ESA Earth Observation educational programme

Francesco Sarti, ESA, Scientific Coordinator of the Education and Training Activities in Earth Observation

Trans-Atlantic Training – Pécs 2017

EO Tools for Education

Creation of Tools for Earth Observation Education, Training and Outreach

Tools for secondary schools

1. Posters
2. Atlases
3. Multilingual web-based tools (Eduspace),
4. Educational SW package for Image Processing and GIS (LeoWorks)

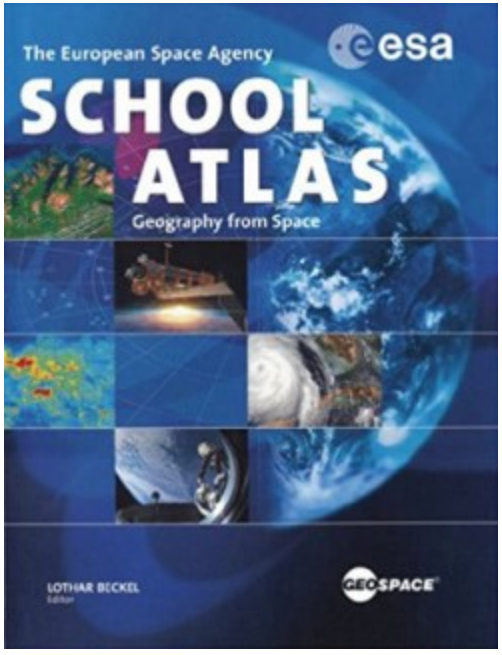
Tools for general outreach

1. i-books
2. Apps for Tablets

Tools for University level

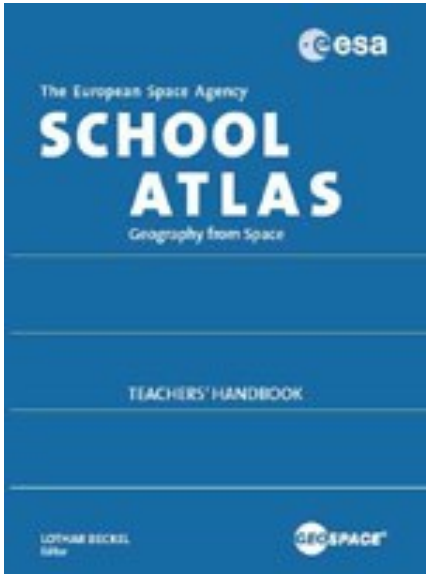
1. MOOCs
2. SAR videos
3. SNAP Tutorials
4. Thematic Exploitation Platforms (TEP's)

ESA School Atlas, new ESA Water Atlas

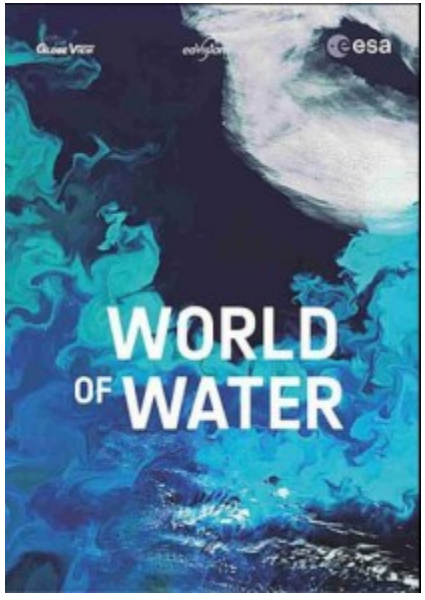


Introduction to ESA; Earth Observation; Global Overview; Continental Overview; the Natural Sphere; The Cultural Sphere.

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



Describes the major issues related to water on Earth. It also presents water as a natural resource, focusing on global water, the oceans, seas, lakes and rivers of the Earth.

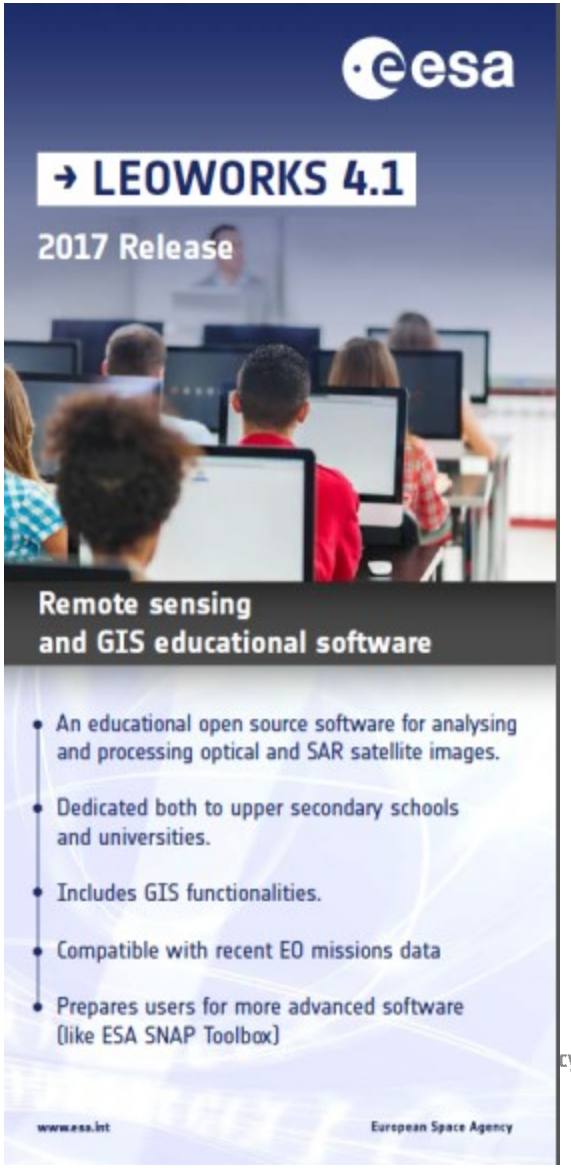


Both freely available i n PDF from ESA web pages (https://earth.esa.int/web/guest/eo-education-and-training)

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

LEOWorks 4.1
Image Processing Software

1. View images, histogram, pixel values, header info
2. Crop, invert, stretch, layer stack, etc
3. Image arithmetic, filters
4. Classification, PCA, geometric correction, pan sharpening
5. Radar and optical module (multimission, including Sentinel data)
6. GIS tools
7. Open-source, Java-based



