



EO College –  
Eine Lernplattform für die Erdbeobachtung  
- Ressourcen, Technologien und Bezugsquellen -

# About me

- Master of Sciences in Geoinformatics from Uni Jena, Germany
- Coordinator of the EO College learning portal
- Specialised in the conception, development and production of eLearning content
- CEO of ignite eduaction



Robert Eckardt  
University of Jena |  
ignite eduaction





# Outline

**I. EO College**

**II. Other Resources**



# EO College



# eo-college.org



September 2017

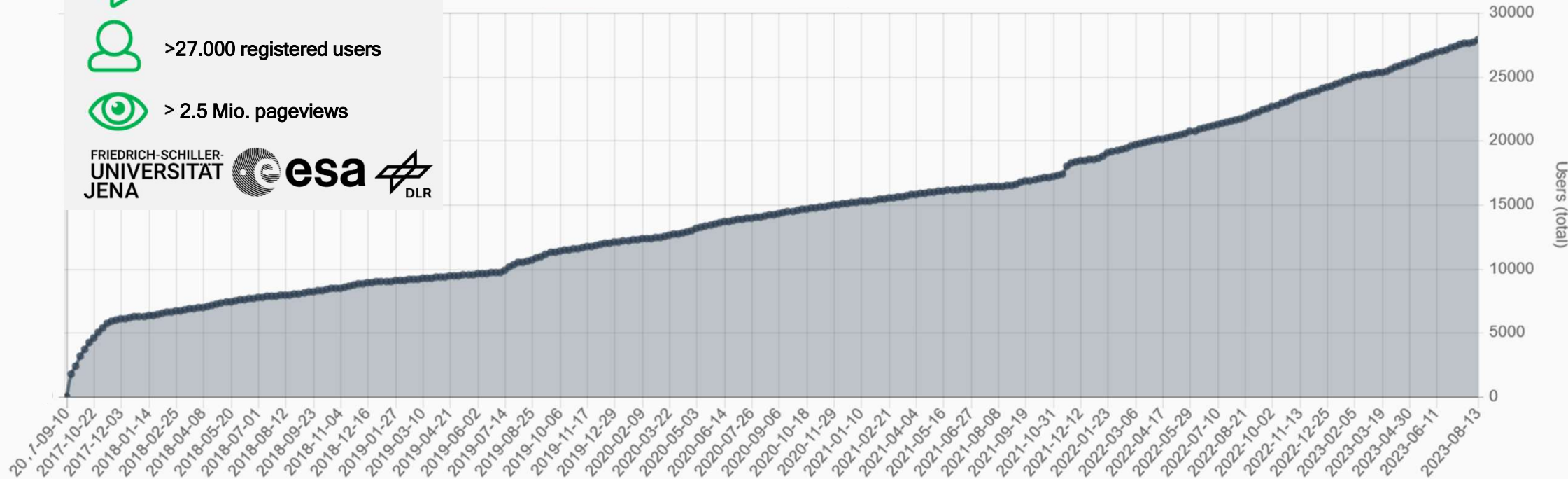


>27.000 registered users



> 2.5 Mio. pageviews

FRIEDRICH-SCHILLER-  
UNIVERSITÄT  
JENA





🔍 Enter search term

Order By ▾

CATEGORY  
Select some options ▾

SPECTRUM  
Radar x ▾

TYPES  
Select some options ▾

LANGUAGE  
🇬🇧 🇪🇸

Remove filters

UNIT




eo

Biomass

SAR EDU • March 10, 2021

UNIT



eo

The evolution of Sentinel-1

EO College • July 25, 2019

UNIT



eo

Land Cover Classification

EO College • July 25, 2019

TALK

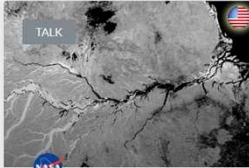


NASA

Conceptos básicos de SAR

NASA ARSET • April 24, 2019

