

EO Tools for Education

8th ESA Training Course on Radar and Optical
Remote Sensing, 5 - 9 September, 2016, Cesis,
Latvia

Francesco Sarti, ESA

A satellite image showing a large river delta system, likely the Amazon, with a prominent dark, winding river channel cutting through a vast green landscape. The terrain is a mix of lush green vegetation and lighter, brownish-yellow areas, possibly indicating different land cover types or topography. The river flows from the top left towards the bottom right, with several smaller tributaries branching off. The overall scene is a high-resolution aerial view of a natural landscape.

EO Tools for Education

- ❑ E-learning tools
 - ESA kids (*primary*)
 - Eduspace (*secondary*)
 - SEOS (*secondary*)
 - LearnEO! (*secondary/undergraduate*)
 - Bilko (*secondary/undergraduate*)
- ❑ Printed resources
 - ESA School Atlas and Water Atlas (*secondary*)
 - ESA EO Teacher's Pack (*secondary*)
- ❑ Training courses
 - EO summer schools (*graduate*)
 - Advanced training courses (land, ocean, atmosphere) (*graduate*)
 - Other EO training Courses (*graduate and undergraduate*)
- ❑ Training within programmes
 - DRAGON
 - TIGER

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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

[EO Education and Training Home](#)
[EO Education for Schools](#)
[Advanced EO Training for PIs](#)
[Other EO Training](#)

- 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.

- EO data

- EO data distributed by ESA
- [Access data online](#)
- [Access GME's data](#)
- [How to apply for data](#)
- [Eoli Catalogue](#)
- [ESA Multimedia Gallery](#)

- EO training activities

- [Education for Schools](#)
- [EO Summer Schools](#)
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- [Advanced Training](#)
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- [Upcoming / Past Events](#)

- EO software

- [NEST Training](#)
- [LEOVworks Download \(19.5mb\)](#)
- [Bilbo](#)
- [ILVVIS](#)

- Key Resources

- [Sample data](#)
- [Auxiliary data](#)
- [Catalogue access](#)
- [Document Library](#)
- [Upcoming Events](#)
- [Events Catalogue](#)
- [Software Tools](#)
- [Online Archives](#)
- [EO Software Toolboxes](#)

- 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



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

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Data Access Missions Earth Topics PI Community Explore more...

You are here Home > EO Education and Training > Other EO Training

- Training Package Details

SAR Land Applications Tutorial

The aim of this tutorial is to introduce beginners to land applications of satellite remote sensing using synthetic aperture radar (SAR). It is intended to give students a basic understanding of SAR technology, the main steps involved in the processing of SAR data, and the type of information that may be obtained from SAR images. The tutorial has three main components:

- [Background and Theory](#) – an overview of the principles behind SAR remote sensing, data processing techniques, examples of land applications, and current and future sources of SAR data
- [The Bilko Exercise](#) - a computer practical using the Bilko software with ENVISAT ASAR data, allowing students to apply the theoretical knowledge to the processing and interpretation of actual SAR data
- [Answers and Examples A](#)
- [Answers and Examples B](#)

Model answers to questions from both parts of the tutorial.

EO Education and Training

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EO Education for Schools
Advanced EO Training for PIs
Other EO Training

- Earth Online Resources

EO Data Access

- [EO data distributed by ESA](#)
- [Access data online](#)
- [Access Copernicus data](#)
- [How to apply for data](#)

Resources

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EO Software

- [EO Software Toolboxes](#)

Services

- [Credits](#)

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

Space Agency

Central page for EO education and training



Earth Online

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Google™ Custom Search



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European Space Agency

Data Access ▾

Missions ▾

Earth Topics ▾

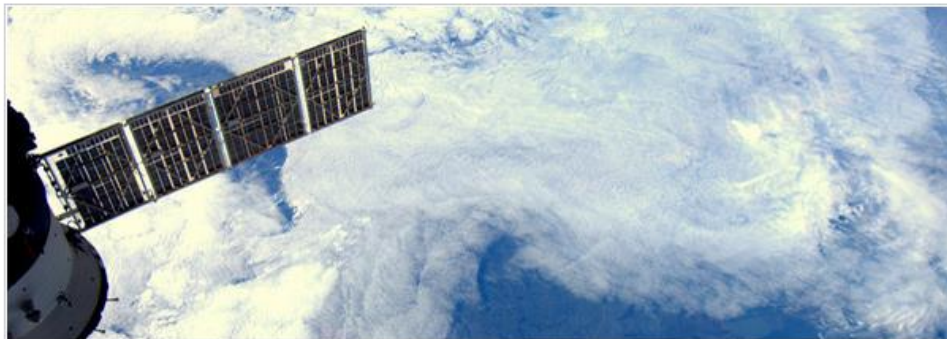
PI Community ▾

Explore more... ▾

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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