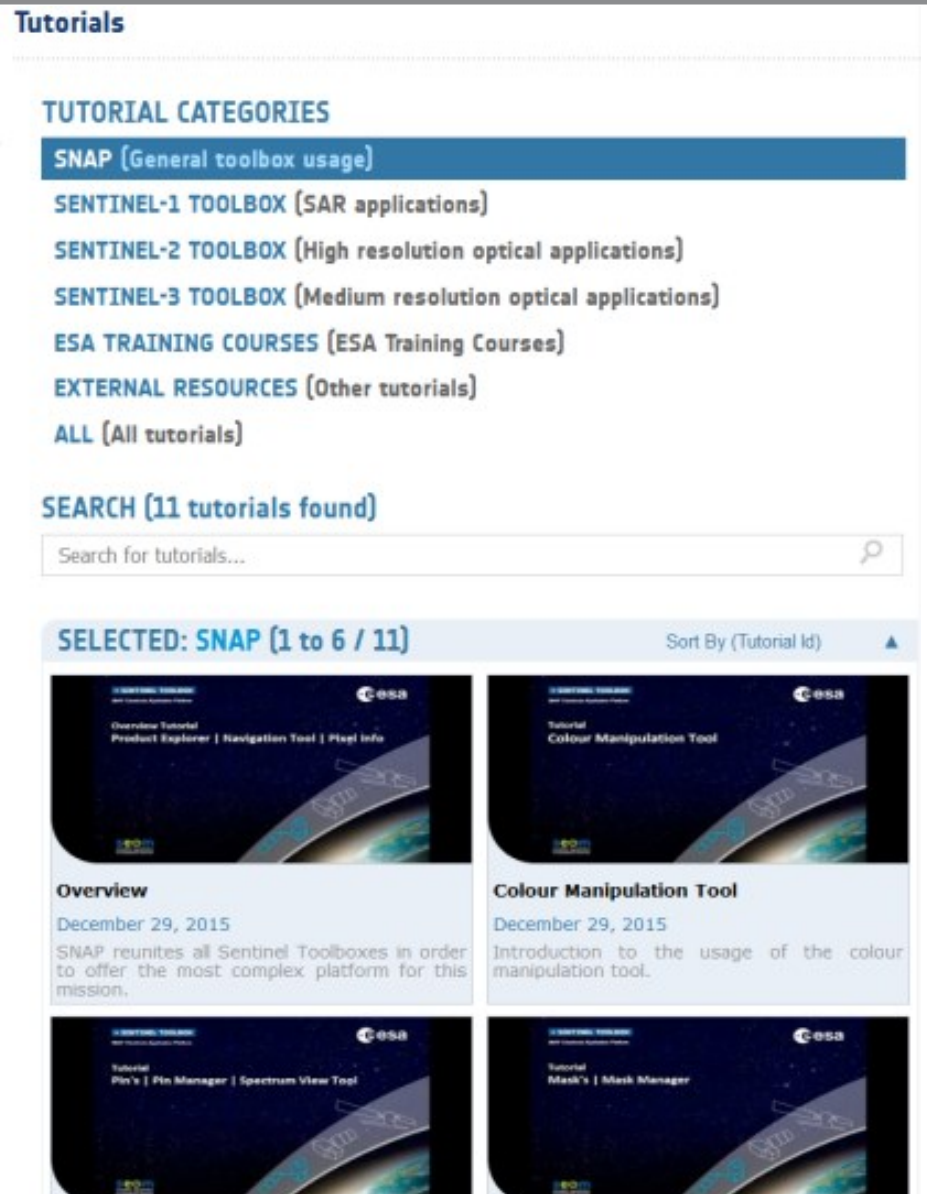
Sentinel Application Platform (SNAP): SW toolboxes with tutorials and forum

1. Set of tutorials for SNAP (Sentinel toolboxes)

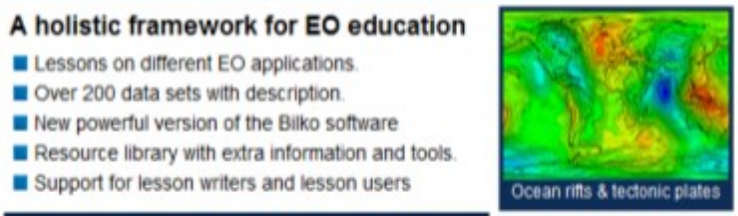
http://step.esa.int/main/doc/tutorials/

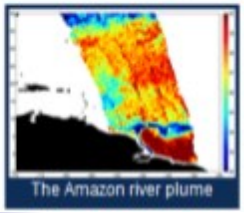
1. User forum dedicated to Sentinel toolboxes (SNAP)

http://forum.step.esa.int/



Capacity Building in the frame of International Cooperation with UNESCO





I-books, Apps

Sentinel App

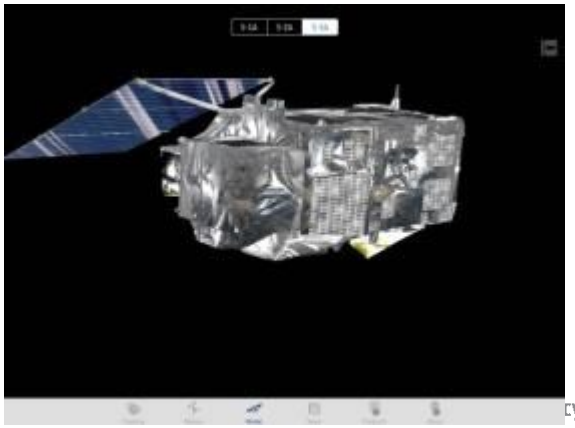
esa

esa sentinel

Available on the App Store

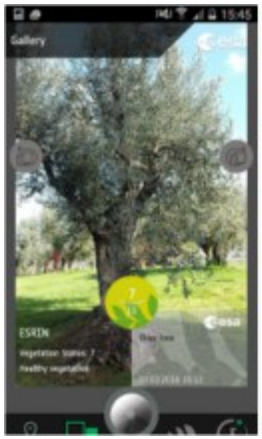
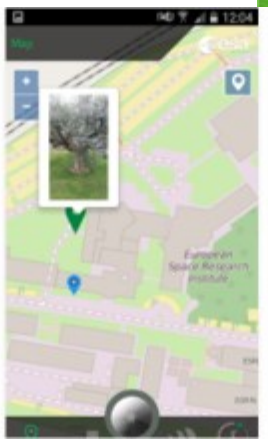
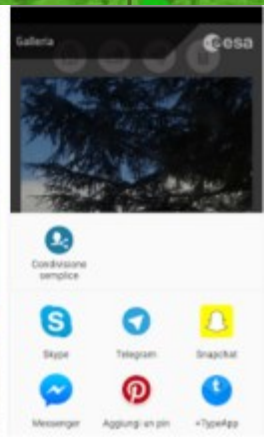
ANDROID APP ON Google play

