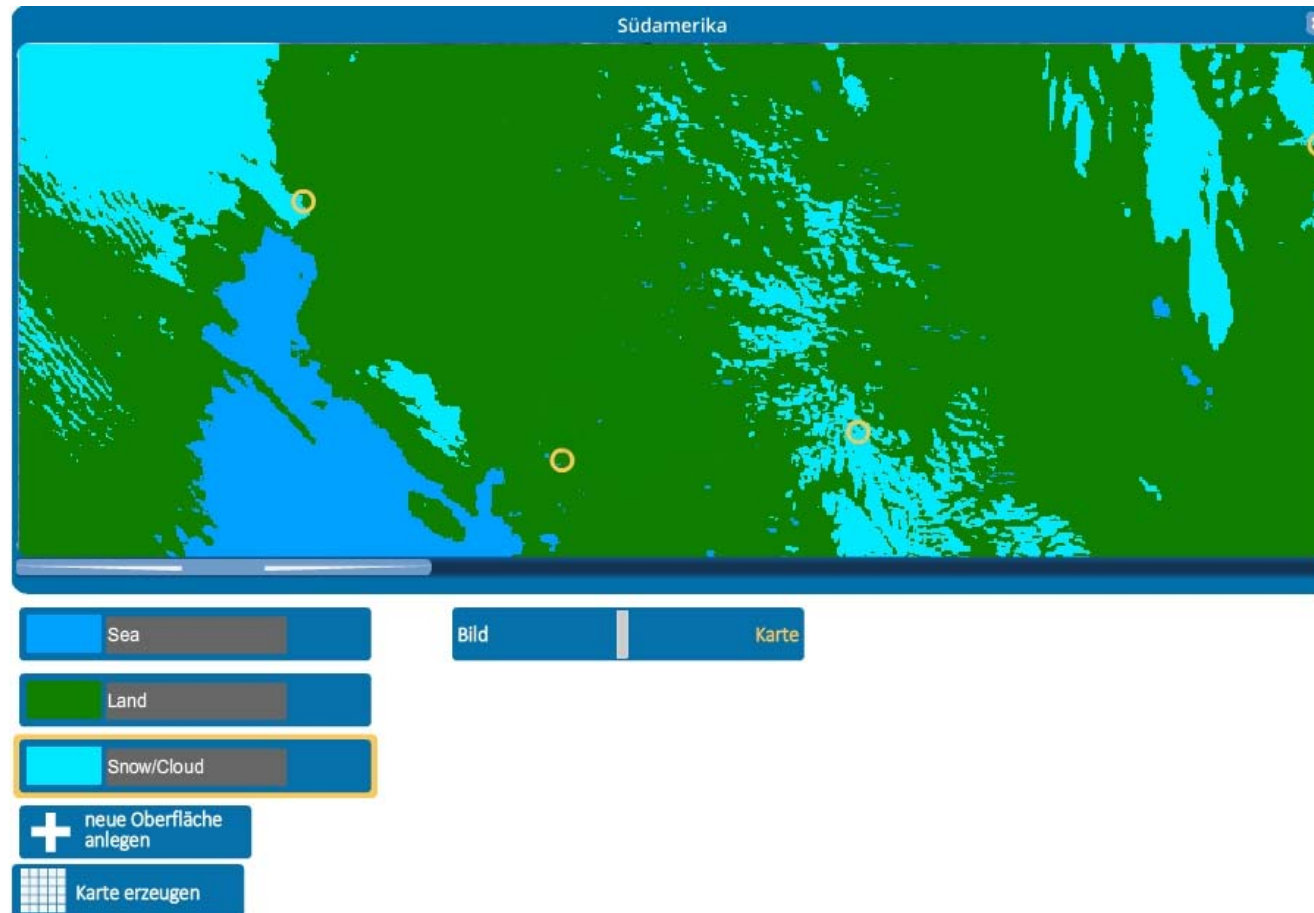


Toshiba – Nadir View (Cuba)

Source: NASA

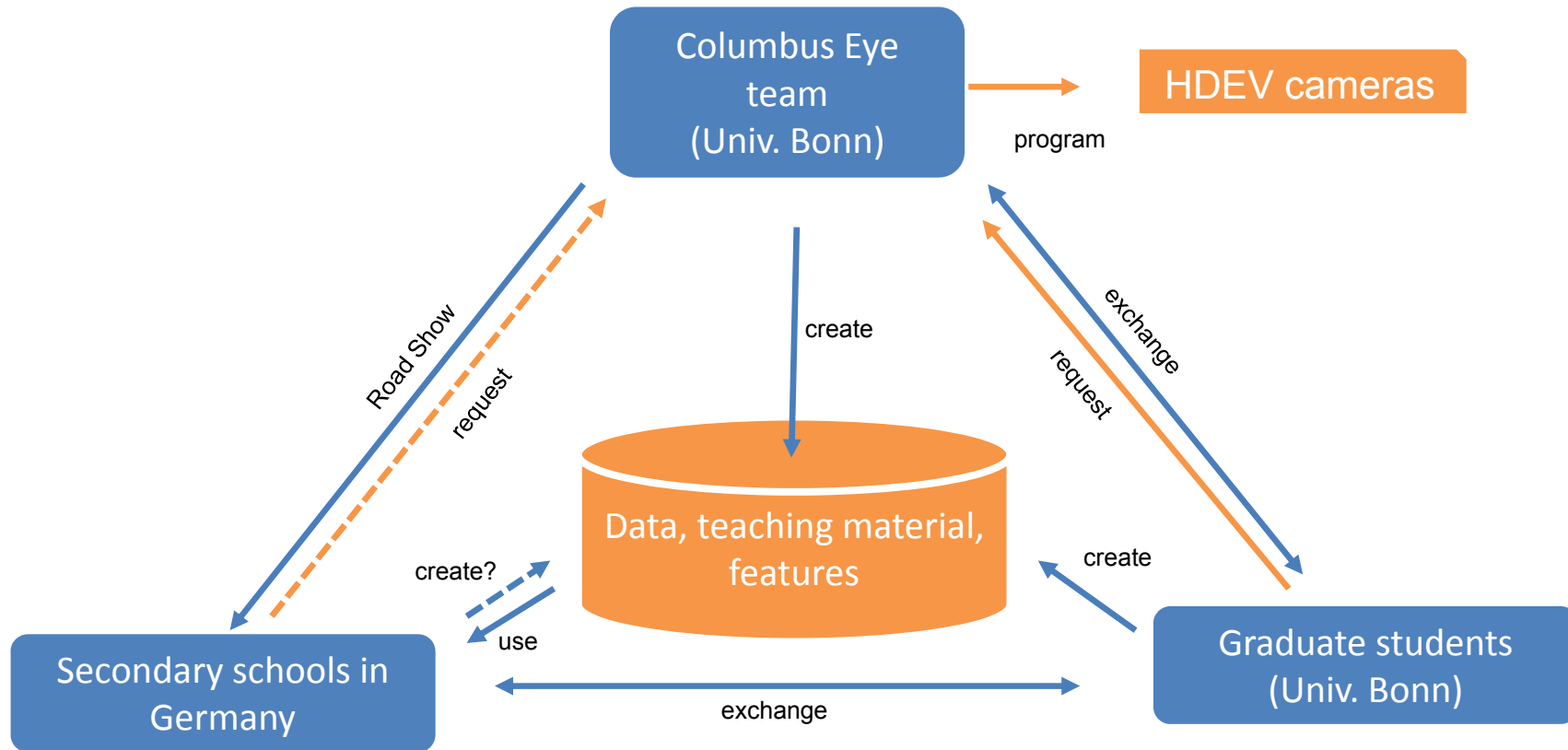
Columbus Eye – HDEV in Schools

Learning Tools on HDEV-Images of the ISS



Columbus Eye – HDEV in Schools

Communication within the Columbus-Eye project





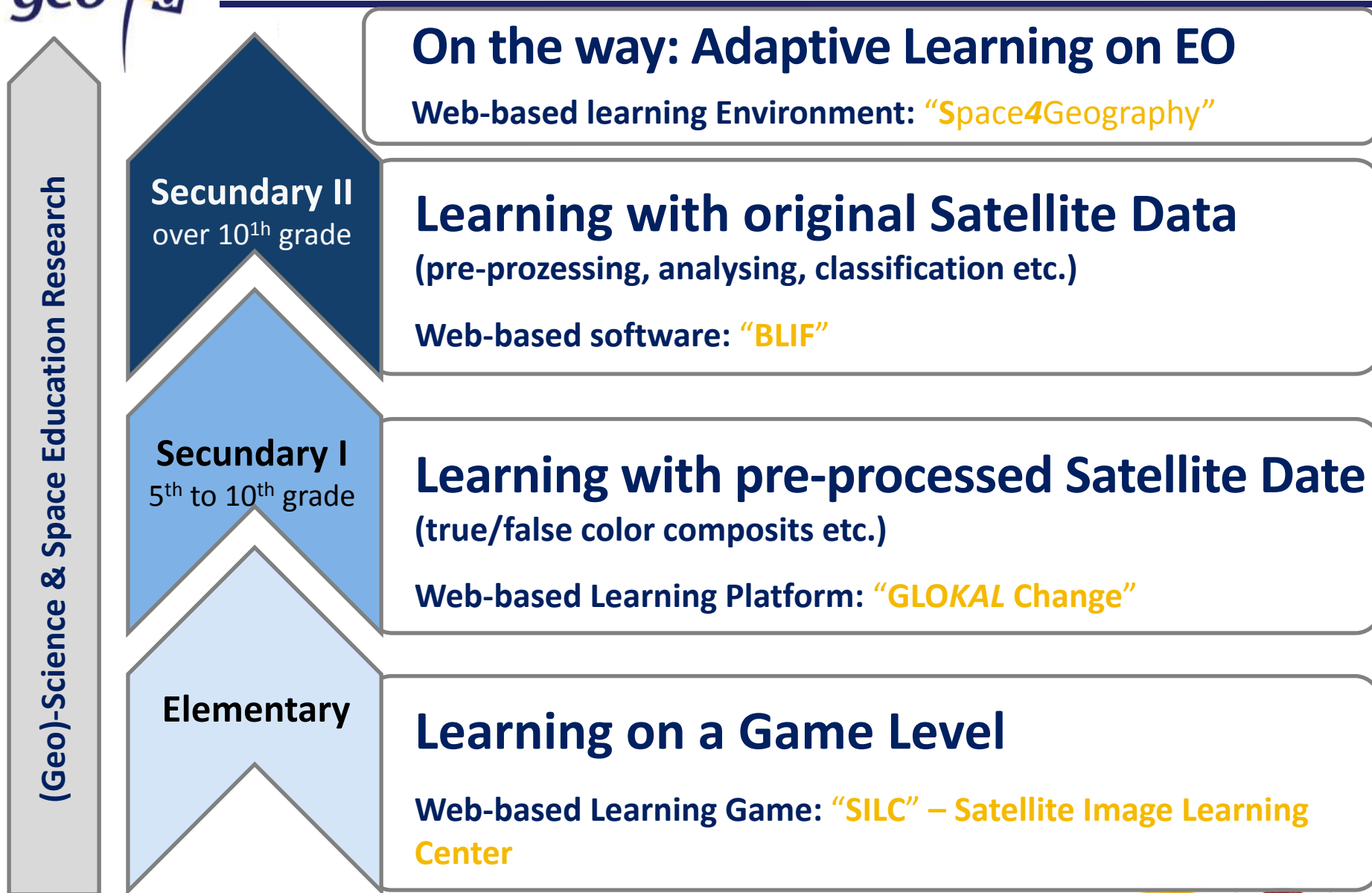
Space Education & digital Geomedia

Fields of Competence & Applications

of the Research Group for Earth Observation – *rgeo*



Prof. Dr. Alexander Siegmund
University of Education & University Heidelberg
Dept. of Geography, Research Group for Earth Observation – *rgeo*



Nationwide analysis of curricula and definition of relevant topics



Concept of the web-based learning environment

Learning modules

- 10 geographical key topics
- Exemplary application of remote sensing
- Problem-oriented web-based learning
- Interactive multimedia content, e.g. 3D-visualisations and animations prepared in cooperation with DLR/DFD

Web-based remote sensing software

Image processing and analysis (BLIF)

Geo-Mapserver

Satellite image database (*RapidEye, TerraSAR-X, Landsat 5/7/8*)

Evaluation



Testing phase (*DLR_School_Lab Oberpfaffenhofen, GIS-Station*)



Nationwide dissemination (promotion and training of multipliers)

Geographical Topics & Environmental Challenges

Hochwasser
Schwierigkeit: leicht - mittel
Dauer: 30 - 60 min

Bioenergie
Schwierigkeit: mittel - schwer
Dauer: 45 - 60 min

Flächenverbrauch
Schwierigkeit: leicht - schwer
Dauer: 20 - 45 min

Photovoltaik
Schwierigkeit: leicht - mittel
Dauer: 20 - 60 min

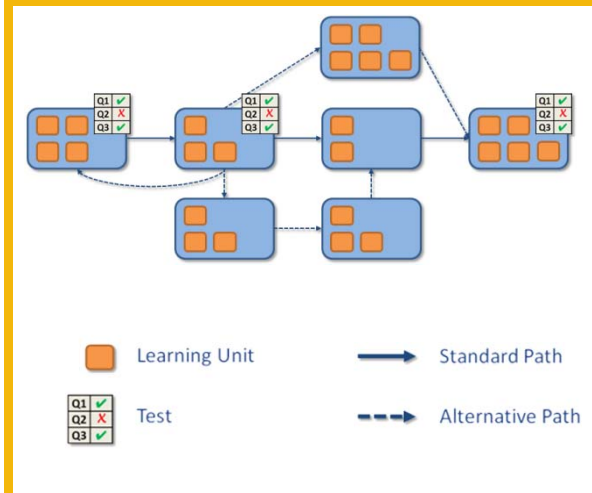
MODULAUSWAHL 1/2

- Sek I + II Geography
- Close link to the curricula
- Topics: land use conflicts, urbanization, natural hazards, renewable energies, urban climate, deforestation, glaciers, agriculture,...