TALK

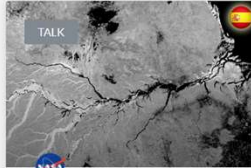


NASA

SAR Processing and Data Analysis

NASA ARSET • April 24, 2019

TALK

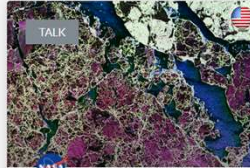


NASA

Procesamiento y análisis de datos de SAR

NASA ARSET • April 24, 2019

TALK




NASA

Introduction to Polarimetric SAR

NASA ARSET • April 24, 2019

TALK

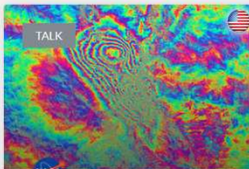


NASA

Introducción SAR polarimétrico

NASA ARSET • April 24, 2019

TALK



NASA

Introduction to SAR Interferometry

NASA ARSET • April 24, 2019

TALK




NASA

Introducción a SAR interferométrico

NASA ARSET • April 24, 2019

TALK



NASA

Basics of SAR

NASA ARSET • April 24, 2019

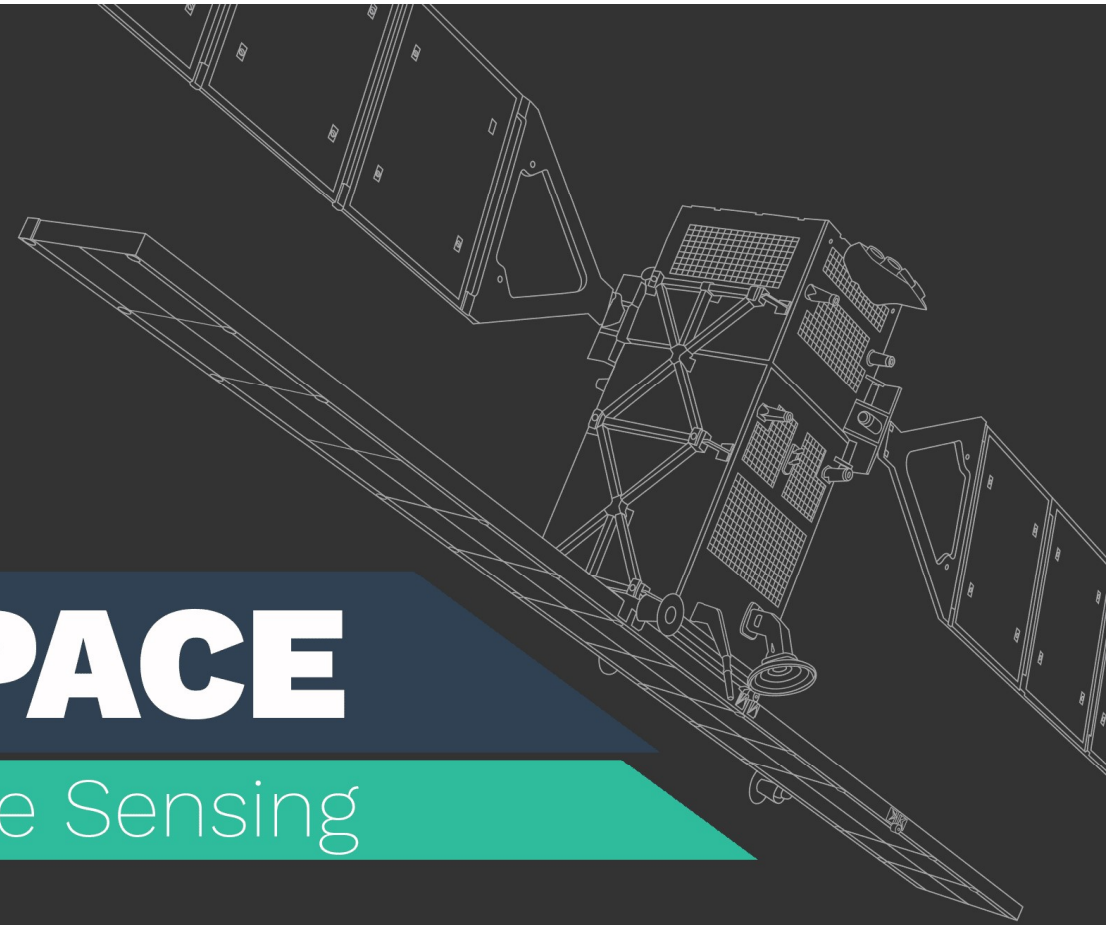
BOOK



🌐

SAR Handbook

SERVIR Global • April 11, 2019



# ECHOES IN SPACE

Introduction to Radar Remote Sensing

FREE OF CHARGE

OPEN TO ANYBODY

SELF-PACED LEARNING

> 5.000 Students

5 LESSONS

CERTIFICATE FOR COMPLETION



Introduction

What is radar?

Radar History

What is an active radar system?

Basics of active systems

The SAR principle

What is an electromagnetic wave?