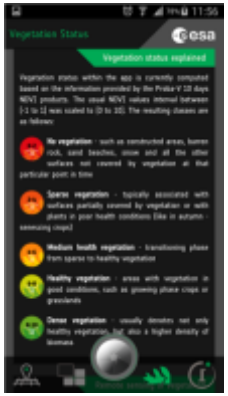
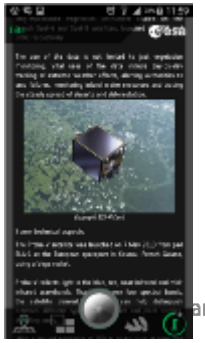
- See where the Sentinel satellites are in real-time
- See the last and next time they have been and will be over your location; Move them to the time of the last data transmission and smoothly move them back to their current location over the 3D globe
- Explore the Sentinel satellite 3D models
- Get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



Proba-V App

- Take a picture of a landscape
- Associate the vegetation status derived from Proba-V NDVI products in your area to the picture
- See graphics of the vegetation status evolution during the last 6 months (tap on picture icon or on map)
- Build your picture gallery and see all your pictures on the map
- Share the pictures on social media
- Learn about Proba-V, get news and image of the week
- UI available in several languages: English, Italian, Portuguese, Dutch, Spanish, German, etc.

CCI App & visualisation tool

Climate from Space, ESA's iPad App for visualization of climate data being produced through the European Space Agency's Climate Change Initiative (CCI)

Available on the App Store

ANDROID APP ON Google play

Allows to visualize temporal changes of:

- sea surface temperature,
- the ice sheets,
- sea level,
- sea ice,
- carbon dioxide,
- soil moisture and many more.

Video courses (University level) about EO

ESA recently started to create educational MOOCs for EO techniques & Applications, starting with Climate Change

What is a MOOC?

1. **Massive**: no limitation on the number of participants. The record is 440,000!

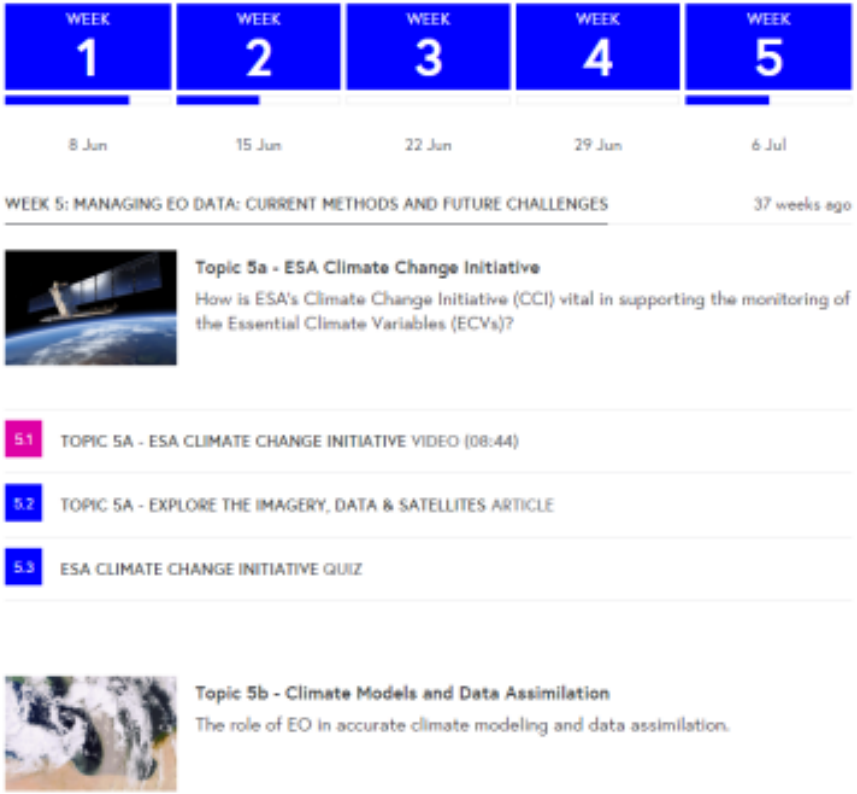
2. **Open**: free and accessible for anyone with an Internet connection

3. **Online**: all activities are made online

4. **Course**: it has a specific topic, prepared by specialists, offering theoretical and practical content

1st MOOC about “Climate from Space”

- https://www.futurelearn.com/courses/climate-from-space
- **10,000+ subscriptions**, 50% active, **completion rate** of 30% (very high!)
- MOOC 5-weeks course (June, 2015 / Dec, 2015) included videos, text, quiz, interactive exercises, satellite tracking app
- Interactive, with Q&A. Two editions done, more will follow

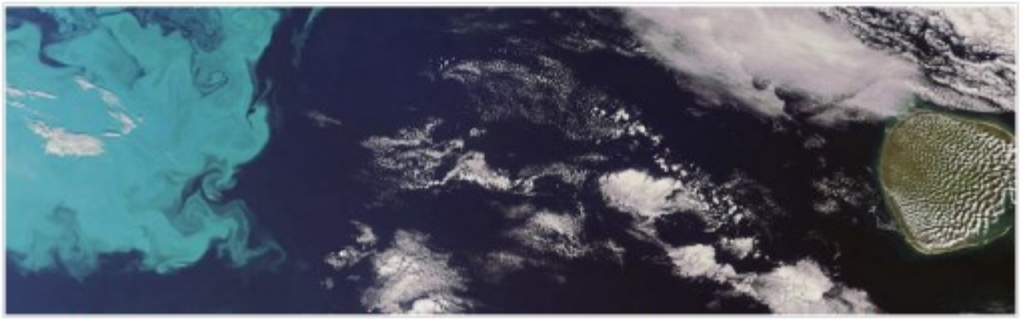


Other ESA MOOCs

Monitoring Climate from Space

Explore our planet from space and learn how Earth observation is used to monitor climate change, with this free online course.