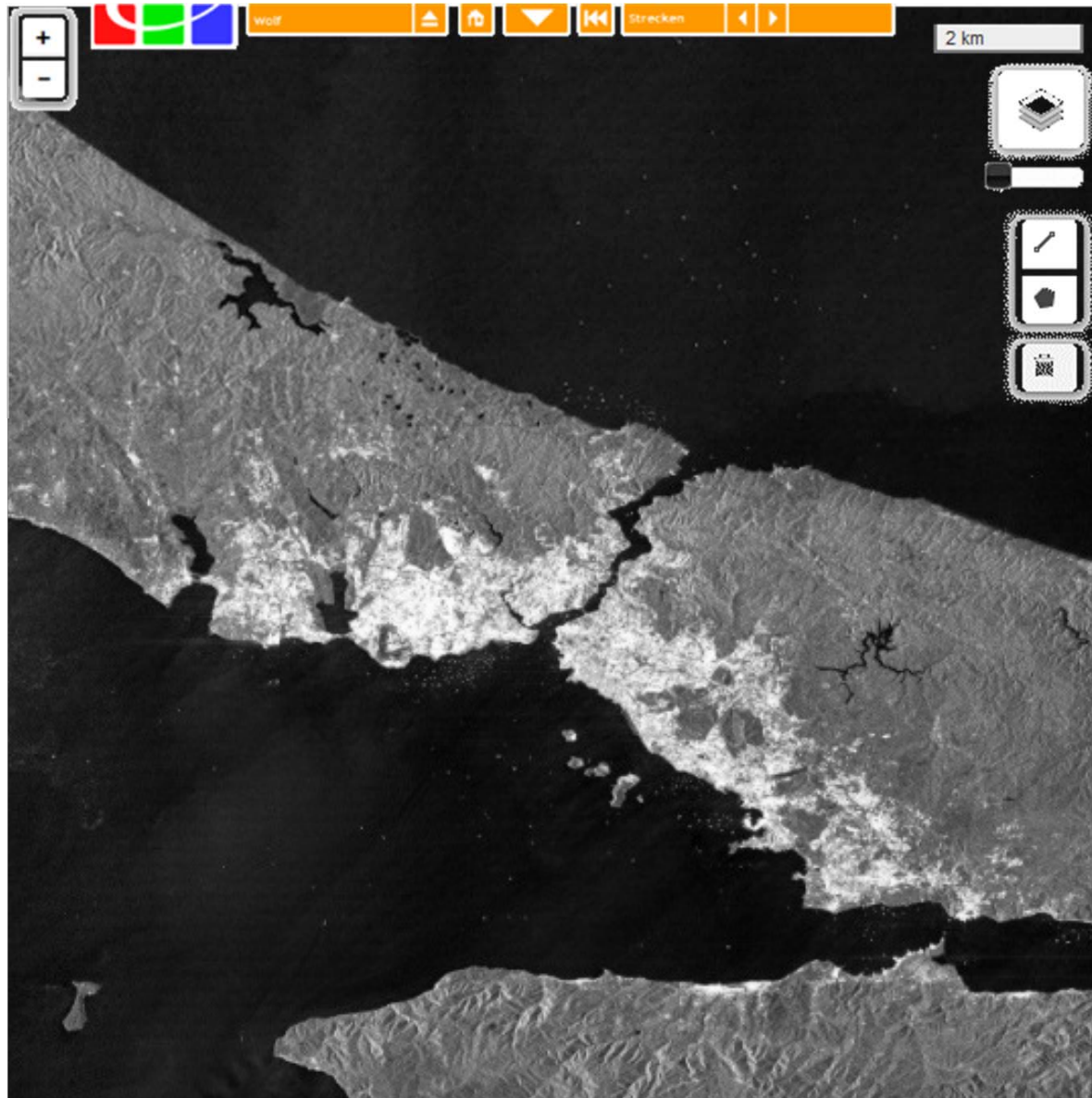
Remote Sensing Image Analysis

- ...with the integrated educational remote sensing software *Blif*
- Provision of original satellite data: *RapidEye, TerraSAR-X, Landsat, ...*
- Processing chain:
 - a. data import & AOI definition
 - b. image enhancement
 - c. band composites
 - d. vegetation indices
 - e. image classification & change detection

E-Learning Educational Approach

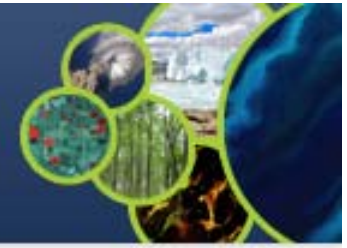


- Multicodal & interactive
- Individual learning: adapts and personalizes learning content to meet individual skills, needs and preferences of the learners
- Instant feedback for the learners
- Learning transfer & problem-oriented learning
- Course management functions





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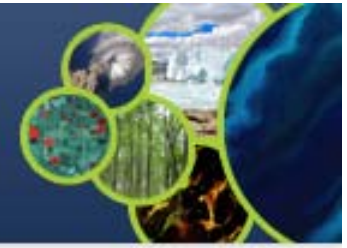


Realization #2

ESA Activities
Secondary Schools -
Training and Education
in the Frame
of International Cooperation



Education for secondary schools

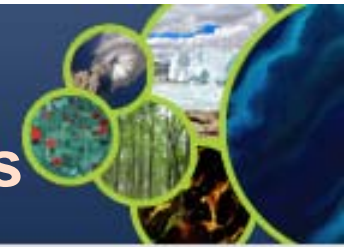


Creation of [Tools for secondary schools](#):

- Books and posters (also for [general public](#))
- Atlases, i-books (also for [general public](#))
- Apps for Tablets (also for [general public](#))
- Multilingual web-based tools (EDUSPACE),
- educational SW package for Image Processing and GIS (LeoWorks),
- School Lab
- Collection and distribution within ESERO project (European countries / curricula)



Eduspace: ESA web-based EO Educational tool for secondary schools



ESA Education **Home** Earth from Space Environmental Issues Envisat for Schools

- About Eduspace**
 - What is Eduspace? ▶
 - What tools does it offer? ▶
- Languages...** ▶
- Remote Sensing Principles**
 - What is remote sensing? ▶
 - Remote sensing in depth ▶
 - History of Earth observation ▶
 - Mapping and satellite data ▶
 - Satellite orbits ▶
 - Resource satellites ▶
 - Weather satellites ▶
- Resources...** ▶
- Multimedia**
 - Image Gallery ▶
 - Video Gallery ▶
 - MIRAVI: Earth live ▶
- Services**



03-May-2010

Earth from Space: Image of the week



ESA Education **Home** Weather and Climate Global Change Natural Disasters

06-Nov-2013

Earth from Space: Image of the week



- About Eduspace**
 - What is Eduspace? ▶
 - What tools does it offer? ▶
 - Choose your language... ▶
- Remote Sensing Principles**
 - What is remote sensing? ▶
 - Remote sensing in depth ▶
 - History of Earth observation ▶
 - Mapping and satellite data ▶
 - Satellite orbits ▶
 - Earth observation satellites ▶
- Resources...** ▶
- Multimedia**
 - Image Gallery ▶
 - Video Gallery ▶
- Services**
 - Contact us ▶
 - Search in Eduspace ▶

Search



Flash floods in Thessaloniki

Floods are considered one of the most catastrophic natural disasters. They affect more people than any other natural disaster, posing serious risks for people's lives, properties and infrastructure. Due to the increasing frequency of severe flood events, as well as evidence of global climate change and rise in sea levels, floods are now considered a serious threat.

[Full story ▶](#)



The Gulf Stream

The Gulf Stream is a warm, fast flowing current that forms the western boundary of the North Atlantic Gyre. During its course, its temperature gradually drops as it releases heat into the atmosphere.

[Full story ▶](#)



Climate change and glaciers

Detecting and quantifying glacier retreat and advancement, glacier area changes, and glacier lake changes is one of the most important contributions satellite technology can make to further our understanding of climate change. For a large number of glaciers, especially those found in remote places, satellite remote sensing is the only method scientists have to study them.

[Image archive](#)

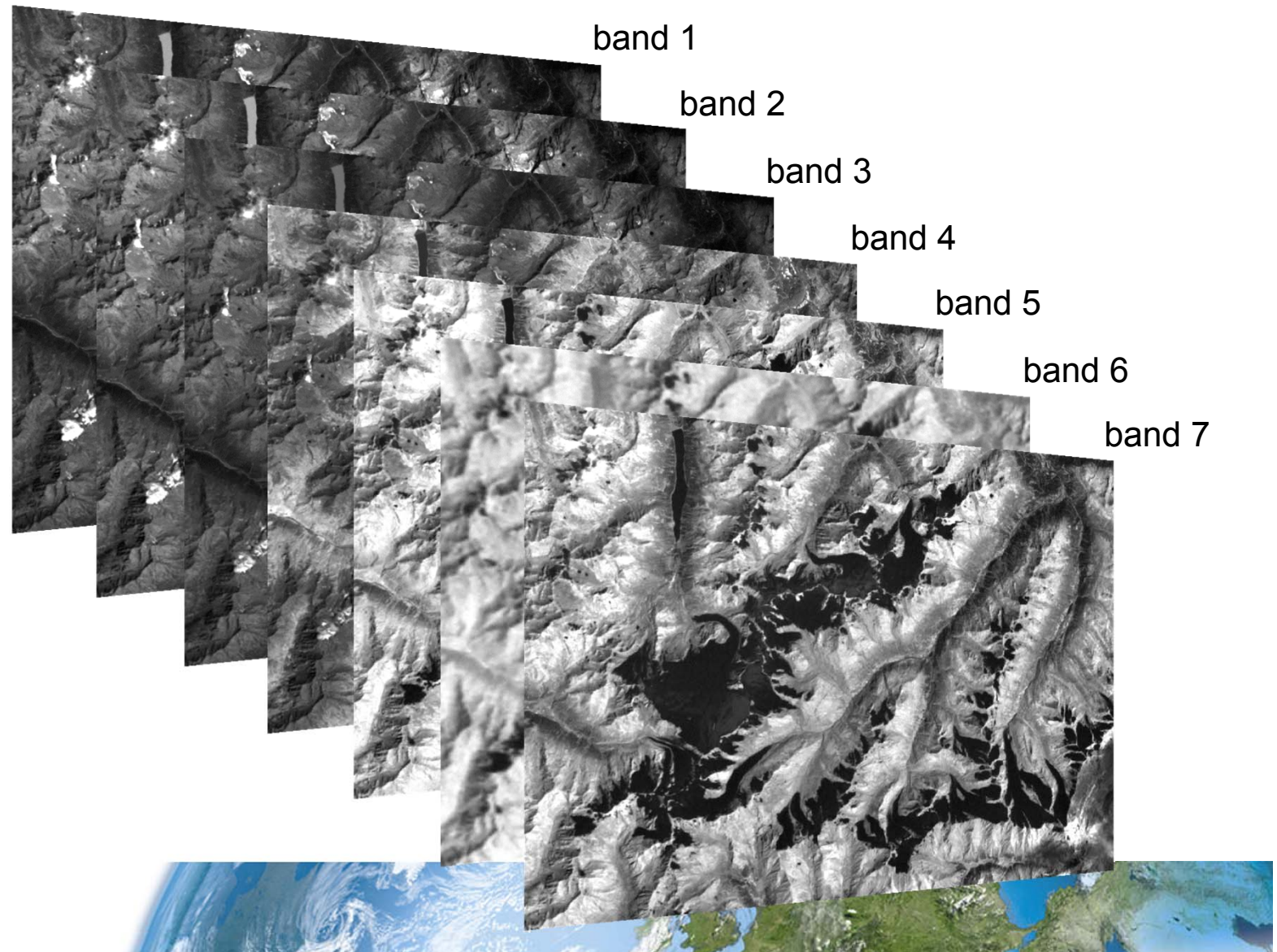


LEOWorks 4.0

- **View images, histogram, pixel values, header info**
- **Crop, invert, stretch, layer stack, etc**
- **image arithmetic, filters**
- **Classification, PCA, geometric correction, pan sharpening**
- **Radar and optical module (multimission, including Sentinel data)**
- **GIS tool**
- **Open-source, Java-based**