Properties of EM Waves

The EM spectrum

Sensors & Missions

The radar bands

Existing missions

Getting used to radar images

SAR image features

Comparison to optical images





The  
imaging  
geometry

Radar imaging geometry

Effects of imaging geometry

Interaction  
with the  
Earth surface

The scattering mechanisms

Important parameters

How to  
obtain and  
use radar  
data

Sentinel-1 data access

Intro to SNAP

Other data sources



Theory

Intro to Interferometry

Intro to Polarimetry

Intro to Time Series

Settlements

Urban applications

Urban Tutorial

Forest

Forest applications

Forest tutorial

Agriculture

Agriculture Applications

Agriculture tutorial



### Theory

Scattering mechanisms  
over water

### Water Bodies

Water body applications

Water body tutorial

### Oceanography

Maritime Applications

Sea Ice

Sea Wind

Sea Waves

Sea Surface Current

Oil Spill Mapping



Theory

Subsidence Monitoring

Hazard monitoring

Seismic  
events

Seismic introduction

Volcano Tutorial

Flood  
monitoring

Flood applications

Flood tutorial

Wrap up

Processing tools

Final test

Land in Focus

# Basics of Remote Sensing





Fundamentals of Remote Sensing

Electromagnetic Waves and their  
Spectrum

Atmospheric Interaction

Reflection and Absorption



Passive Imaging Techniques

Active Imaging Techniques



Spatial Resolution

Temporal Resolution

Spectral Resolution

Radiometric Resolution





Preprocessing - Optical Data

Preprocessing - Radar Data

Sensor Accuracy



Visual Image Interpretation

Objects and Pixels

Classification

Accuracy Assessment

Image Classification Tutorial

Time Series Analysis



Software

Platforms for Data Access

Cloud Processing







# Further Courses



**GRUNDLAGEN**  
der Radarrückstreuung



**BASIC PRINCIPLES**  
of Radar Backscatter



**PRINCIPES FONDAMENTAUX**  
de la rétrodiffusion radar



**PRINCIPIOS BÁSICOS**  
de la Retrodispersión Radar





**HYPER**  
**EDU**

Beyond the Visible  
**Introduction to Hyperspectral Remote Sensing**

**ed**  
college

**HYPER** **EnMAP**  
**EDU** education  
college

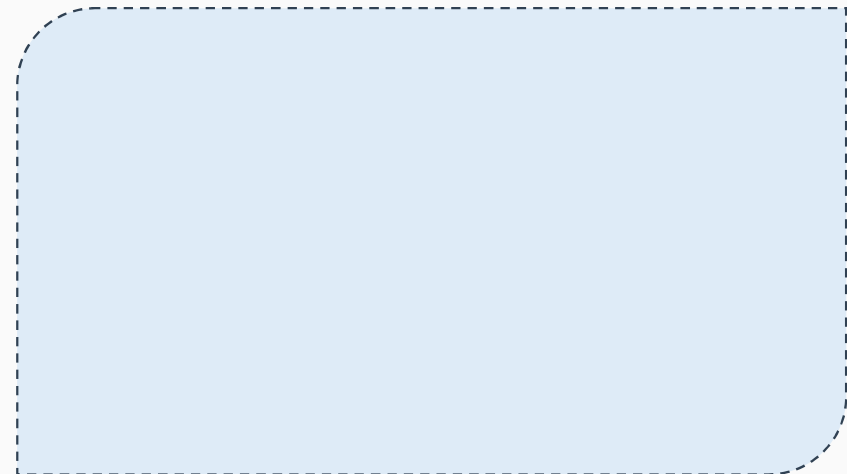
Beyond the Visible  
**EnMAP data access and image preprocessing techniques**

**ed**  
college

**HYPER** **EnMAP**  
**EDU** education  
college

Beyond the Visible  