Earth Observation from Space: the Optical View



Discover how optical Earth observation data is gathered and used in this free online course from the European Space Agency (ESA).

- **3rd ESA MOOC on Climate from Space "Greenland special"**

https://www.futurelearn.com/courses/climate-from-space

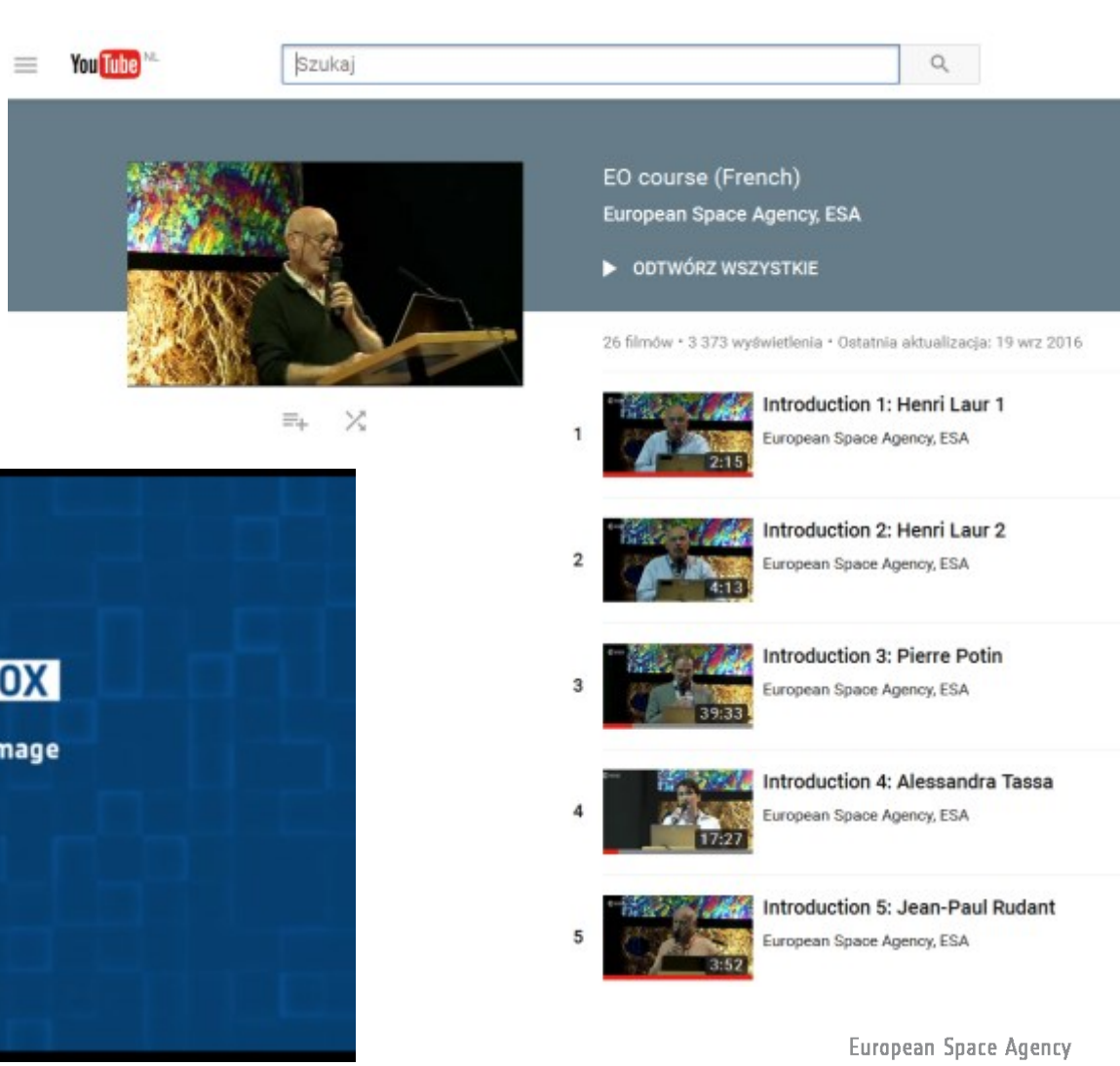
- **1st ESA MOOC on "EO from Space: The Optical View"**

https://www.futurelearn.com/courses/optical-earth-observation

- **1st ESA MOOC on "EO from Space: The Radar View"**
  Foreseen launch in October 2017

SAR video lectures and SNAP tutorials (French)

1. SAR basic theory and practical exercises with SNAP (French version)
2. Subtitles (Spanish, English) done for free by students, in preparation



Firefox | EO Education and Training Home - Eart... | https://earth.esa.int/web/guest/eo-education-and-training | Most Visited | Getting Started

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EO Education News

Participate in the ESA LearnEO! competition

23 September 2013

Participate in the ESA LearnEO! lesson-writing competition, bring your work to a world audience and take a chance to win up to 5,000 euros!

Find out more on the LearnEO! competition webpage.

EO Education and Training

Overview of Earth Observation Training at ESA

ESA undertakes a wide range of activities in the field of Earth Observation education, training and capacity building. The scope of these activities ranges from high level training in state-of-the-art processing for the next generation of Principal Investigators to more general outreach activities and Earth Observation education for schools.

The aim of this website is to provide a single portal that supplies information about these activities, and enables access to resources produced in their framework.

LearnEO!

LearnEO! is an Earth observation education project funded by ESA. Its aim is to increase the understanding of satellite data from ESA missions and show how these can be used to tackle environmental problems in the real world.

Read more

Education for Schools

ESA has developed an EO educational website "Eduspace" that mainly targets secondary schools. In addition to this, ESA provides workshops for teachers and has funded the development of many tools for EO education.