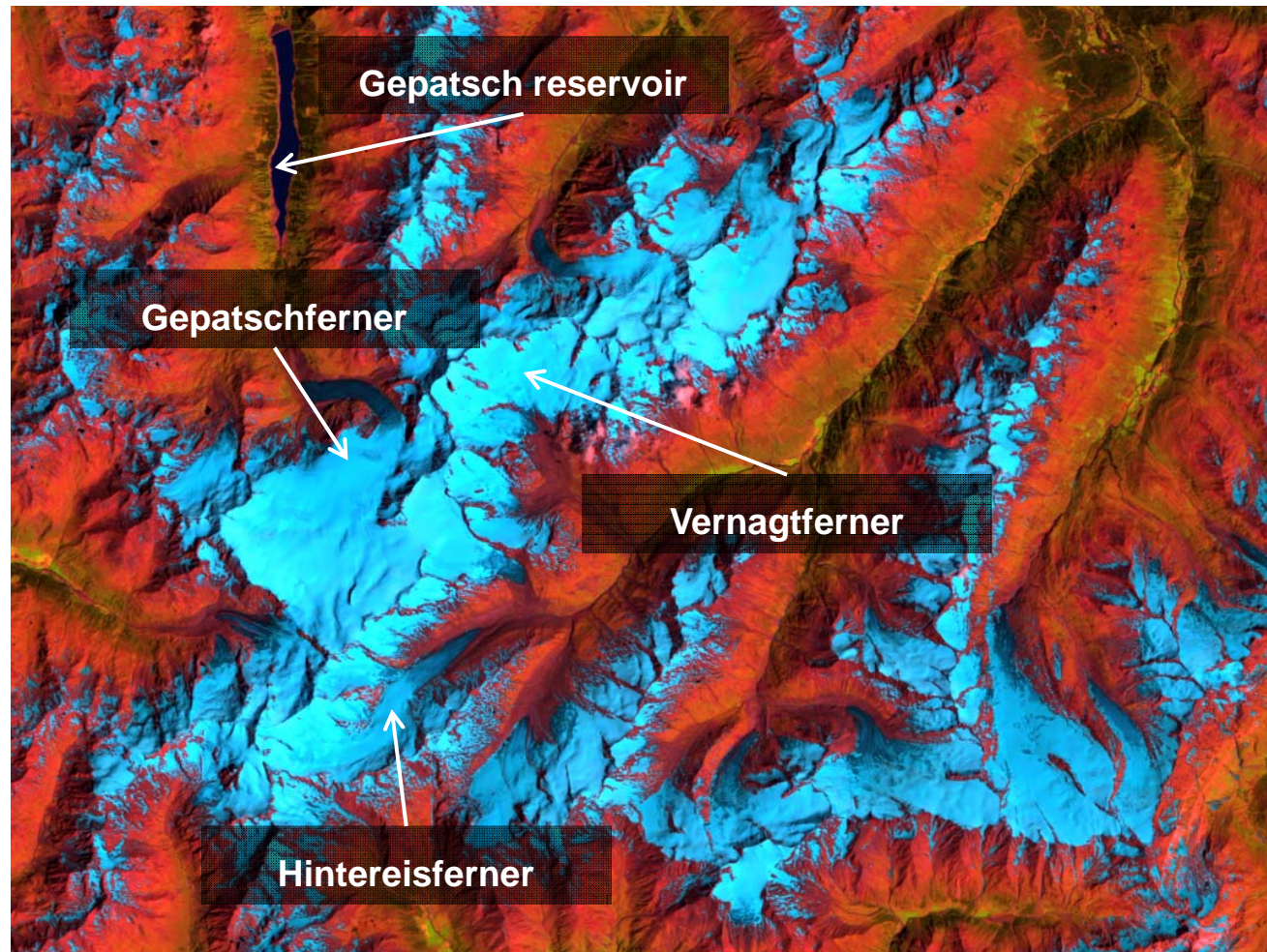
Satellite Data: Landsat TM

Available at Glovis / USGS



Ötztal Alpes, Austria

September 1986

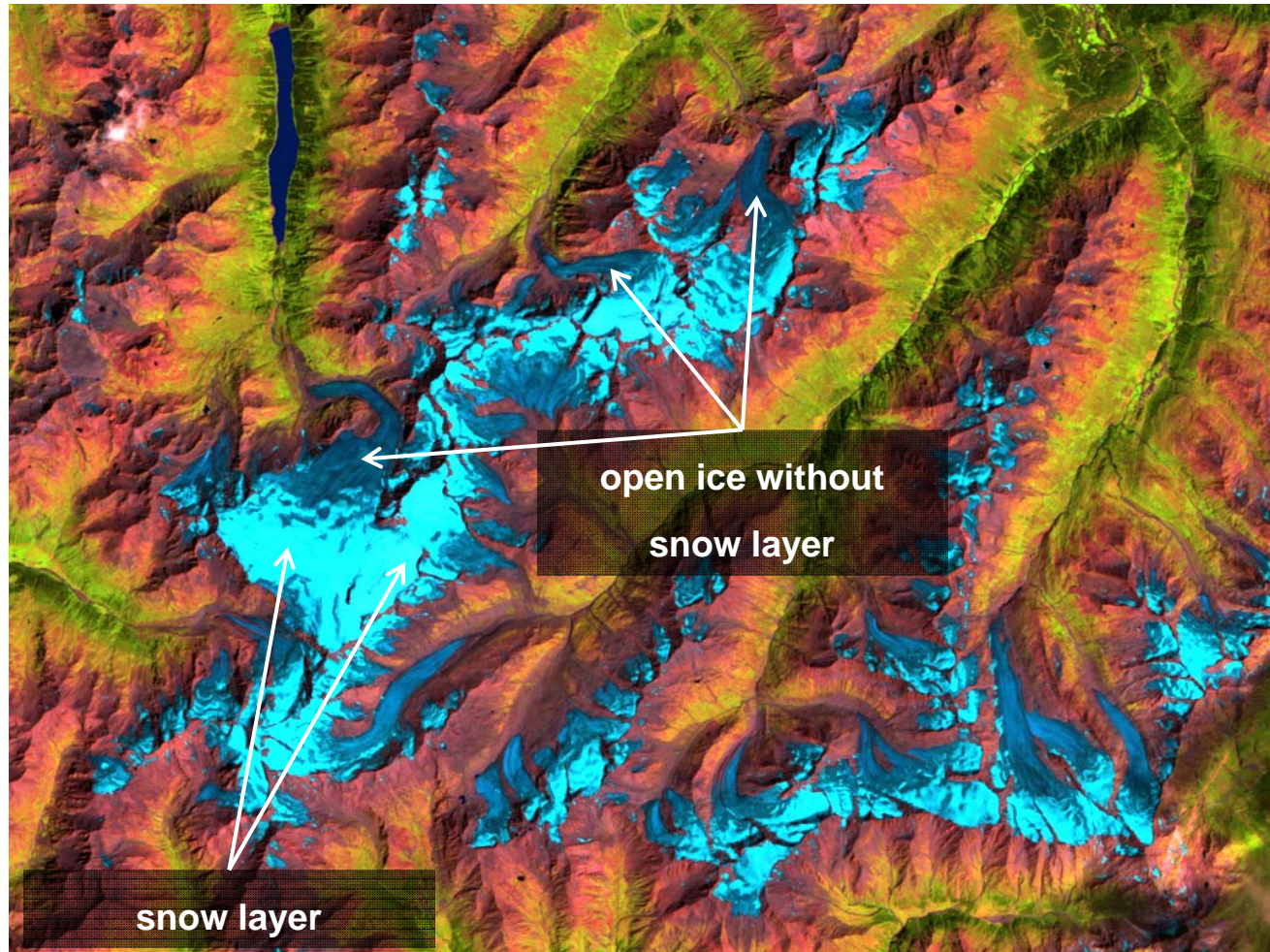


Landsat TM, RGB 5/4/3



Ötztal Alpes, Austria

September 2003

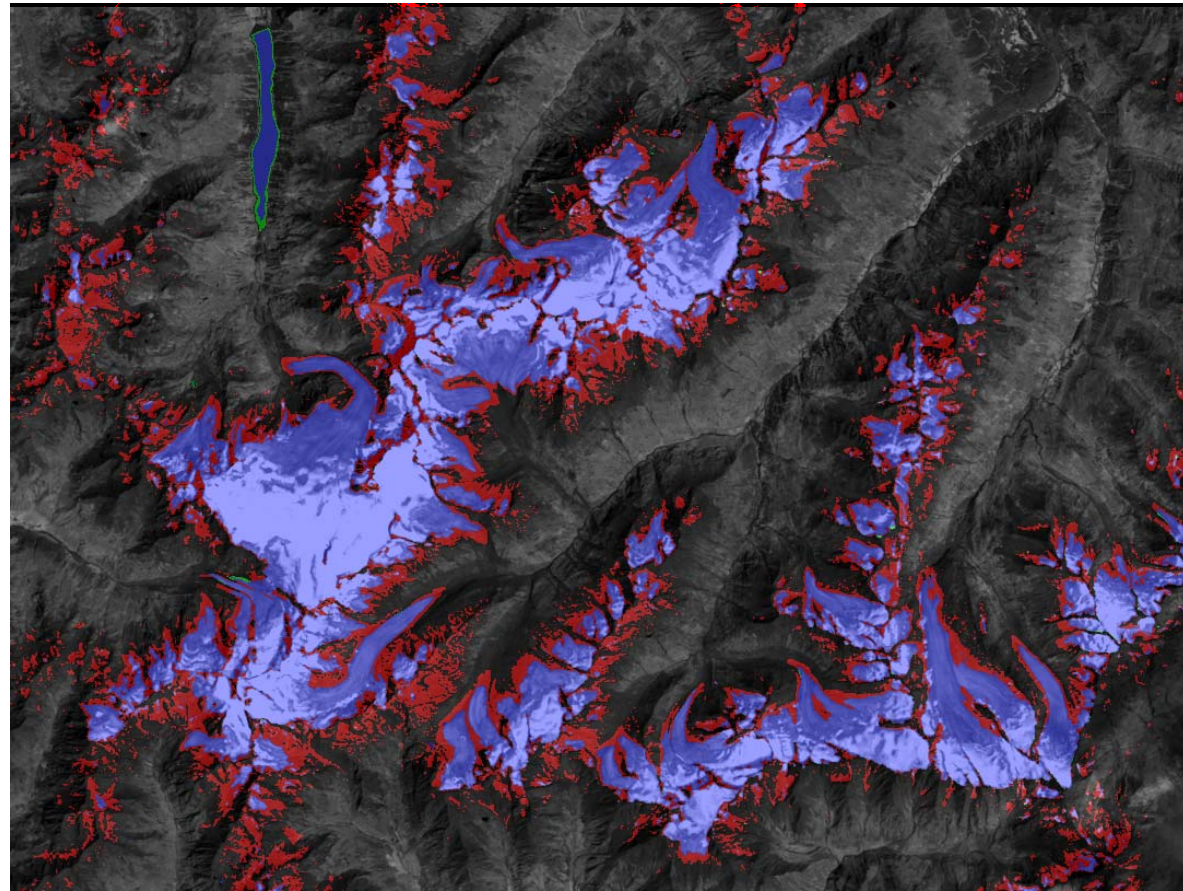


Landsat TM, RGB 5/4/3

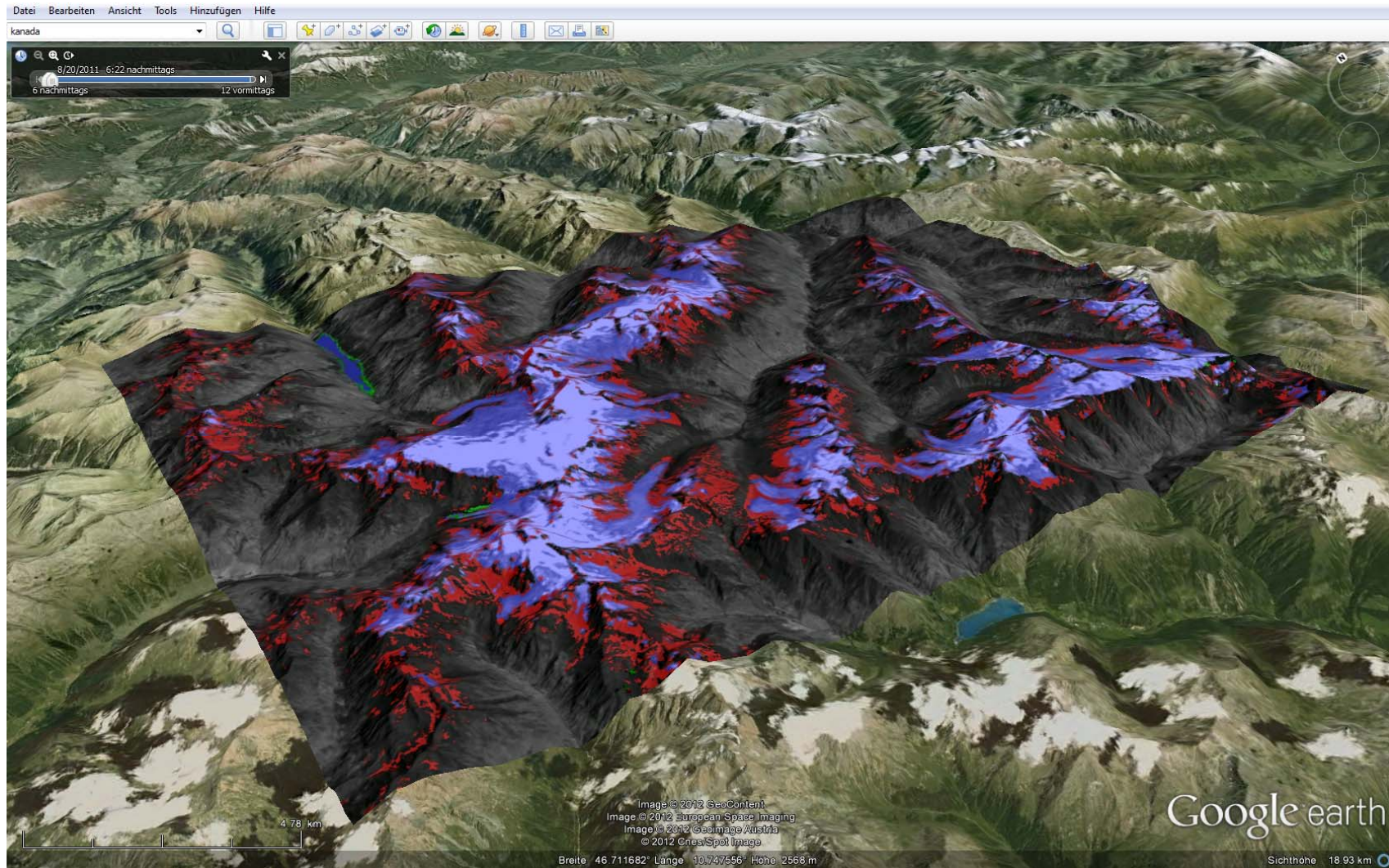


Change Detection

Combination – transparent overlay



Change Detection export image to Google Earth

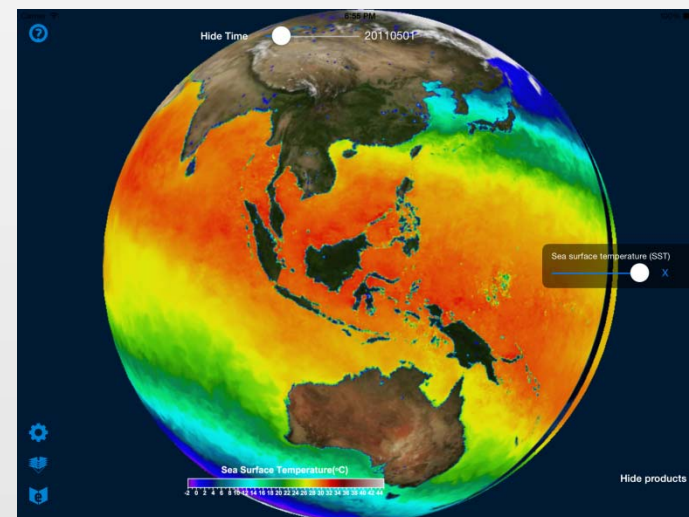
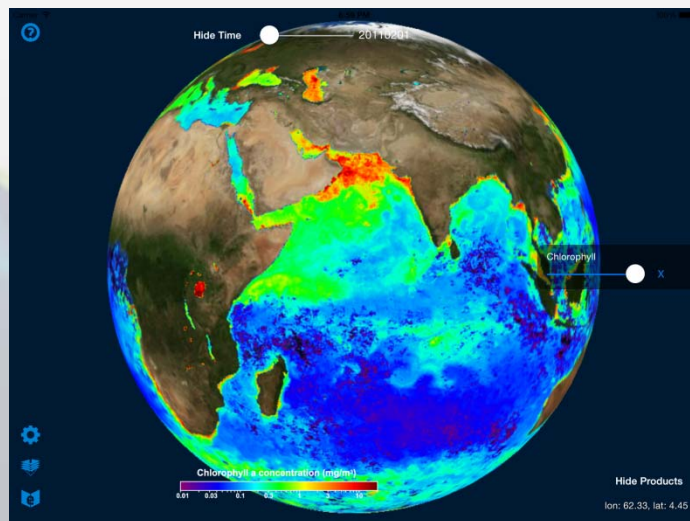
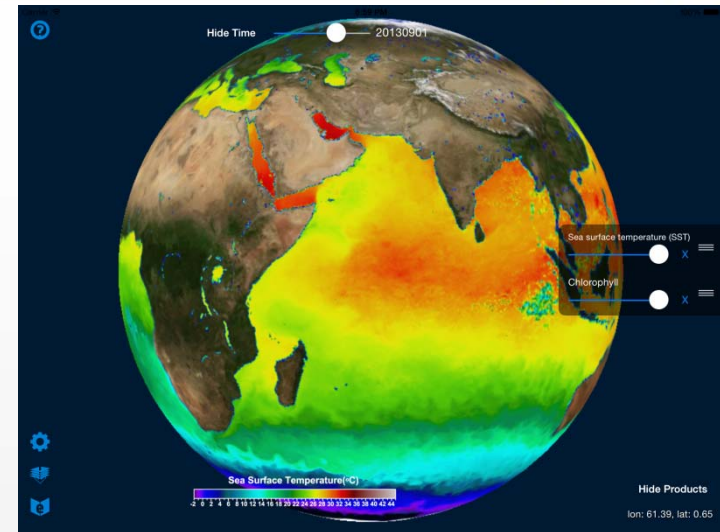




Educational App for EO



- For iOS tablets (iPad, iPad mini)
- Can be used as presentation tool and as support to school or



the

CEOS

Sentinel App



- Will be also on Google Play (Android phones, tablets) in April

- See where the Sentinel satellites are in real-time
- See the last and next time they have been and will be over your location; Move them to the time of the last data transmission and smoothly move them back to their current location over the 3D globe
- Explore the Sentinel satellite 3D models
- Get information and news about the Copernicus Programme
- Get information about access to Sentinel data
- Set Notifications to be warned when satellites are flying by.





Creation of posters for schools



→ WHAT IS REMOTE SENSING?

"Remote sensing" is defined as the acquisition of information about an object without being in physical contact with it. A photographer taking a photo of a landscape is doing remote sensing, using his camera as a sensor. When the target is far away from the sensor, as in the case of satellite remote sensing, we need more sophisticated instruments.

A sensor is a device that measures the amount of electromagnetic radiation, it receives and transform it in an electric signal, which is then coded and sent to ground.

By means of satellite sensors, both active and passive, we observe the Earth and measure important geophysical parameters, in order to monitor the status and the "health" of our planet.

get more on: www.esa.int/eduspace



PASSIVE SENSORS

They measure the radiation coming from a source external to the sensor, such as the thermal radiation emitted by the Earth or the sunlight coming from the Sun and reflected by objects on the Earth.

airborne and spaceborne optical instruments measuring visible and near-infrared radiation, such as those on board ENVISAT, SPOT, Proba, Landsat satellites and the SENTINEL-2 (3A, 4B);
airborne and spaceborne instruments measuring thermal infrared radiation, such as the radiometers on board ERS-1 and 2 (ATSR), ENVISAT (AASTR) - designed primarily to measure Sea Surface Temperature - as well as SENTINEL-3 (OLCI) Sea and Land Surface Temperature Radiometer.

ACTIVE SENSORS

These sensors use their own source of radiation in order to illuminate targets, they then measure the amount of radiation reflected back to the sensor, as well as the time it takes for it to return.

airborne and spaceborne Radar and LiDAR instruments. In particular Synthetic Aperture Radar (SAR) on board ERS-1 and 2, ENVISAT, Sentinel-1, TerraSAR-X, Cosmo-SkyMed, ALOS satellites.

→ SATELLITE ORBITS

Satellites in space follow trajectories called orbits. The orbits of planets, as natural satellites of the sun, were described by **J. Kepler** in the beginning of 17th century. Artificial satellites placed in space by humans follow the same laws of planetary motion. These laws are based on the principle of universal gravitation formulated by **I. Newton** in the end of the 17th century.