**Imaging Spectroscopy for Agricultural Applications**

**ed**  
college





# **ZERO HUNGER**

**The role of remote sensing  
in the path towards SDG #2**





Towards Zero Hunger  
**FOOD SECURITY**



Towards Zero Hunger  
**LAND & EO**



Towards Zero Hunger  
**EO DATA, TOOLS  
& TECHNIQUES**



Towards Zero Hunger  
**SDG 2: ZERO  
HUNGER**



Towards Zero Hunger  
**AGRICULTURE  
& LIVESTOCK**



**Hands-on Tutorial**

**Land Cover Classification  
and Accuracy Assessment**

with optical data  
using Random Forest Classifier  
in Google Earth Engine



# Other Resources



# Training Calendar

- Most comprehensive collection of EO-related trainings worldwide
- Multiple implementations (e.g. CEOS WGCapD, EUMETSAT) form different organisations
- Mutual database for collection of resources

Go to  
Training Calendar

The screenshot displays the 'Events' page on the EO College website. The page features a dark blue header with navigation links: COURSES, EVENTS, RESOURCES, DISCUSSION, SOFTWARE, and ABOUT. A search bar and notification icons are also present. Below the header, the 'Events' title is centered. On the left side, there is a filter sidebar with sections for 'Enter search term', 'Sort by', 'REGIONS', 'LANGUAGE' (set to English), 'TRAINING TYPE', and 'THEMATIC AREAS'. A 'Remove filters' button is located at the bottom of the sidebar. The main content area is a grid of 12 event cards, each providing details such as the event title, date, language, type, and host organization. The events listed include 'South-Eastern Europe Meteorological Training Course (SEEMET)', 'Application of machine learning approaches to ocean colour topics', 'Training school and Workshop on Dust Aerosol Detection and Monitoring', 'Weather-related satellite data with Jupyter Notebooks', 'Weather-related satellite data with Jupyter Notebooks - Series of online short courses', 'Winter Weather in Satellite Data - Series of online short courses', 'Coding for EO (Python & R) - Series of online short courses', 'Machine Learning for Seamless Thunderstorm Nowcasting from Multiple Data Sources - Series of online short courses', 'Gap Filling Ocean Data (statistical and machine learning methods)', 'RMets Autumn Series of Meteorological Masterclasses: Sea Ice in the Climate System', and 'RMets Autumn Series of Meteorological Masterclasses: Sea Ice in the Climate System'.