Read more

EO Summer Schools

TIGER Training

EO Education and Training

- EO Education and Training Home
- EO Education for Schools
- Advanced EO Training for PIs
- Other EO Training

EO data

- EO data distributed by ESA
- Access data online
- Access GMES data
- How to apply for data
- EoII Catalogue
- ESA Multimedia Gallery

EO training activities

- Education for Schools
- EO Summer Schools
- Dragon Programme
- Tiger Initiative
- Advanced Training
- Other EO Training
- Upcoming / Past Events

EO software

- NEST Training
- LEOWorks Download (19.5mb)
- Bilko
- ILWIS

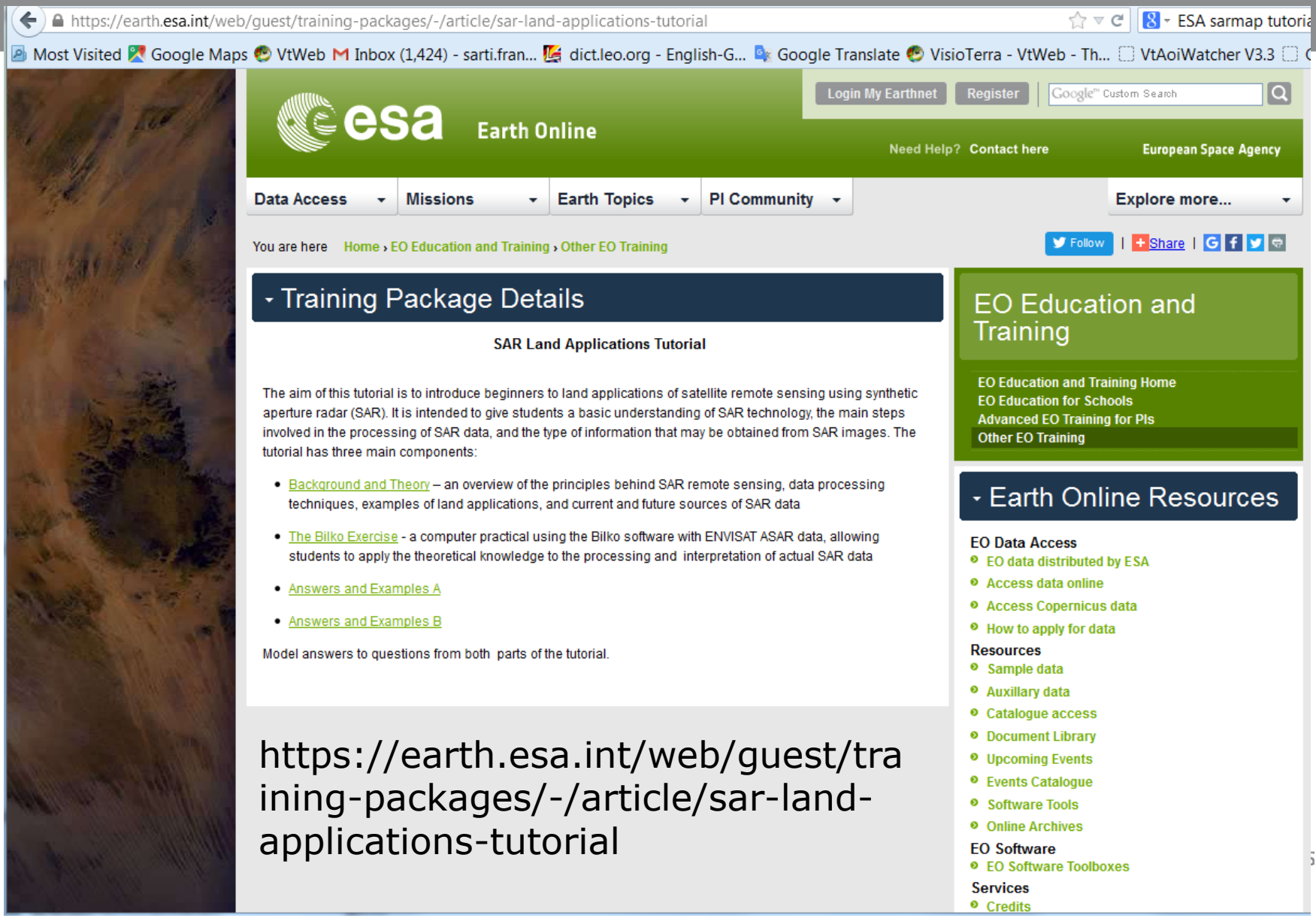
Key Resources

- Sample data
- Auxiliary data
- Catalogue access
- Document Library
- Upcoming Events
- Events Catalogue
- Software Tools
- Online Archives
- EO Software Toolboxes

Central page for EO education and training

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

Central page for EO education and training



https://earth.esa.int/web/guest/training-packages/-/article/sar-land-applications-tutorial

Central page for EO education and training

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Other EO Training

In addition to the programmes listed in the Overview page, ESA organises other EO training events on an ad hoc basis, and produces EO training material at various levels.

Below is a list of each training package listed in chronological order (to access the material for each package, click on the links provided in the list):

Training Packages

7th ESA Training Course on Radar Remote Sensing (30 May - 4 Jun 2016)
Training course on the theory and applications of spaceborne Synthetic Aperture Radar (SAR). The course is held in Sofia, Bulgaria.

Read more

EO Education and Training

- EO Education and Training Home
- EO Education for Schools
- Advanced EO Training for PIs
- Other EO Training

EO Data

- EO data distributed by ESA
- Online Archives
- Catalogue access
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- Eoli Catalogue
- ESA Multimedia Gallery

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https://earth.esa.int/web/guest/eo-education-and-training/university-undergraduate-level

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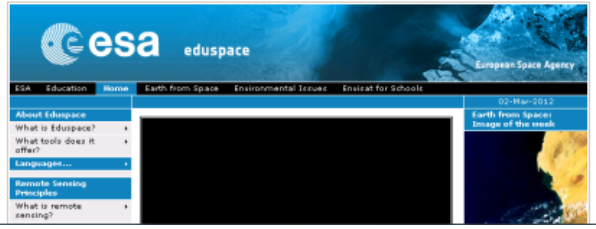
EO Education for Schools

EO Education for Schools

ESA undertakes educational projects aimed at bringing Earth Observation into the school curriculum. ESA has developed the Earth Observation educational website, "Eduspace". Other activities include organising and contributing to workshops for teachers, and developing tools (such as atlases and CDs) for EO education.

Eduspace

ESA has produced and maintains the Earth Observation website for secondary schools, Eduspace. This website contains a wealth of knowledge about remote sensing, image processing, satellites, instruments and applications of Earth Observation. As well as being a source of information, the website is interactive and contains many exercises and case studies designed to be used with software and data that can be downloaded freely from the site. Eduspace is targeted mainly to secondary schools, but can be useful to anyone new to Earth Observation.