NEAR POLAR SUN-SYNCHRONOUS ORBITS

These are roughly circular orbits, almost perpendicular to the equatorial plane of the Earth and such that the satellites pass over each area always at the same local mean solar time. This is the most common type of orbit for Earth observation satellites. With their sensors, they analyse a different strip of the Earth at each pass and need several days, in order to cover most of the Earth's surface.

Such a typical satellite was ESA's Envisat, orbiting at a velocity of 7.45 km/sec, 800 km over the Earth's surface.
Other satellite families in this type of orbit are, for instance: SPOT, SENTINEL, LANDSAT.

GEOSTATIONARY ORBITS

These are circular orbits on the plane of the Equator, about 36,000 km above the Earth's surface. Such orbits are used mostly by meteorological and telecommunication satellites. Geostationary satellites rotate around the Earth at the same angular speed as the Earth's rotation, so they are constantly "looking at" the same part of the Earth's surface, therefore appearing stationary to an observer on the Earth.

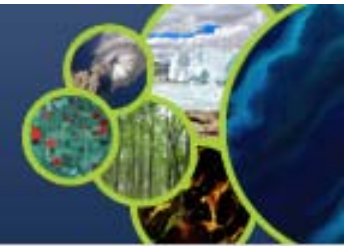
Examples of geostationary satellites are the meteorological METEOSAT series and the telecommunication EUTELSAT satellites.

get more on: www.esa.int/eduspace

European Space Agency

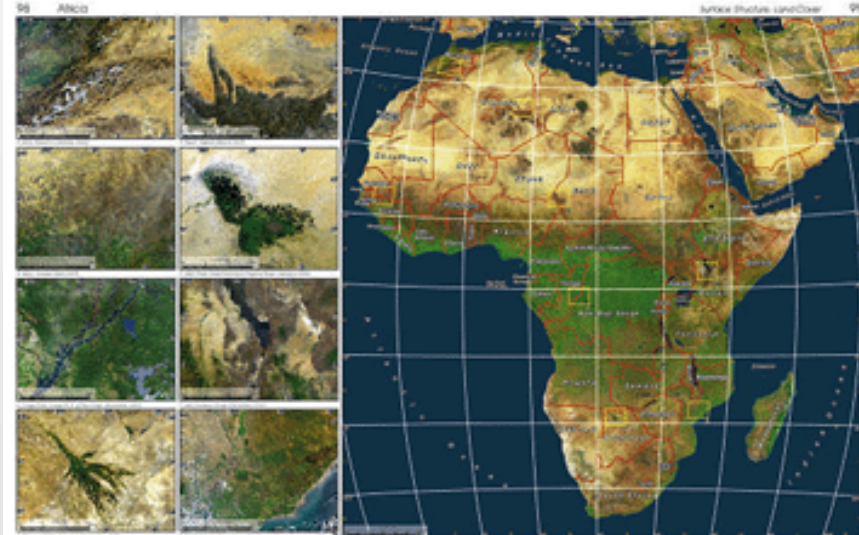
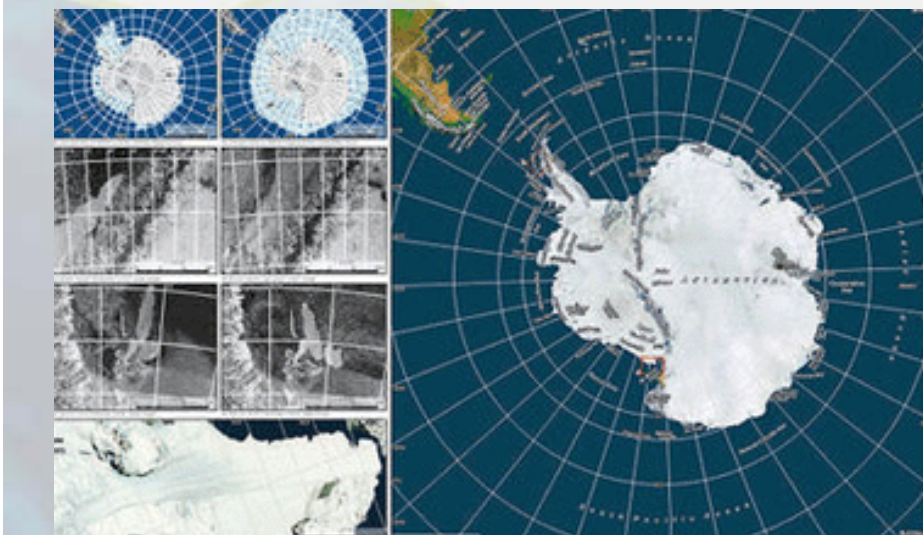
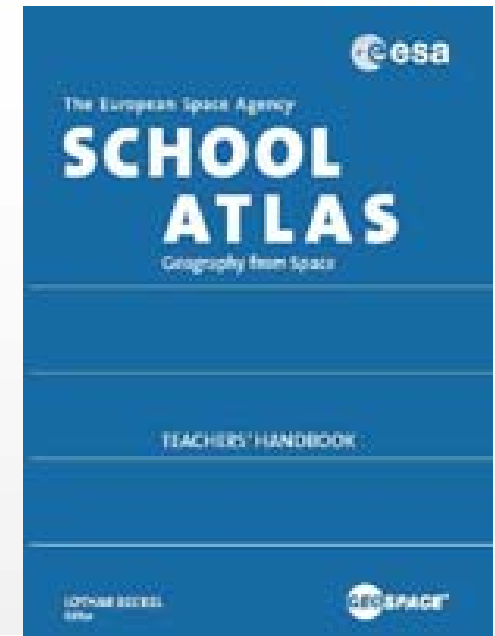


ESA School Atlas new ESA Water Atlas



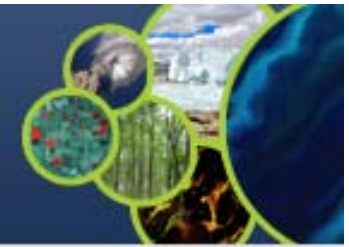
Introduction to ESA; Earth Observation; Global Overview; Continental Overview; the Natural Sphere; The Cultural Sphere.

Annex: Teachers' Handbook, DVD-ROMs with the original bands of the satellite data, handbook content and exercises, connected to Eduspace and its SW Leoworks





Training & Education in the frame of International Cooperation: Earsel network



Long-term cooperation in organising joint Workshops for Secondary School teachers with Earsel (European Association of Remote Sensing Laboratories)



European Association of Remote Sensing Laboratories

Special Interest Group

Remote Sensing in Education and Training

4th June 2013 University of Basilicata, Matera, Italy

4th EARSeL Workshop on Education and Training
to be organised in the framework of the [33rd EARSeL Symposium](#)

Home
Topics
Programme
Abstract Book
Committees
Call for Papers
Proceedings
Venue
Contact
SIG Homepage



Remote sensing of the earth covers many topics that are significant for natural science disciplines in school and university curricula. Satellite imagery and data derived from satellite sensors enable studies ranging from local phenomena around schools, up to large-scale perspectives showing the diversity of nature in the various climatic regions on earth. This allows thus to point out the dependence between local and global scales. Remote sensing data are used to observe and understand actual conditions on earth, but they also ingested into models allowing the prediction of future developments (e.g., of the climate).

All relevant institutions and interested individuals are invited to participate. In particular the workshop is also addressing the **Global Environment and Security (GMES)** programme of the European Commission and the European Space Agency. The success of GMES services and information products, especially in the fields of environment, climate change and natural disasters depends on specific training activities which include remote sensing for earth observation as a core element.