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▾ EO Data

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- [Eoli Catalogue](#)
- [ESA Multimedia Gallery](#)

▾ EO Training Activities


- Education for Schools
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<https://earth.esa.int/web/guest/eo-education-and-training/university-undergraduate-level>

European Space Agency

Central page for EO education and training



**eduspace**
European Space Agency

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

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

Image processing software

Eduspace Image Catalogue ▶

Tools for schools ▶

Multimedia

Image Gallery ▶

Video Gallery ▶

Services

Contact us ▶

Search in Eduspace ▶

Search

GO

Combine RGB

Select Red Band

RON1

Select Green Band

RON2

Select Blue Band

RON3

Output Type Byte

OK Cancel Help

Image processing software

Eduspace provides students and teachers with the proper tools to manipulate images.

LEOWorks

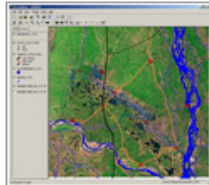
LEOWorks is an important feature of Eduspace. It allows secondary school students to do actual processing of satellite imagery. LEOWorks is able to perform basic and advanced processing operations, such as geometric correction, pan-sharpening and image classification. Several tools are available, such as Geographical Information Systems (GIS) functionalities that enable the displaying, drawing and managing of information layers as points, lines and polygons, on top of images.

LEOWorks is a didactical tool with extensive help pages and an all-inclusive tutorial (see right of page). With the assistance of this documentation, students will be able to experiment with their own imagery and undertake their own processing. LEOWorks is compatible with data collected by several Earth Observation missions, and can read most standard image formats (e.g. jpg, tif, bmp, png).

LEOWorks 4 is the latest version of the software and it is platform independent (Windows, MacOS, Linux).

ArcExplorer

ArcExplorer is a freeware used to display and analyse layers of Geographical Information Systems (GIS). It includes a complete user guide that has been made available by ESRI, one of the leading providers of GIS software and GIS solutions.



08-Sep-2016

Software downloads

• Eduspace Image Catalogue

• LEOWorks 3

• LEOWorks 4 (MacOS)

• LEOWorks 4 (Windows)

• LEOWorks 4 (Linux)

• ArcExplorer

Tutorials

• LEOWorks 3 Tutorial

• LEOWorks 4 Tutorial

• LEOWorks 4 QuickStart (pdf)

• ArcExplorer Tutorial

European Space Agency

Central page for EO education and training



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Data AccessMissionsEarth TopicsPI CommunityExplore more...

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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.



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EO software

Central page for EO education and training



The screenshot shows the ESA Earth Online website. The header features the ESA logo, 'Earth Online', and navigation links like 'Data Access', 'Missions', 'Earth Topics', and 'PI Community'. A search bar and social media links are also present. The main content area is titled 'ESA School Atlas' and contains several paragraphs of text about the atlas, its funding, and its availability. A sidebar on the right lists 'EO data' and 'EO training activities'. The bottom of the page mentions the availability of DVDs and a Teacher's Handbook.

esa Earth Online

Need Help? [Contact here](#) [European Space Agency](#)

[Data Access](#) [Missions](#) [Earth Topics](#) [PI Community](#) [Explore more...](#)

You are here [Home](#) [EO Education and Training](#) [EO Education for Schools](#)

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

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- Advanced EO Training for Pls
- Other EO Training