EO Education and Training

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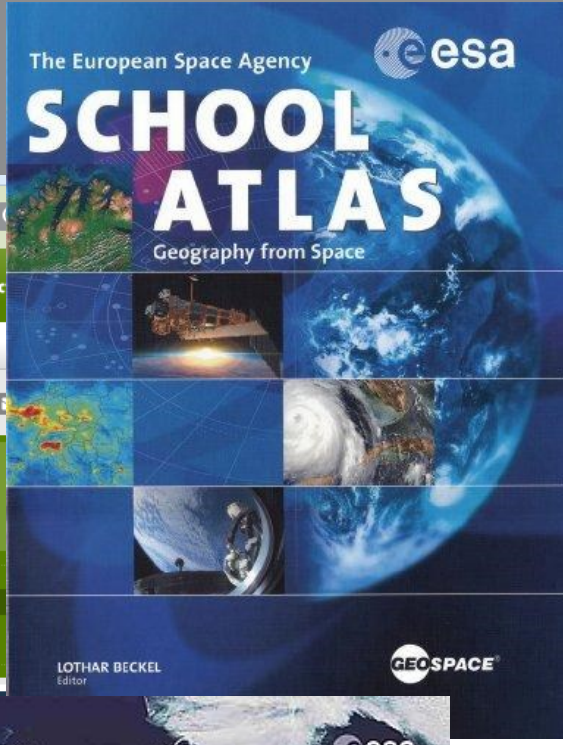
EO software

Central page for EO education and training



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ESA School Atlas

ESA and Geospace launched an educational resource in the form of the ESA School Atlas. As a complement to the more conventional atlas, this represents an evolutionary leap in teaching resources, using satellite data to show the Earth *as it really is*.

The Atlas is built on satellite imagery and is packed with the most current and visually stunning results of Earth Observation. It displays in a clear and novel way all the fundamental processes affecting the Earth system, and demonstrates the techniques of the future for monitoring and understanding our planet.

This Educational resource is an invaluable tool for the classroom, finally providing a very affordable exposure to costly satellite imagery from a wide variety of sensors. Wide swath imagery providing continental and global overview is included, together with satellite imagery of the highest spatial resolution available today, with images of 0.6m resolution.

The production of the School Atlas was funded by ESA's Earth Observation programme specifically to convert this kind of Earth Observation material into an educational resource affordable to schools, and the atlas is available at a much reduced cost!

Earth Observation exploits our understanding of physics and computer science to observe a great many features and processes taking place on the Earth's surface and atmosphere. Some examples include the monitoring of plants, oceans, atmospheric gas concentrations, geological features and changing cities. As such, while the methods of Earth Observation are primarily relevant to the study of physics and computer science, the applications are significant to an extremely wide variety of disciplines, including among others: geography, biology, chemistry, environmental sciences, art and history.

The ESA School Atlas kit is a very valuable resource also for students of Geographic Information Systems (GIS). There are many ready made digital exercises on DVDs provided with the Atlas that can be used with the free software packages LEOWorks and ArcExplorer.

The Atlas is accompanied by a Teacher's Handbook and a digital version on two DVDs. It is available in both English and German.

Alternatively, select the links below to download freely the DVDs and Teacher's Handbook:

- ESA School Atlas DVD 1 (4.69 Gb)
- ESA School Atlas DVD 2 (3.20 Gb)
- Teacher's Handbook (English)
- Teacher's Handbook (German)

The Atlas contains the following content:

EO Education and Training

- EO Education and Training Home
- EO Education for Schools
- Advanced EO Training for PIs
- Other EO Training

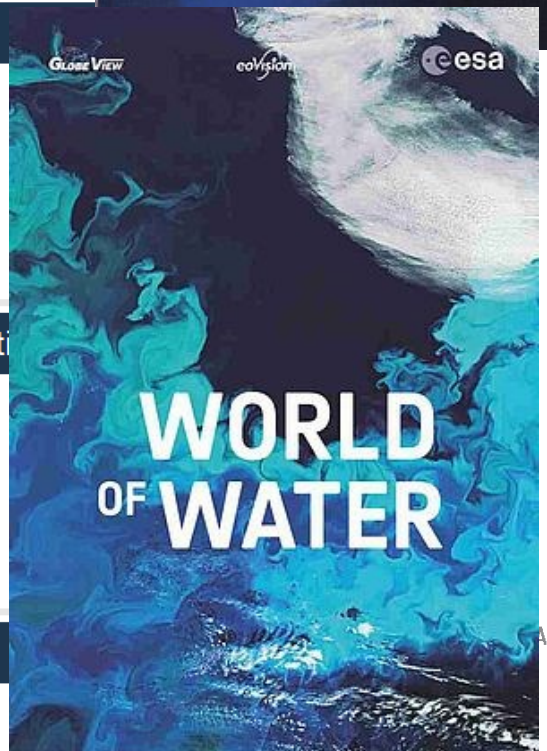
EO data

- EO data distributed by ESA
- Online Archives
- Catalogue access
- Sample data
- Sentinel-1 Data Hub
- Eoli Catalogue
- ESA Multimedia Gallery

EO training activiti

- Education for Schools
- EO Summer Schools
- Dragon Programme
- Tiger Initiative
- Advanced Training
- Other EO Training
- Upcoming / Past Events