Moreover, the workshop will focus on the planned foundation of the **International Remote Sensing Academy (IRSA)**, initiated by EARSeL in early 2012. The goal will be to discuss the strategic framework of the Academy.

recent Earsel Workshop and Training in ESRIN on RS for Archaeology (Nov 2015)

Preparing Bonn (June 2016), Beijing (July 2016) and Krakow (Sept 2016) Earsel training events



ESA ESEROs - European Space Education Resource Offices



Target: European students starting from an early age (primary and secondary education)

Goal: using the space context to make the teaching and learning of STEM subjects more attractive

ESERO offers an annual series of national or regional training sessions for both primary and secondary school teachers, offered in collaboration with national partners

Presently located in:

Belgium: Planetarium of the Royal Observatory of Belgium in Brussels

Czech Republic: Prague, with Charles University of Prague and others

UK: based at the National STEM Centre in York

Ireland: Dublin, with the Science Foundation Ireland

Netherlands: at the Nemo Science Learning Centre in Amsterdam,

Nordic ESERO: Denmark, Finland, Sweden and Norway (based at NAROM),

Poland: in the Copernicus Science Centre in Warsaw,

Portugal: in the Knowledge Pavilion, Lisbon,

Romania: based in the Romanian Space Agency



Training courses - centralized web page



The content of most training courses can be linked from the central web page for ESA EO Education and Training:

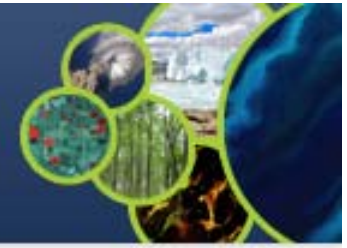
<https://earth.esa.int/web/guest/eo-education-and-training>

The screenshot shows the ESA Earthnet Online website. The header includes the ESA logo, 'Earthnet Online', and navigation links like 'Login My Earthnet', 'Register', and a search bar. Below the header is a navigation menu with 'Data Access', 'Missions', 'Earth Topics', 'PI Community', and 'Explore more...'. The main content area is divided into several sections:

- EO Education News**: A section titled 'Participate in the ESA LearnEO! competition' dated 23 September 2013. It describes a lesson-writing competition with a prize of up to 5,000 euros and provides a link to the 'LearnEO! competition webpage'.
- EO Education and Training**: A section featuring an image of a satellite in orbit and the text 'Overview of Earth Observation Training at ESA'. It states that ESA undertakes a wide range of activities in Earth Observation education, training, and capacity building, ranging from high-level training to outreach.
- EO data**: A section with a list of links: 'EO data distributed by ESA', 'Access data online', 'Access GMES data', 'How to apply for data', 'Eo! Catalogue', and 'ESA Multimedia Gallery'.
- EO training activities**: A section with a list of links: 'Education for Schools', 'EO Summer Schools', 'Dragon Programme', 'Tiger Initiative', 'Advanced Training', 'Other EO Training', and 'Upcoming / Past Events'.



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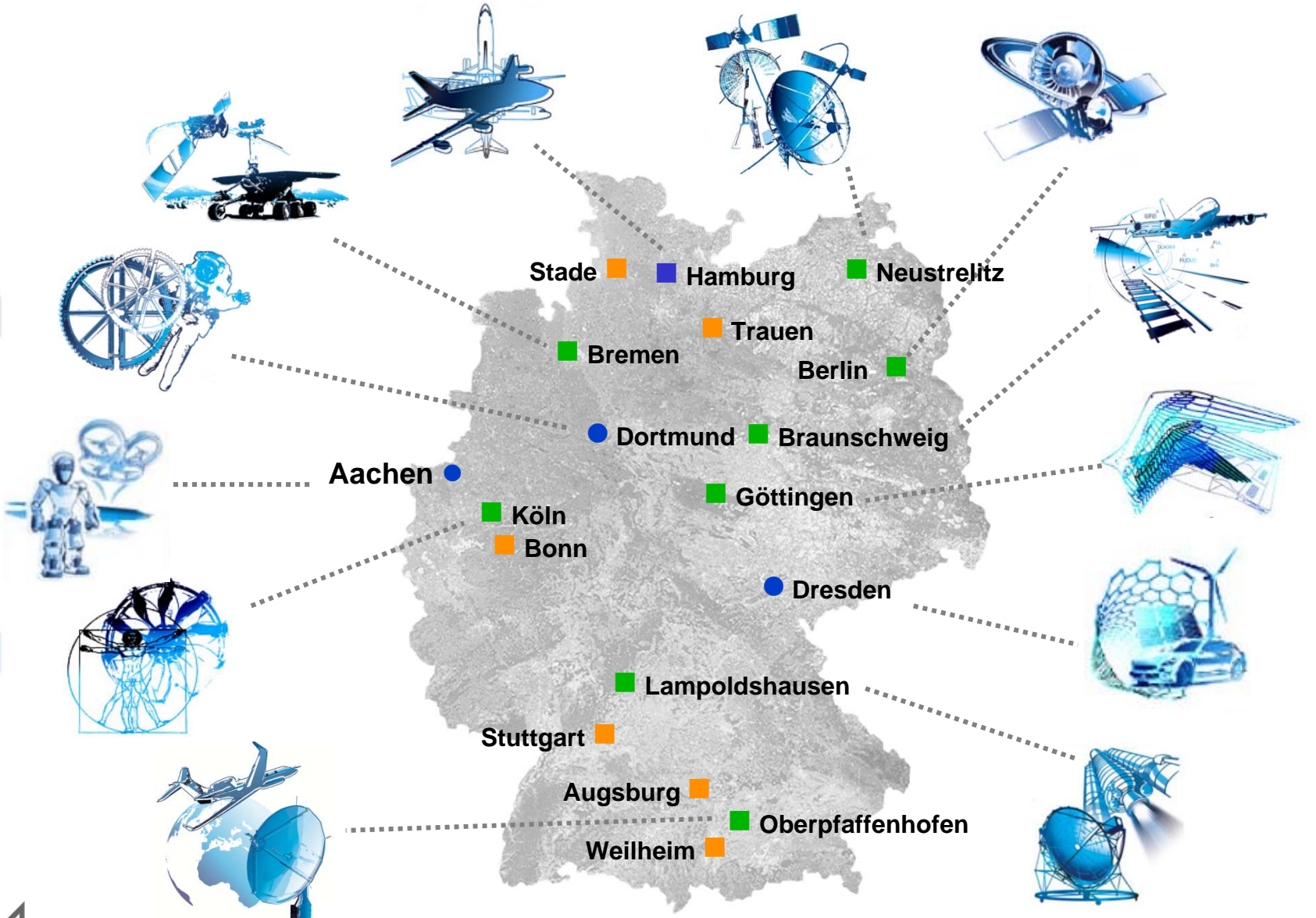
Realization #3

DLR_School_Lab



Promoting the Next-Generation Scientists

DLR_School_Labs



DLR Site Oberpfaffenhofen

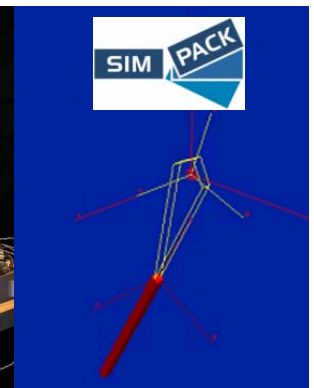
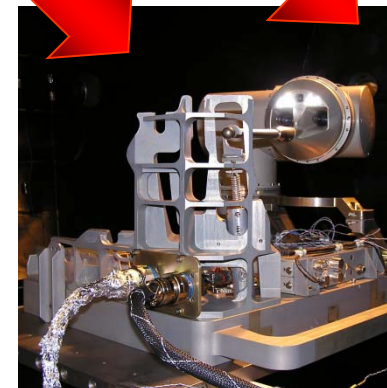
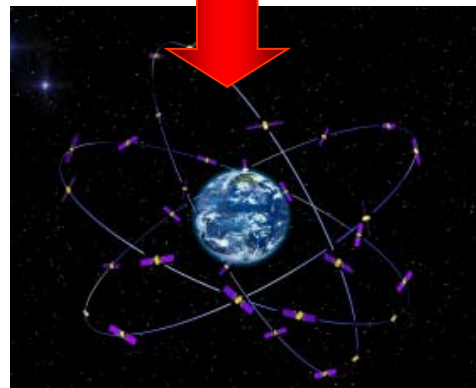
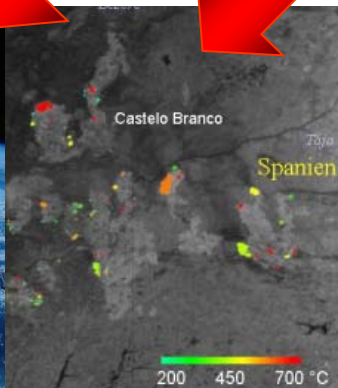
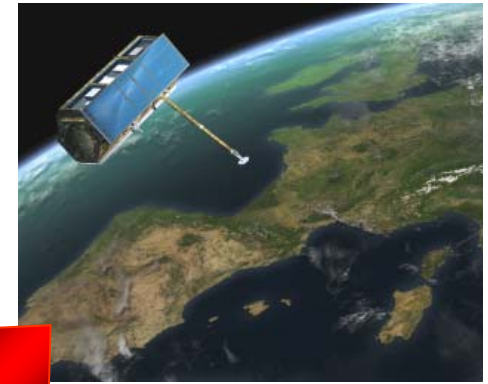
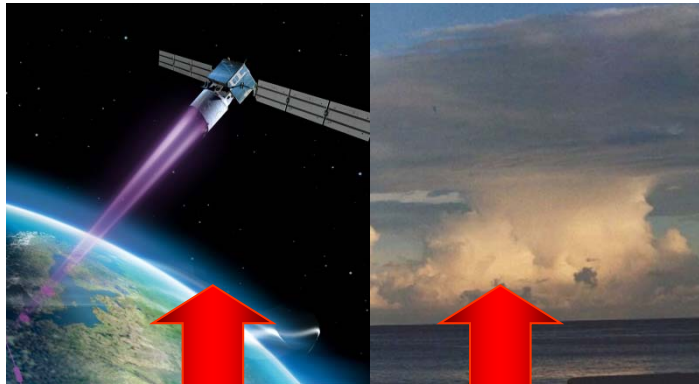
Employees: Approx. 1,700

Size of site: 245 000 m²

Research institutes and facilities:

- Microwaves and Radar Institute
- Institute of Communication and Navigation
- Institute of Atmospheric Physics
- Remote Sensing Technology Institute
- Institute of Robotics and Mechatronics
- Institute of System Dynamics and Control
- German Remote Sensing Data Center
- Space Operations and Astronaut Training
- Galileo Control Center
- Flight Experiments





Experiments @ DLR_School_Lab Oberpfaffenhofen

Represent the Research of All 10 DLR Institutes

Experiment

1. Infrared Technology
2. Laser Technology
3. Radar Technology
4. Optical Remote Sensing
5. Weather and Climate
6. Satellite Data Analysis
7. Satellite Navigation
8. Robotics
9. Virtual Mechanics
10. Flight Team Simulator
11. Mobile Rocket Basis
12. ASURONaut
13. Tunnel Boring Machine

Institute

- Remote Sensing Technology
- Physics of the Atmosphere
- Microwave and Radar Technology
- Remote Sensing Data Center
- Physics of the Atmosphere
- Remote Sensing Data Center
- Communication and Navigation
- Robotics and Mechatronics
- System Dynamics and Control
- Flight Operations
- Space Operations
- Robotics and Mechatronics
- Technical University Munich





The Team

DLR_School_Lab

Oberpfaffenhofen

13 High Tech
Experiments

Competent
Mentoring

Authentic
Ambience

DLR_School_Lab
Oberpfaffenhofen

Experimental Concept

...Representing the DLR-Institutes' Competence

➔ **Authenticity**

...Didactical Transfer

➔ **Inquiry-Based Science Education**



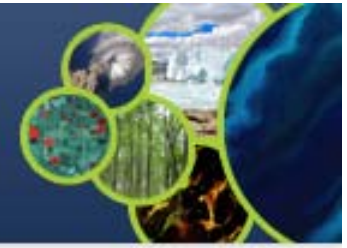
DLR_School_Lab Oberpfaffenhofen

- ❖ 13 years
- ❖ 30.000 secondary school students
- ❖ 3.000 teachers
- ❖ 3.500 MINT talents
- ❖ 300 teachers of the gifted





WGCapD-5
Hampton, Virginia, USA
March 29th – April 1st, 2016



Realization #4

EO School Lab
@ International Conferences
- an ESA-DLR Initiative



Our Goals

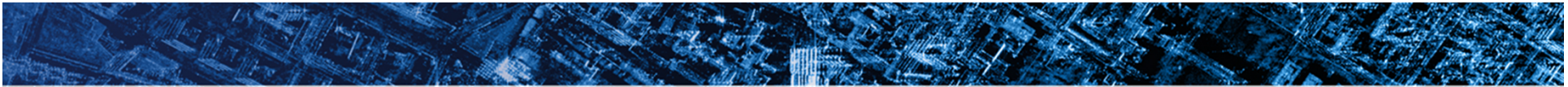
- Attract (young) people to EO
 - Technology
 - Missions
 - Software
 - Data
 - Applications
- Create awareness for the usefulness of EO – especially in developing countries
- Demonstrate advantage of combined expertise



Joint DLR/ESA EO Education stand at IGARSS 2012 in Munich

Combined lab experiments, training sessions and 3D Demonstrations



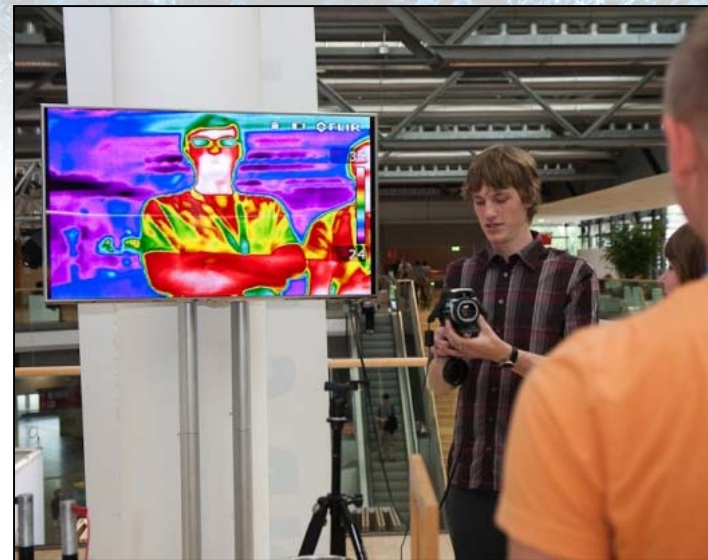




Radar experiment



Spectroscopy



Infrared techniques

The DLR School Lab experiments presented at IGARSS.