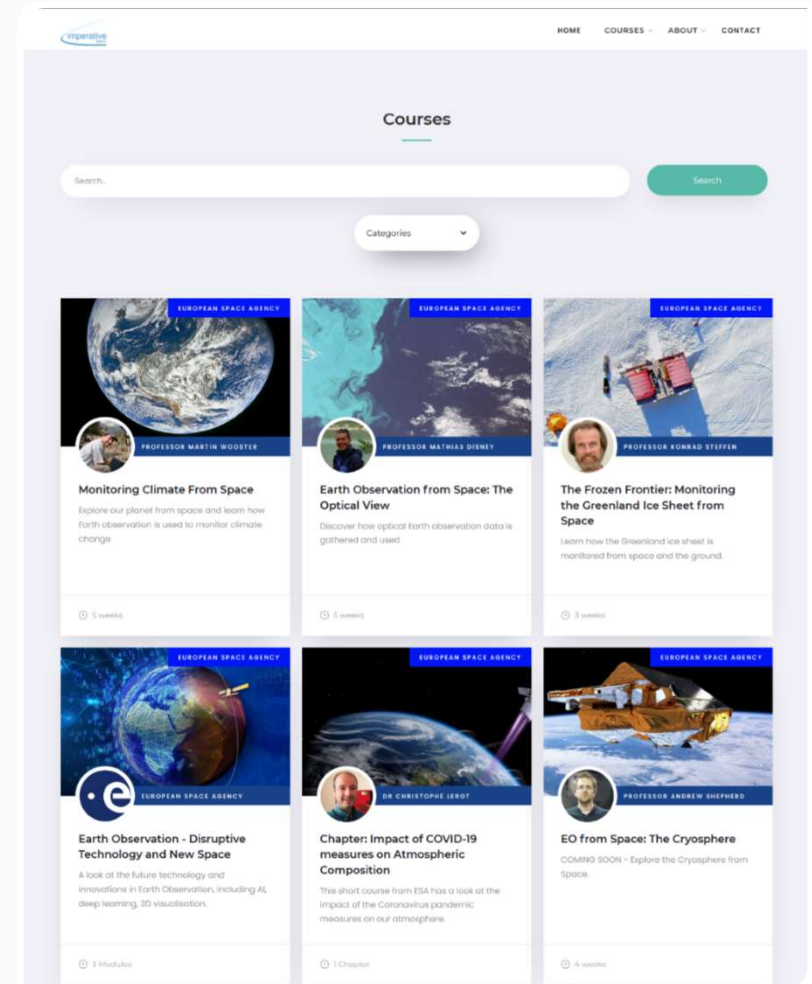
<https://eo-college.org/events/>



# Imperative MOOCs

- UK-based developer of EO-related online courses

Go to  
Imperative MOOCs



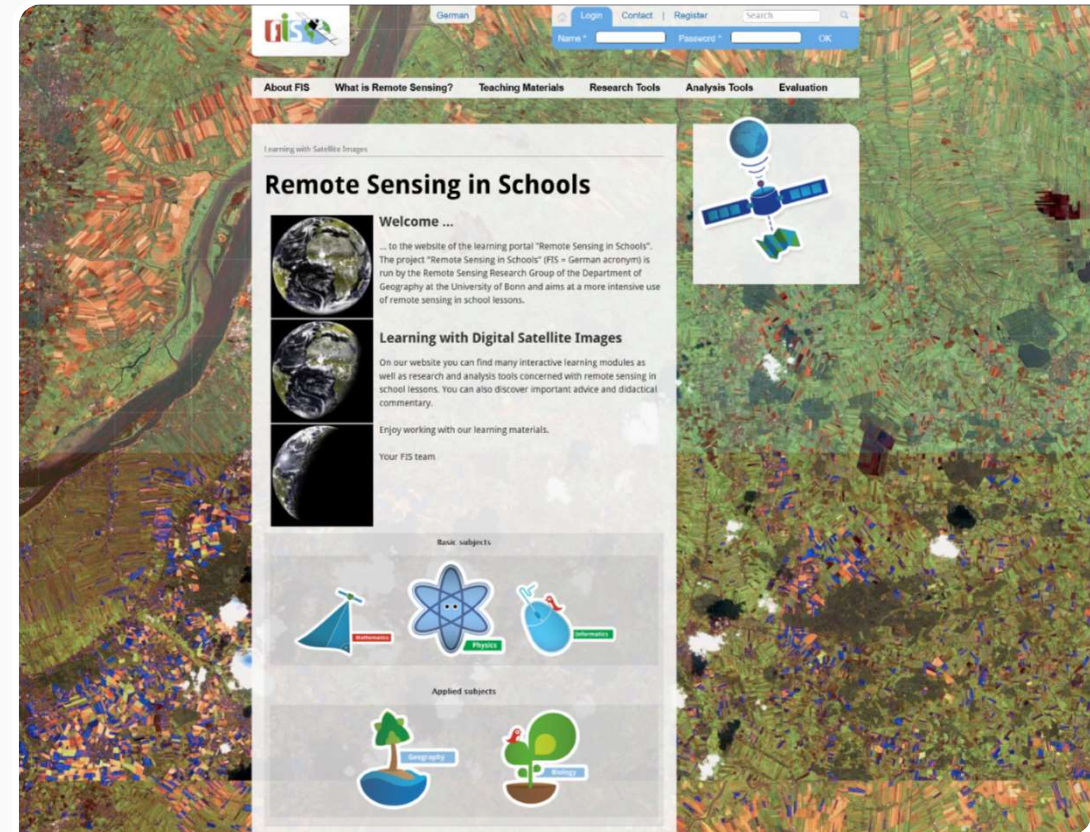
<https://www.imperativemoocs.com/>



# Remote Sensing in Schools

- Free learning materials, specifically designed for schools
- Also very useful for beginners in the subject

Go to  
RS in Schools





## NASA – Applied Remote Sensing Training Program

- Extensive set of webinars

Go to  
NASA Arset

NASA EARTH SCIENCE APPLIED SCIENCES

ABOUT WHAT WE DO OUR IMPACT JOIN THE MISSION

APPLIED REMOTE SENSING TRAINING PROGRAM

# ARSET

HOME / WHAT WE DO / CAPACITY BUILDING

### CURRENT AND UPCOMING TRAININGS

**ARSET - Introduction to NASA Resources for Climate Change Applications**  
September 29, 2021 - October 06, 2021

**ARSET - Agricultural Crop Classification with Synthetic Aperture Radar and Optical Remote Sensing**  
October 05, 2021 - October 19, 2021

ABOUT ARSET  
DISASTERS  
HEALTH & AIR QUALITY  
LAND  
WATER RESOURCES

<https://appliedsciences.nasa.gov/>



## ESA - eo4society

- Collection of ESA training offers
  - MOOCs
  - Webinars
  - Video tutorials
  - On-site trainings

Go to  
ESA eo4society

The screenshot displays the 'MASSIVE OPEN ONLINE COURSES (MOOCs)' section of the ESA eo4society website. The page features a blue header with navigation icons (menu, search, calendar) and a main heading 'MASSIVE OPEN ONLINE COURSES (MOOCs)'. Below the heading, there is a descriptive paragraph about MOOCs and their benefits. The main content area is a grid of eight course cards, each with a representative image, a title, a brief description, and a 'MORE INFO' button.

### MASSIVE OPEN ONLINE COURSES (MOOCs)

ESA's Massive Open Online Courses (MOOCs) show how EO technology and data applications work, what the data looks like and how it can have impact in both science and on the ground through real-world case studies.

They are designed to welcome students from all paths of life: from scientists to policy-makers, teachers, or other professional, as well as school or university students or casual learners.

Each course lasts several weeks, and breaks the mould of conventional education by blending data, video, apps and on-line materials. The learning experience can be personalised thanks to its social aspect (with online discussions and feedback from educators) and to the use of optional materials.