EO software



Agency

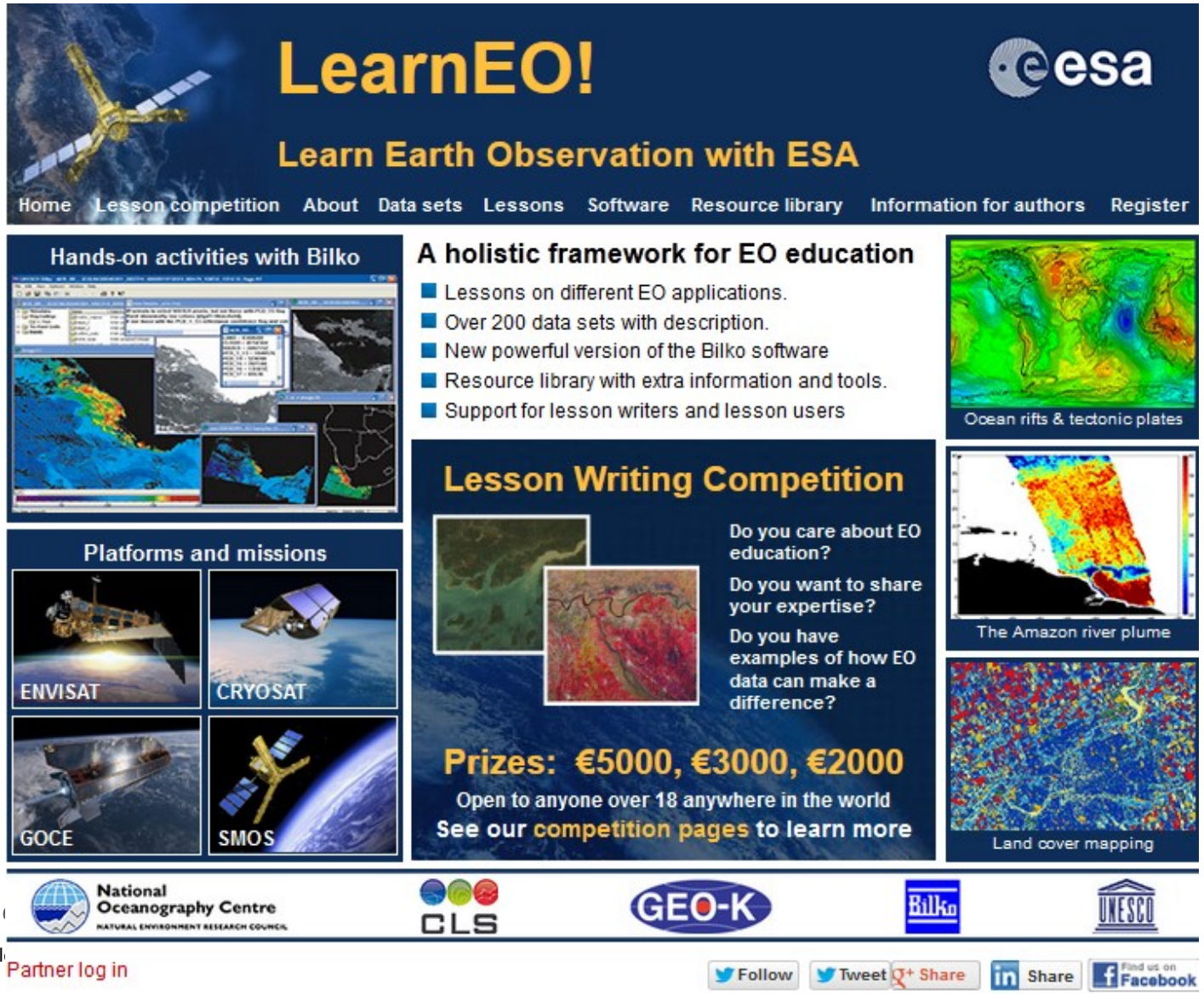
LearnEO!

http://www.learn-eo.org/index.php

1. LeanEO! is an Earth observation education project funded by the European Space Agency. Its aim is to increase the understanding of satellite data from ESA missions and show how these can be used to tackle environmental problems in the real world.

2. Lessons use Bilko software.

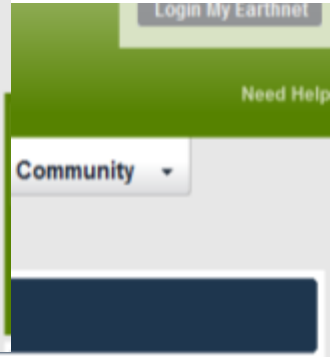
3. **The Amazon river plume**
4. **Monitoring oil pollution at sea**
5. **El Niño and the Southern Oscillation (ENSO)**
6. **Monitoring Atlantic storms**
7. **Observing Earth gravity:**
8. **Monitoring Arctic sea ice**
9. **Forest monitoring**
10. **Monitoring urban growth**
11. **Land cover mapping**
12. **Monitoring soil moisture**

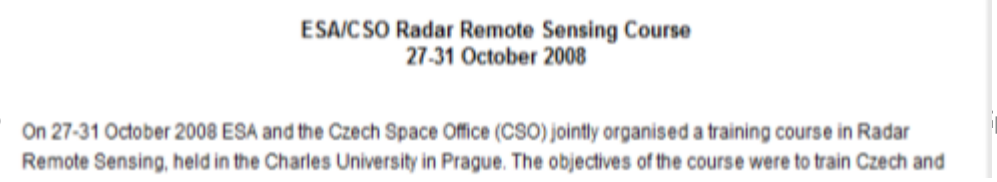


Training courses at University level in Europe: ECS (Capacity Building in Earth Observation)

Series of Radar Training Courses in ECS countries since 2008 (University level): first for Radar Remote Sensing, now extended to the Sentinels

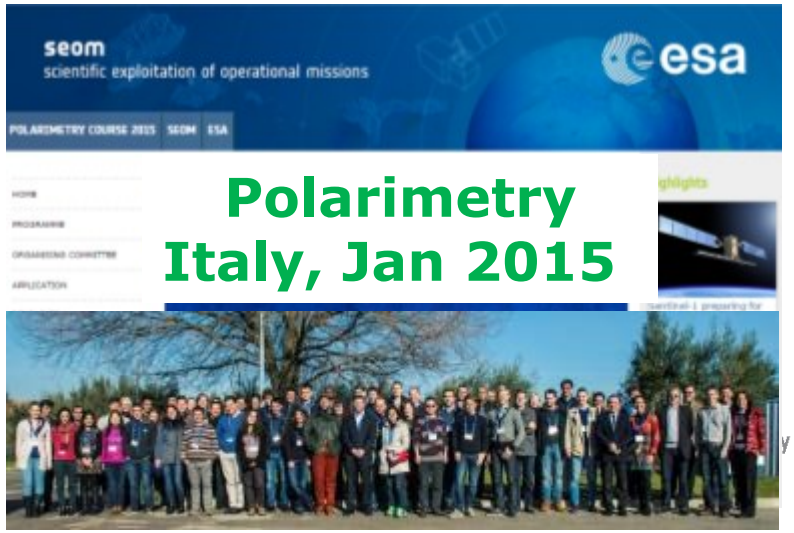
Czech Republic (2008), Romania (2009), Poland (2010), Hungary (2011), Estonia (2012), Cyprus (2013), Malta (2014), Slovenia (2015), Bulgaria (May 2016) and Latvia (Sept 2016), Lithuania (July 2017)





Training courses at University level in Europe: Innovative Training for Next generation EO Scientists, in MS

seom
scientific exploitation of operational missions



Training courses at University level in Europe: Earth Observation Summer Schools in ESRIN

1-12 August 2016 Summer School ESRIN
70 early career scientists have taken part.