(More info at: <http://www.dlr.de/schoollab/desktopdefault.aspx/tabid-1991>)

The School Lab was combined with ESA lectures and computer practicals based on Eduspace

(http://www.esa.int/SPECIALS/Eduspace_EN/) in a joint ESA/DLR EO Education stand for school visits

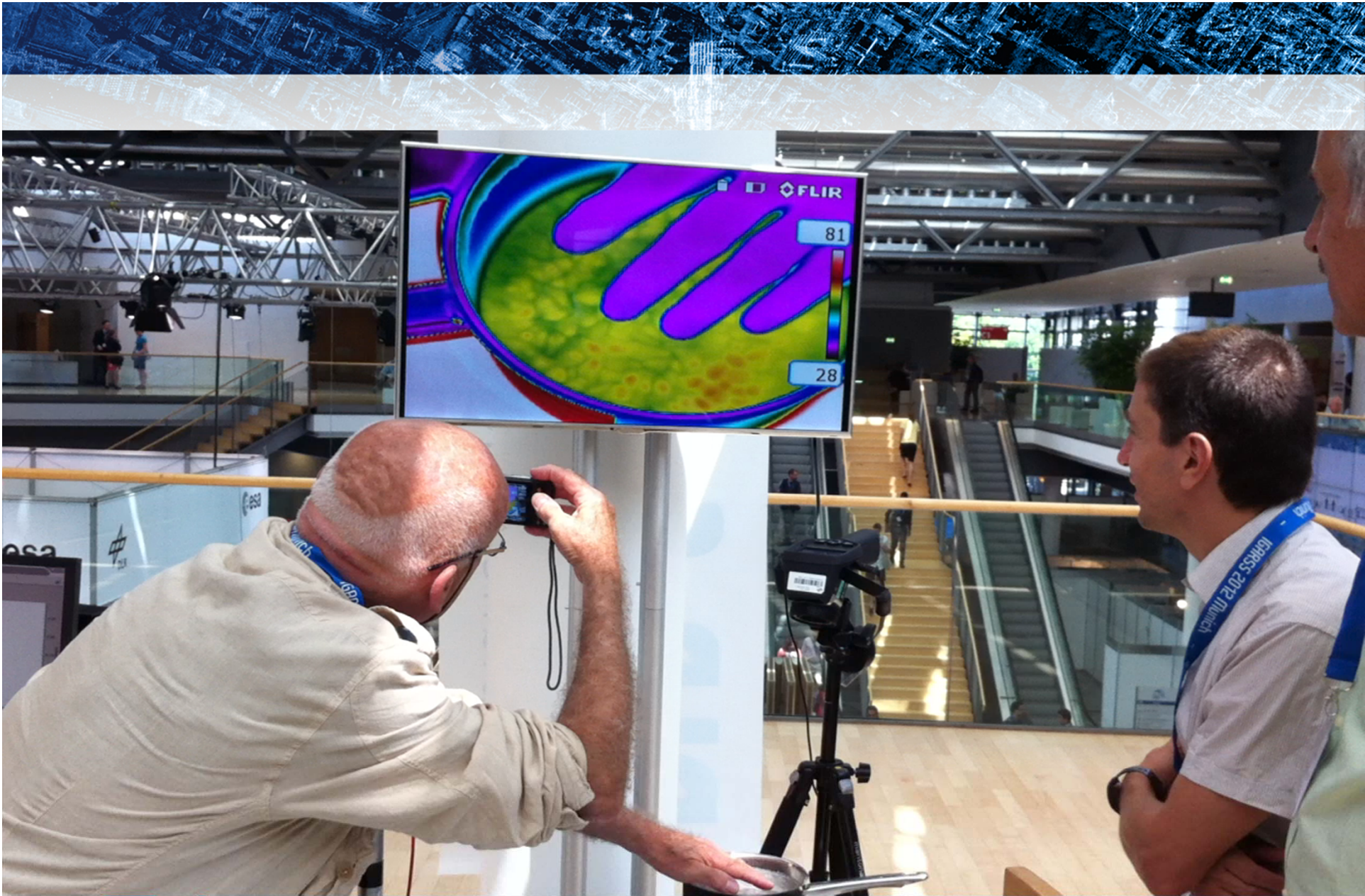




EO training sessions for high schools delivered by ESA.

(More info at: http://www.esa.int/SPECIALS/Eduspace_EN/)

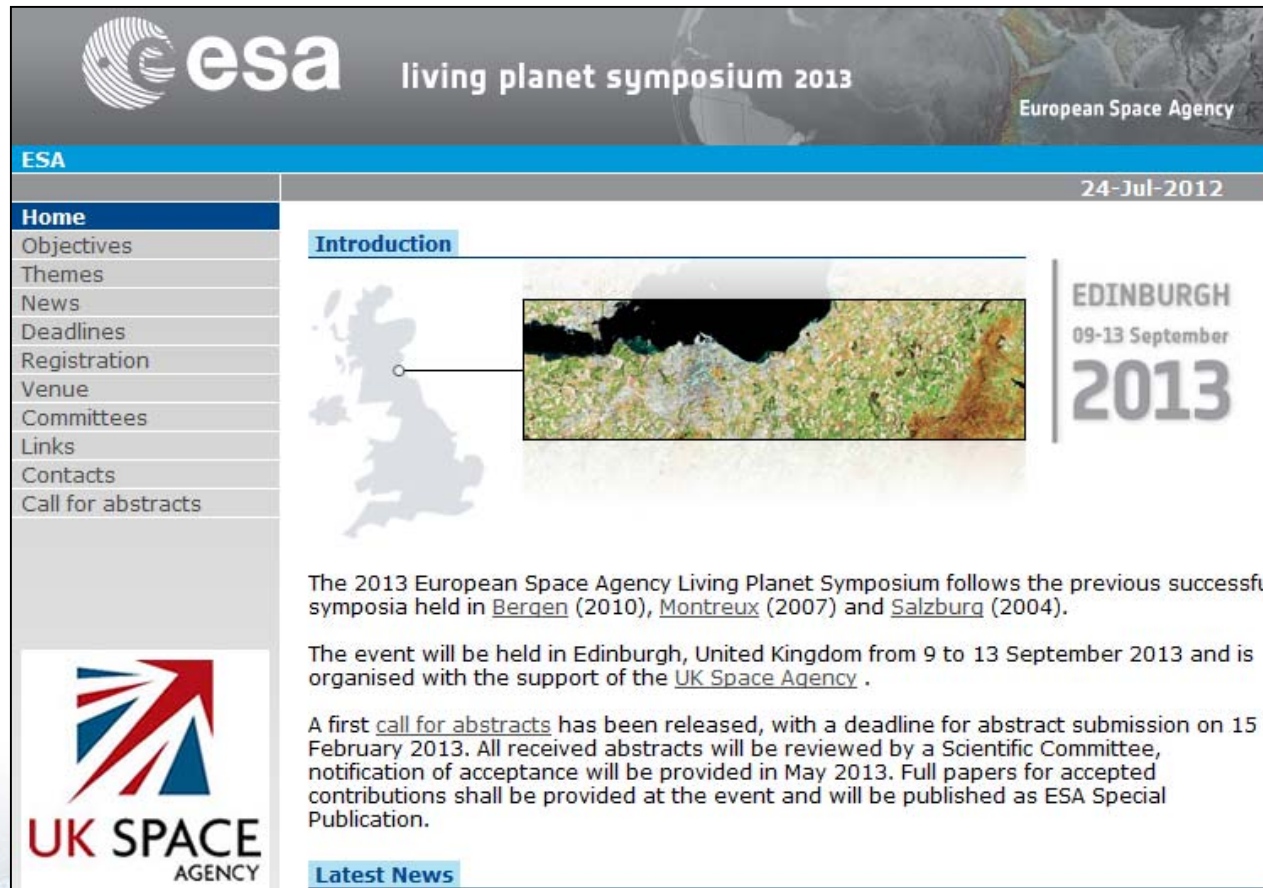




Living Planet Symposium 2013

Edinburgh, United Kingdom, 09 - 13 September

→ a DLR/ESA/UK Space Agency EO education stand based on IGARSS 2012




esa living planet symposium 2013 European Space Agency

24-Jul-2012

Home
Objectives
Themes
News
Deadlines
Registration
Venue
Committees
Links
Contacts
Call for abstracts

Introduction



EDINBURGH
09-13 September
2013

The 2013 European Space Agency Living Planet Symposium follows the previous successful symposia held in [Bergen](#) (2010), [Montreux](#) (2007) and [Salzburg](#) (2004).

The event will be held in Edinburgh, United Kingdom from 9 to 13 September 2013 and is organised with the support of the [UK Space Agency](#).

A first [call for abstracts](#) has been released, with a deadline for abstract submission on 15 February 2013. All received abstracts will be reviewed by a Scientific Committee, notification of acceptance will be provided in May 2013. Full papers for accepted contributions shall be provided at the event and will be published as ESA Special Publication.

UK SPACE AGENCY

Latest News



living planet
symposium

EDINBURGH
09-13 September

2013



LPS School Lab

Edinburgh International Conference Centre
10 - 13 September 2013

Learn about the science and technology behind Earth Observation through half day sessions of lab experiments and demonstrations. Includes an exhibition tour at a major science conference.



Suitable for:

- Groups of ~15 students at S5 or S6 level*
- CPD sessions available for educators

* Includes content that complements the Biology, Chemistry Geography, Physics Highers and Advanced Highers and provides a clear example of interdisciplinary science

For FREE registration and information visit:

<http://www.bis.gov.uk/ukspaceagency/news-and-events/2013/Jun/register-for-living-planet-symposium-school-lab>

Image credit: ESA and DLR



German
Aerospace Center



flickr

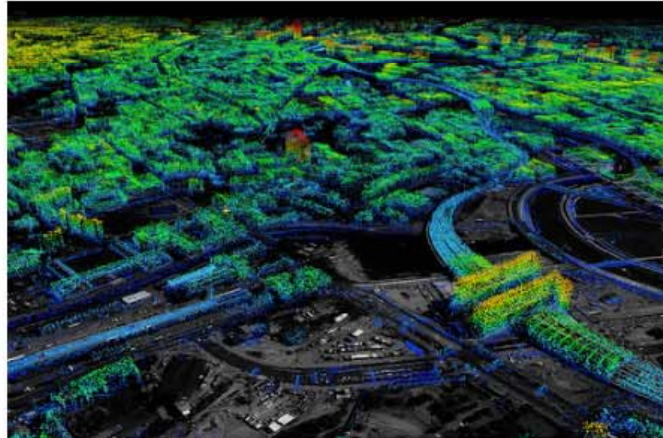
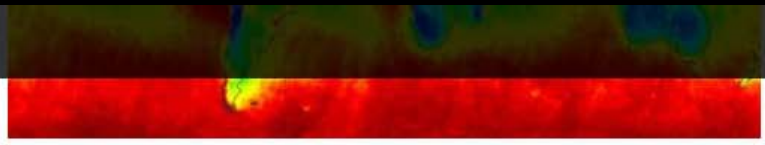
Registrieren

Entdecken

Hochladen



Anme



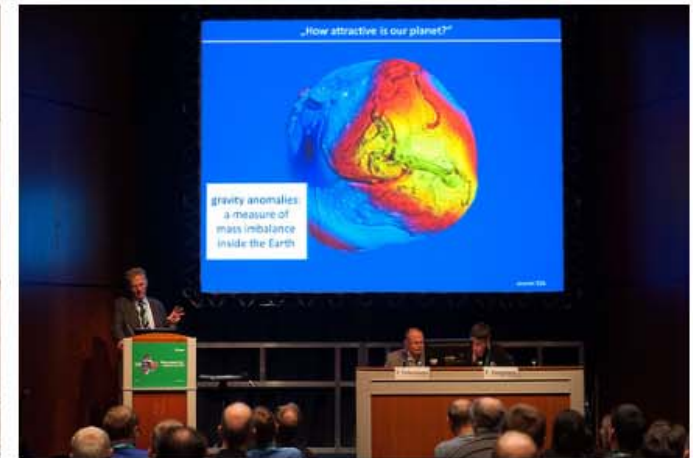
registrieren

Entdecken

Hochladen



Anmelden



LPS16

Home

Registration

Programme

Authors

Events and Keynotes

Sponsors

Partners and Exhibitors

Guidelines for Presenters

EC Grant

News

Important Dates

Special events

Venue and Accommodation

Objectives

Themes

Abstract Submission

Committees

Links

Contacts

[LPS16 > Home](#)



Living Planet Symposium 2016

The 2016 European Space Agency Living Planet Symposium follows the previous successful symposia held in Edinburgh (2013), Bergen (2010), Montreux (2007) and Salzburg (2004).