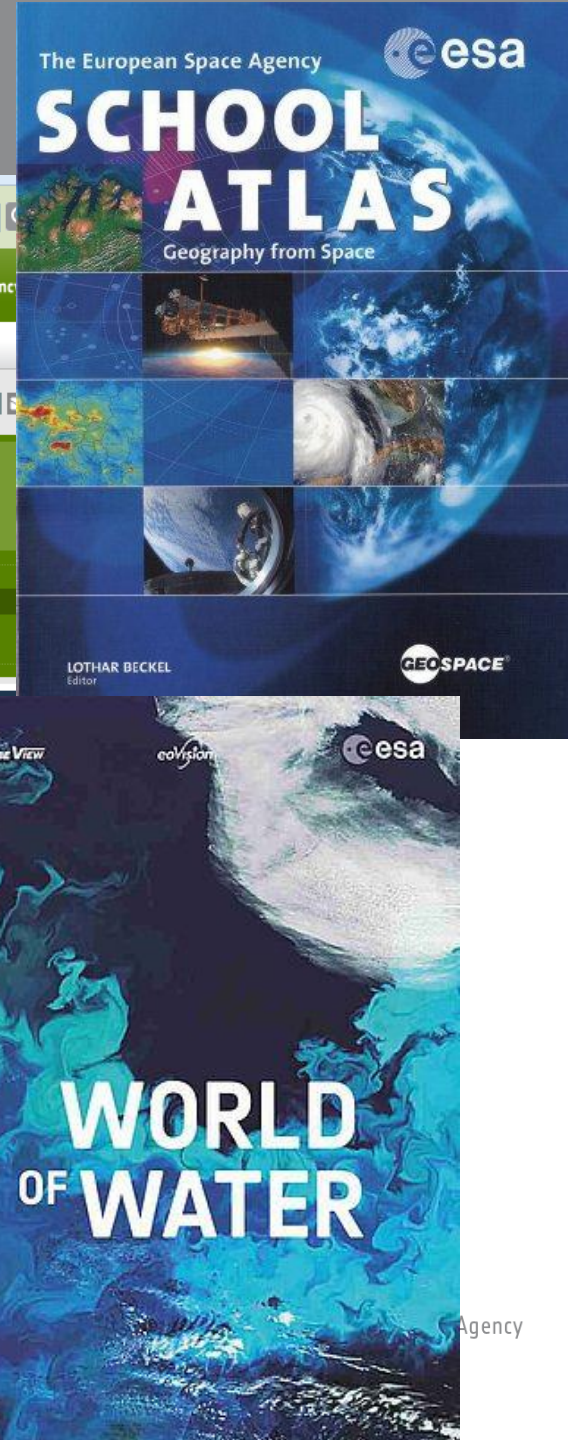
EO data

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EO training activities

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- Dragon Programme
- Tiger Initiative
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- Upcoming / Past Events

EO software



1. LearnEO! 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

ESA Presentation | 20 June 2016

ESA UNCLASSIFIED – Releasable



LearnEO!

Learn Earth Observation with ESA

Home Lesson competition About Data sets Lessons Software Resource library Information for authors Register

Hands-on activities with Bilko

A holistic framework for EO education

- Lessons on different EO applications.
- Over 200 data sets with description.
- New powerful version of the Bilko software
- Resource library with extra information and tools.
- Support for lesson writers and lesson users

Lesson Writing Competition

Do you care about EO education?
Do you want to share your expertise?
Do you have examples of how EO data can make a difference?

Prizes: €5000, €3000, €2000

Open to anyone over 18 anywhere in the world
See our **competition pages** to learn more

Platforms and missions

ENVISAT CRYOSAT

GOCE SMOS

Ocean rifts & tectonic plates

The Amazon river plume

Land cover mapping

SNAP = Sentinels Application Platform

<http://step.esa.int/main/toolboxes/snap/>

- **Optical exercise (S-2):**
 - a. Application: spectral analysis & vegetation mapping
 - b. Data: Sentinel-2
 - c. Processing steps:
 - Sentinel-2 metadata
 - Band visualisations
 - Spectral analysis
 - Band maths (NDVI)
- **SAR exercise (S-1):**
 - a. Application: Flood mapping
 - b. Data: Sentinel-1
 - c. Processing steps:
 - Sentinel-1 import
 - Multilook
 - Calibrate
 - Geocode
 - Stack
 - Flood map creatio
 - Export to Google Earth

Thanks for your attention!!!



Web sites of interest for EO Education:

International Charter: www.disasterscharter.org

GMES / Copernicus: <http://copernicus.eu/>

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

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

ESA Earth Observation:

[http://www.esa.int/Our Activities/Observing the Earth](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/](http://www.esa.int/SPECIALS/Eduspace_EN/)

SEOS Project: <http://www.seos-project.eu/home.html>