Usually organized every 2 years, open to students from worldwide, free tuition

Topics :
Global Observing Systems, Earth System Modelling, Data Assimilation, Global Change

Training courses at University level in Europe: EARSeL

Long-term cooperation in organising joint Workshops for teachers / young reseachers with EARSeL (European Association of Remote Sensing Laboratories)

Recent EARSeL Workshop and Trainings: Bonn (June 2016), Bejing (July 2016) and Frascati(Rome)/ESRIN on RS for Archaeology (November 2015)

Upcoming event: 3rd Student Workshop on Ecology and Optics of the Coastal Zones (10-13 July 2017, Kaliningrad, Russia)

Training courses at University level in Europe: cooperation with other space agencies (DLR, NASA)

Examples: Cooperation with NASA (Trans-Atlantic Training on LULC in Baltic Countries and Eastern Europe). Forthcoming TAT training event in Hungary, June 2017.

See TAT http://web.natur.cuni.cz/gis/tat/
LCLUC workshop http://www.nyme.hu/lcluc_training.html?&L=4
https://web.natur.cuni.cz/gis/lucc/

Cooperation with CEOS WGCapD

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CEOS Committee on Earth Observation Satellites

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Our Work

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    - Training Workshops
    - Meetings
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    - Resources
    - Contact Us
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  - WGClimate
  - WGDisasters
  - WGISS
- Virtual Constellations
- Ad Hoc Teams
- Other CEOS Activities

CEOS / Our Work / Working Groups / WGCapD

WGCapD

The Working Group on Capacity Building and Data Democracy

The WGCapD (formed at the 25th CEOS Plenary in 2011) undertakes a variety of activities based on the four pillars of the Data Democracy Initiative Mission and aims to unify CEOS efforts toward:

- Providing wider and easier access to Earth Observation data
- Increasing the sharing of software tools such as the use of open source software and open systems interface
- Increasing data dissemination capabilities and transferring relevant technologies to end users
- Providing intensive capacity building, education, and training (including awareness and outreach) for enabling end users to gather the information they need and for increasing communication on achieved results

The WGCapD-6 Group Photo in Oberpfaffenhofen, Germany (2017)

Training courses online - 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

http://seom.esa.int/

seom
scientific exploitation of operational missions

esa

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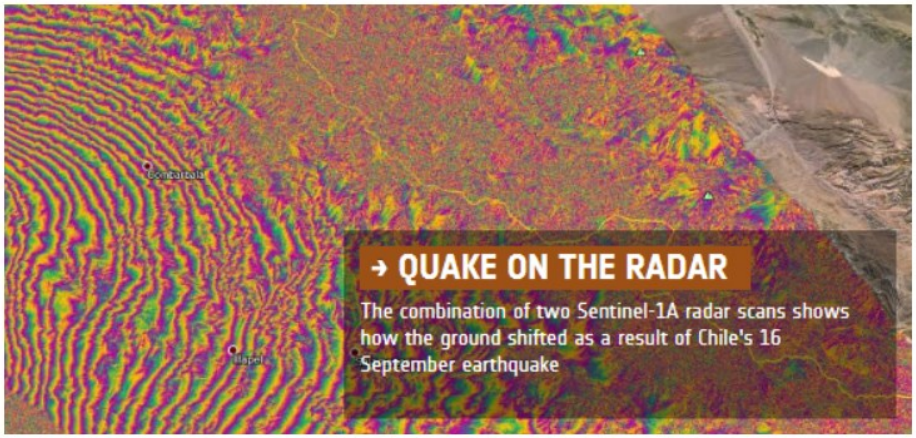
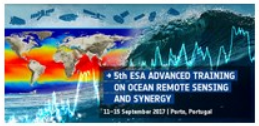
SEOM > Home



Archive

seom
scientific exploitation of operational missions

EO OPEN SCIENCE

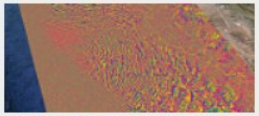


Ocean Training Course 2017

Land Training Course 2017

SEOM STUDIES RESULTS

Chile earthquake on the Radar



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S1 Toolbox Mosaic of Estonia

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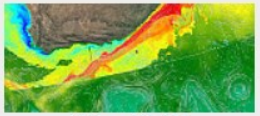
Ocean Virtual Laboratory



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EO Science for Society

Launch of EO Open Science 2.0

SENTINEL-2 for Science

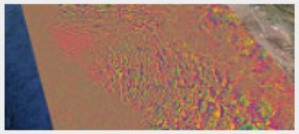
Shaping next-generation

European Space Agency

http://seom.esa.int/

SEOM STUDIES RESULTS

Chile earthquake on the Radar



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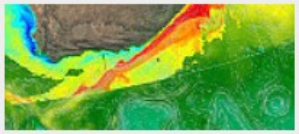

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Launch of EO Open Science 2.0

SENTINEL-2 for Science Workshop

Shaping next-generation scientists

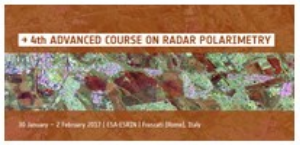
The SEOM (Scientific Exploitation of Operational Missions) element:

The prime objective of the SEOM element of the Earth Observation Envelope Program 4 is to federate, support and expand the large international research community that the ERS, ENVISAT and the Envelope programmes have build up over the last 20 years. It aims to further strengthen the international leadership of European Earth Observation research community by enabling them to extensively exploit observations from future European operational EO missions. SEOM will enable the science community to address many new avenues of scientific research that will be opened by free and open access to data from operational EO missions.

EO Science for Society

FRINGE 2017

Polinsar 2017



Polarimetry Course 2017

ESA EO summer school

EO OPEN SCIENCE 2016

Thanks for your attention!!!

Web sites of interest for EO Education:

Copernicus: http://copernicus.eu/

ESA Earth Watching: http://ew.eo.esa.int/web/guest/home

ESA Education: http://www.esa.int/Education

SEOM: http://seom.esa.int/

ESA Earth Observation: http://www.esa.int/Our_Activities/Observing_the_Earth

ESA Earth Observation Education: https://earth.esa.int/web/guest/eo-education-and-training

Eduspace: http://www.esa.int/SPECIALS/Eduspace_EN/

International Charter: www.disasterscharter.org