The event will be held in **Prague, Czech Republic** from **9-13 May 2016** and is organised in cooperation with the Ministry of Transport, Ministry of Environment and Ministry of Education, Youth and Sports of the Czech Republic and the local support from Charles University in Prague.

A first [announcement](#) has been released, with a deadline for abstract submission on 16 October 2015. Authors can check [here](#) their submitted abstracts. All received abstracts have been reviewed by a [Scientific Committee](#), notification of acceptance has been provided in early February 2016. [Registration](#) to attend the event (free of charge) has been opened in February 2016 [with deadline on 22 April](#), after the publication of the [preliminary programme](#). We thank our [Sponsors](#) for the support.

Full papers for accepted contributions shall be provided at the event and will be published as [ESA Special Publication](#). An [Exhibition](#) will be running from 9 to 12 May 2016. Before the official opening on Monday 9 May, [keynote presentations](#) are scheduled.

Latest News

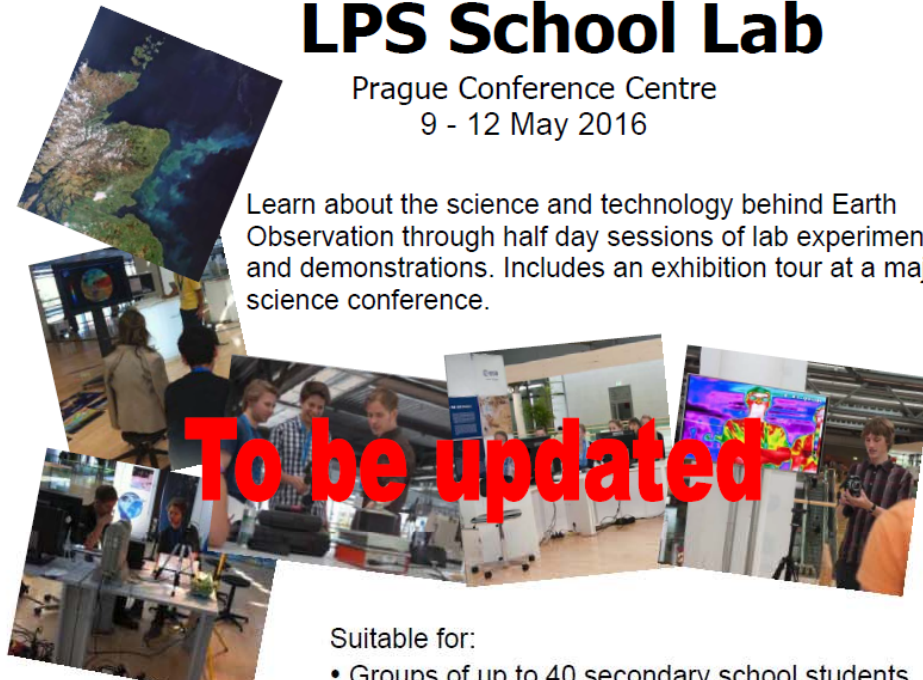
23-March-2016: [A School lab](#) is organised during LPS16!



LPS School Lab

Prague Conference Centre
9 - 12 May 2016

Learn about the science and technology behind Earth Observation through half day sessions of lab experiments and demonstrations. Includes an exhibition tour at a major science conference.



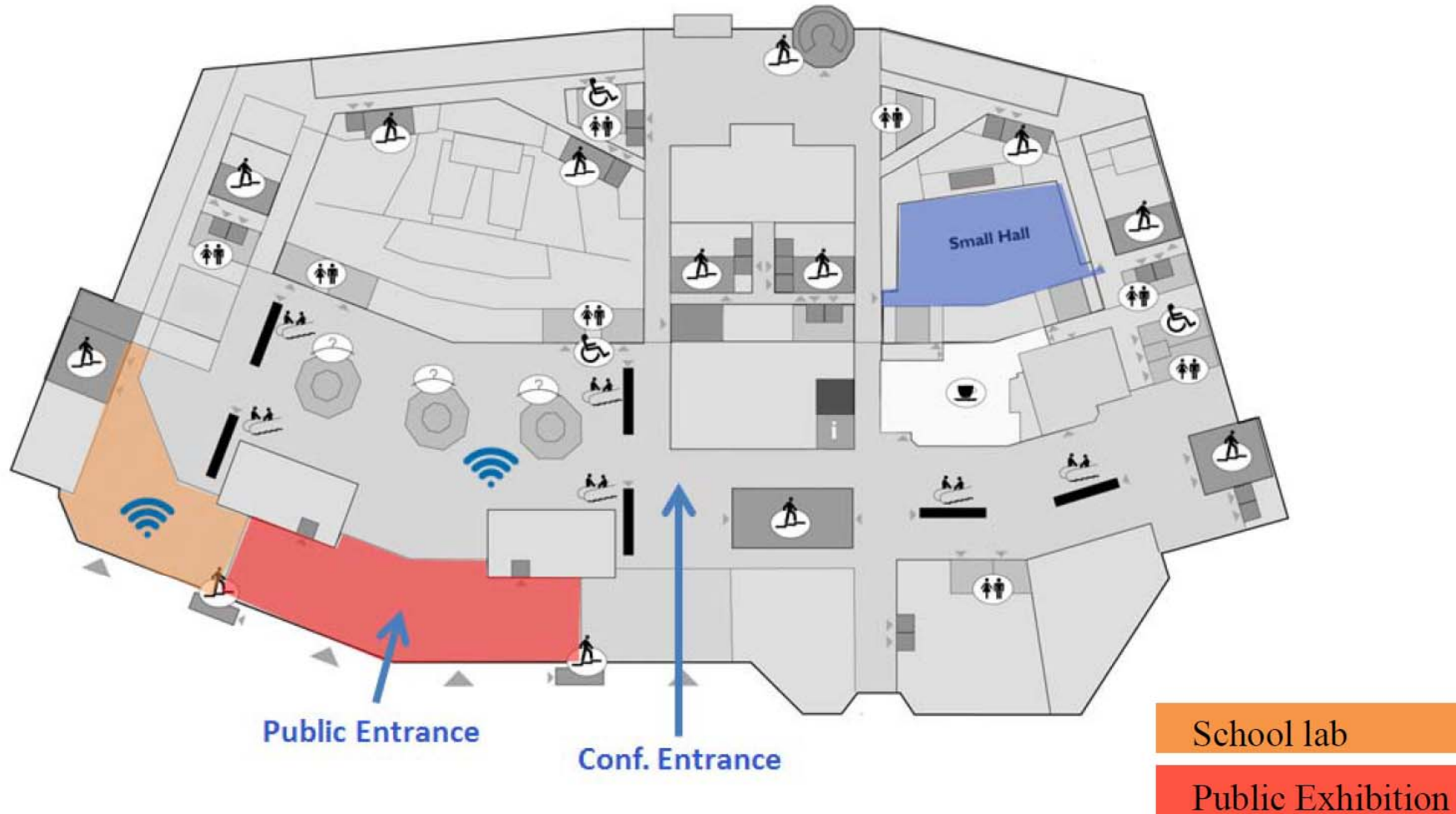
Suitable for:

- Groups of up to 40 secondary school students
- Sessions available for educators

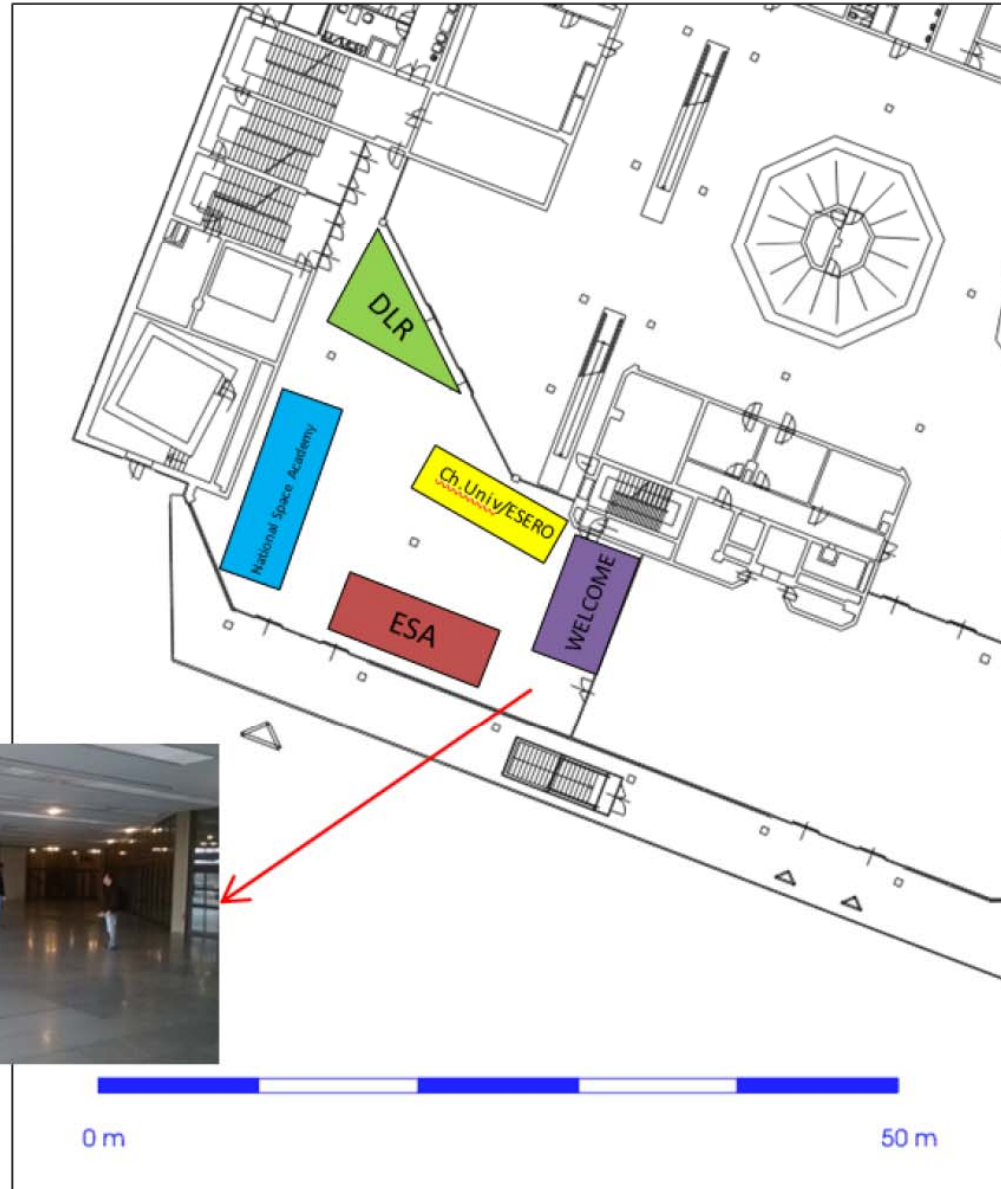
* Includes content that complements Biology, Chemistry Geography, Physics and provides a clear example of interdisciplinary science

For FREE registration and information visit:
<http://www.xxxxxx....>





Plan of the School Lab zone with areas assigned to each agency. The WELCOME area is planned for the introduction (first 15 minutes of each session) and for the feedback collection (last 15 minutes of each session).



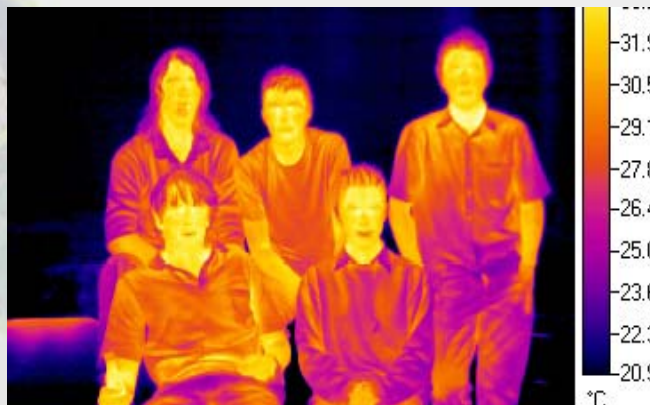
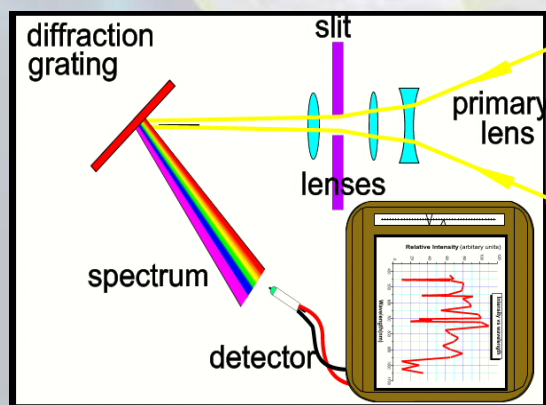
(i) Education in the frame of International Cooperation with other space agencies

→ LIVING PLANET SYMPOSIUM SCHOOL LAB



Creation of joint School Labs with ESA, DLR, UKSA and UK national space academy, Charles University.

Such as IGARSS 2012 and LP Symposium 2013 and LP Symposium in May 2016. Demonstrating RS to schools using instruments such as: Field Spectrometer, Thermal camera, UV light, Stereo Optical Camera, possibly enriched by many other experiments and 3D / oculus technology

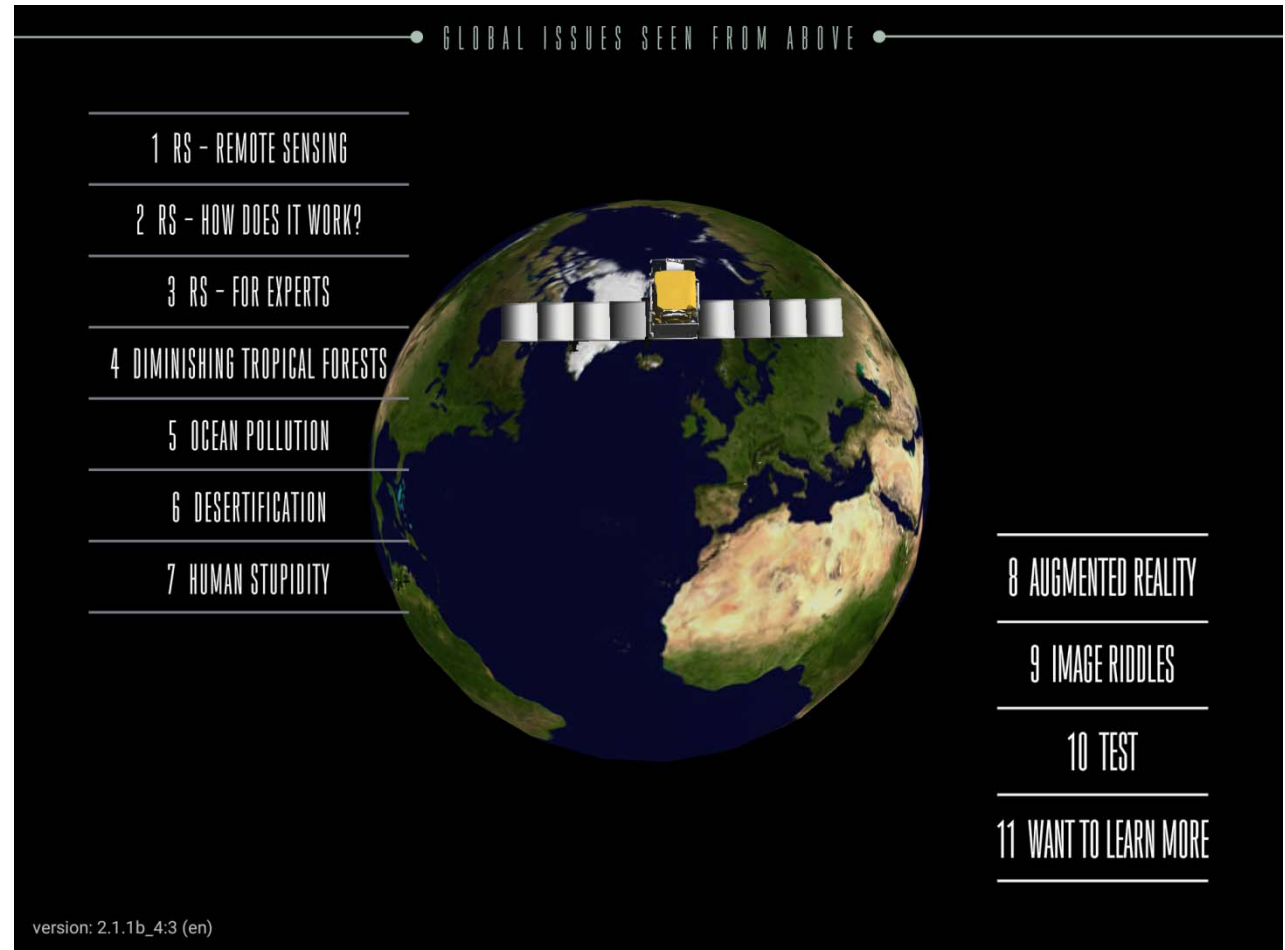


1) Global Issues from Above (EO tablet app)

For Android (now) and iOS (July 2016)

Czech and English,
other languages possible

Introduction to EO
and Global issues
applications

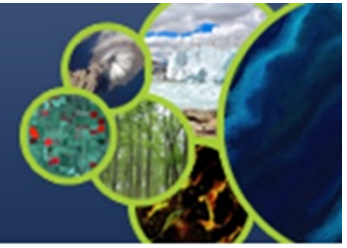


2) Two textbooks and 18 educational programmes for basic and secondary schools

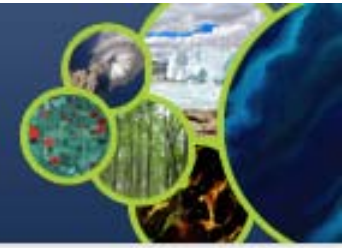




The 5th Meeting of the CEOS Working Group on
Capacity Building & Data Democracy (WGCapD-5)
The CEOS Systems Engineering Office (SEO), Hampton, VA, USA
March 30th – April 1st, 2016



Thank you



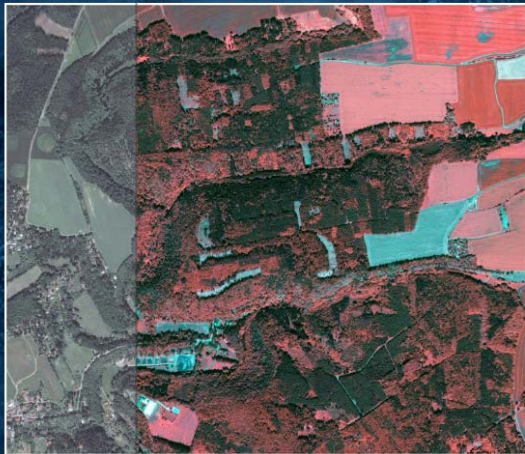
USEFUL ADDRESSES

- ➡ *ESA education portal: www.esa.int/education*
- ➡ *to order EO material: education@esa.int or eohelp@esa.int*
- ➡ *Eduspace: www.esa.int/eduspace*
- ➡ *ESA EO Education web page: <http://eo-edu.eo.esa.int>*
- ➡ *DLR_School_Lab: <http://www.dlr.de/schoollab/en/desktopdefault.aspx/tab1d-1738/>*

► Remote Sensing (introduction to principles and function)

RS - FOR EXPERTS

True and false colours
Choose a surface type and drag the bar across the image to see how false colours make the surface type stand out.



When processed by special software, satellite images can be displayed in true or false colours. A true-colour image shows surfaces the same way as the human eye sees them. By converting an image into a false-colour image, we can highlight things that are not distinguishable in a true-colour image, such as different types of vegetation.

In a true-colour image a forest looks completely uniform. In a false-colour image we can, for example, tell a coniferous forest from a deciduous one, or distinguish the height of the trees.

FOREST WATER BARE LAND FIELDS WITH CROPS

HOME
ENCYCLOPAEDIA
6 / 8
EVALUATE

RS - HOW DOES IT WORK?

Orbits
To learn more, click on "Info".

How does a satellite move?

Geostationary orbit
A geostationary orbit is an orbit above the Earth's equator. Since satellites in such an orbit move at the same speed and in the same direction as the Earth's rotation, they seem to "hang" in the sky above the same place on the Earth's surface (always above the equator). These satellites monitor the same area all the time, being unable to "see" the opposite hemisphere or the polar regions.

Polar orbit
Satellites in a polar orbit fly in a plane that is approximately perpendicular to the equator. Due to the Earth's rotation they monitor a different area on each of their orbits and are thus able to cover the whole surface of the planet over time. However, they are not able to monitor one place on a continuous basis.

HOME
ENCYCLOPAEDIA
6 / 11
EVALUATE

RS - REMOTE SENSING

Why observe the Earth with satellites?
By clicking on the small satellite/eye, you can change the reflected spectrum. At the bottom, you can switch between a forest and a bus.

WHAT DOES THE HUMAN EYE SEE?
The human eye is only capable of discerning some of the reflected electromagnetic radiation – the visible light.

WHAT DOES A SATELLITE SEE?
Satellites or, more precisely, the instruments carried by satellites are able to record other parts of the electromagnetic spectrum as well (such as ultraviolet and infrared radiation), thus collecting more information than humans. After they are launched, they orbit the Earth for many years, sending out huge amounts of data without the need for human intervention.



HOME
ENCYCLOPAEDIA
7 / 12
EVALUATE

► Global issues – EO applications

Diminishing tropical forests

Ocean pollution

Desertification

(Human stupidity)

4 DEFORESTATION

What would a European spruce look like in the tropical forest?
Make the small spruce seedling grow to a height usual for spruces in Europe.

70 m
40 m
20 m
5 m

Too much. Spruces don't grow that tall. Try again.

HOME
ENCYCLOPAEDIA
4 / 10
EVALUATE

This interface shows a height scale on the left with markers at 5m, 20m, 40m, and 70m. A small green spruce tree is positioned at the 5m mark. The background is a dense tropical forest. A text box at the top right asks the user to make the spruce grow to a height usual for spruces in Europe. A feedback message at the bottom says "Too much. Spruces don't grow that tall. Try again." The right sidebar contains navigation icons for HOME, ENCYCLOPAEDIA, a progress indicator (4 / 10), and EVALUATE.

5 DESERTIFICATION

Causes of desertification
Read the information accompanying the pictures.

Unsuitable farming methods reduce soil fertility. It is very important to protect the soil against erosion. Such measures include, for example, following the contour lines when ploughing, rather than going downhill, as this prevents water from running off and carrying away fertile soil. Reasonable use of...

INFO INFO INFO INFO

HOME
ENCYCLOPAEDIA
5 / 9
EVALUATE

This interface features a title "5 DESERTIFICATION" and a sub-header "Causes of desertification". Below the text is a grid of four images: cows in a dry field, a plowed field with contour lines, a deforested landscape, and an irrigation system. Each image has an "INFO" button. The right sidebar includes navigation icons for HOME, ENCYCLOPAEDIA, a progress indicator (5 / 9), and EVALUATE.

5 OCEAN POLLUTION

Looking from above
Match the circles on the satellite image with the right captions.

LAND
ALGAL BLOOM
CLOUDS
CLEAN WATER
CLEAN WATER
A LIT-UP CITY
AN OIL SPILL

HOME
ENCYCLOPAEDIA
1 / 9
EVALUATE

This interface shows a satellite image of a coastal area with several pink circles overlaid. To the right is a list of captions, each with a corresponding circle icon. The captions are: LAND, ALGAL BLOOM, CLOUDS, CLEAN WATER, CLEAN WATER, A LIT-UP CITY, and AN OIL SPILL. The right sidebar contains navigation icons for HOME, ENCYCLOPAEDIA, a progress indicator (1 / 9), and EVALUATE.

4) E-learnings for basic and secondary schools

OSTROVPOZNANI.CZ/elearnings/edu3/odbornej/4#slide6

GEOINFORMATIKA

HISTORIE DÁLKOVÉHO PRŮZKUMU ZEMĚ

PRINCIP FUNKOVÁNÍ

VLASTNOSTI ELEKTROMAGNETICKÉHO ŽÁŘENÍ

DRUŽICOVÉ SYSTÉMY

VLASTNOSTI DRUŽICOVÝCH SNÍMKŮ

KLASIFIKACE OBRAZŮ

VYUŽITÍ

POUŽITÁ LITERATURA

Vlastnosti družicových snímků

Každý senzor nesený družicí vytváří snímky s určitými specifickými vlastnostmi. K základním charakteristikám každého snímače zařízení patří rozlišovací schopnosti, která je určena čtyřmi hlavními typy – rozlišení prostorové, časové, spektrální a radiometrické. U prostorové, časové a spektrální rozlišovací schopnosti je potřeba dosáhnout určitého kompromisu, jelikož cílem je poskytnout co nevyhodnější data pro náš účel.

Prostorová rozlišovací schopnost udává velikost nejménšího objektu, který lze na snímku ještě rozpoznat. V digitálním obraze se jedná o velikost obrazového prvku, tedy pixelu. Je-li prostorová rozlišovací schopnost 10 metrů, například 10 m, pak bude mít každý pixel velikost 10 m × 10 m. Čím bude tato rozlišovací schopnost větší, tím více detailů budeme schopni ze snímku rozeznat. Rostou však samo sebou značně náklady na technické vybavení přístrojů.

Časová rozlišovací schopnost je dána dobou, která uplyne mezi dvěma po sobě následujícími přelety družice nad tímž územím. Snímky stejného místa na zemském povrchu pořízené v různých časových obdobích poskytují velmi cenné informace, které trají nepostřehitelnou roli při detekci změn. S úžitím těchto multitemporálních dat lze sledovat vývoj obátnosti, požárů, eroze nebo stav vegetace z pohledu časových změn.

Síla intervalu vlny elektromagnetické záření, spektrálních pásem, která je ve více spektrálních pásech parametru jako vodní obsah, Počet rozlišitelných úrovní objektu. Rozsah hodnot je se S rostoucím exponentem se (2ⁿ), budou bezpečitby kvality

senzor	doba oběhu	rozlišení
1	1 den	10 m
2	16 dní	10 m
3	16 dní	10 m
4	16 dní	10 m
5	16 dní	10 m
6	16 dní	10 m
7	16 dní	10 m

> GEOINFORMATIKA > K TÉMATU > DÁLKOVÝ PRŮZKUM ZEMĚ
> ZPĚT NA WEB

Pokračování

Holá půda

Holá půda se v této kombinaci spektrálních pásem jeví v odstínech růžové.

ZMĚNSIT

AKADEMIE GEOINFORMAČNÍCH DOVEDNOSTÍ

Jak objekty odrážejí

ZPĚT NA ANIMACI

ZVĚTŠIT

AKADEMIE GEOINFORMAČNÍCH DOVEDNOSTÍ

POZNÁVÁME GEOINFORMATIK(O)U

GEOINFORMATIKA PRO KAŽDÉHO

DPZ

CIS

GPS

ZPĚT NA WEB