- A NEW ONE: Impact of COVID-19 measures on Atmospheric Composition**  
How did COVID-19 affect the atmosphere? Learn about the ICovac project and its findings.
- A NEW ONE... Land in Focus**  
A series of online learning materials suitable for anybody interested in the potential of remote sensing technologies for applications over land surfaces.
- AN ONGOING MOOC: Echoes in Space**  
Echoes in Space is suitable for anybody interested in getting an introduction to Radar images or looking to dive into the topic.
- COMING SOON... EO from Space: The Cryosphere**  
Learn about the role of satellite 'Earth observation' (EO) technology in monitoring the Earth's Cryosphere and the data it produces.
- Earth Observation from Space: the Optical View**  
An introduction to optical Earth observation: monitoring our planet from satellites, using photography, imaging in various wavelengths, lidar and other technologies.
- Earth Observation: Disruptive Technology and New Space**  
A series of interviews with leading experts across Earth Observation and related technologies.
- Monitoring Climate from Space**  
How does EO work, and how can it achieve the essential detail and comprehensive worldwide view that we need for climate monitoring.
- The Frozen Frontier: Monitoring the Greenland Ice Sheet from Space**  
You'll look at the measurements made possible by Earth Observation (EO) satellites like Cryosat, the technologies and

<https://eo4society.esa.int/training-education/>



## Committee on Earth Observation Satellites Working Group on Capacity Building and Data Democracy

- Working group for international collaboration
- Network of int. Space agencies  
and associated members
- Overall very relevant contact point

Go to  
CEOS WGCapD

HOME ABOUT CEOS OUR WORK NEWS MEETINGS DATA & TOOLS RESOURCES CONTACT US LOGIN

CEOS Committee on Earth Observation Satellites

Search

Our Work

Working Groups

- WGCapD
- E-Learning: Courses & Webinars
- Training Workshops
- Meetings
- Resources
- Contact Us

WGCV

WGClimare

WGDisasters

WGISS

Virtual Constellations

Ad Hoc Teams

Systems Engineering Office

Other CEOS Activities

Best Practices and Guidelines

CEOS / Our Work / Working Groups / WGCapD / E-Learning: Courses & Webinars

### E-Learning: Courses & Webinars

Supporting the WGCapD's mission to help people access and use satellite Earth observation data effectively, we organize free online trainings (e.g. webinars, MOOCs, event live feeds) to participants around the globe, often in collaboration with other CEOS Working Groups.

**New trainings and webinars are offered periodically. Visit the CEOS Training Calendar for more information about webinars and MOOCs available.**

#### Online Trainings & Videos

- August 2021: NASA-ESA Trans-Atlantic Training
- Nov 2020: CEOS Visualization Environment (COVE) Overview Video
- Aug 2020: Satellite Remote Sensing for Air Quality Monitoring and Forecasting

#### Webinars

- April 2021: Earth Observation Using Satellite Imagery in Urban Planning and Development
- July 2020: An Introduction to CEOS Analysis Ready Data Webinar
- May 2020: Remote Sensing in Crop Monitoring and Assessment
- December 2019: Webinar Series on Hyperspectral Remote Sensing and its Applications
- October 2019: Geospatial Technology for Wildfire Management Webinar
- September 2019: Future Data Access & Analysis Architecture Initiative Webinar
- December 2018: Sustainable Development Goals (SDG) Awareness Webinar

#### Massive Open Online Courses (MOOCs)

- Echoes in Space: Introduction to Radar Remote Sensing

#### Live Broadcasts

We also co-organize in-person workshops, adding a live broadcast element to allow for free online participation for those unable to join these events in person. Examples of events for which we've offered this capability include:

- June 2017: One Earth - One Health Workshop: Contributions of Earth Observations (EO) to Public Health Practices
- October 2015: Civil Security: Understanding the Risks, Preventing Disasters, and Mitigating the Impacts with Earth Observation (EO) Applications and Services.

Please read on to learn more about additional collaborative capacity building efforts with the CEOS Working Group on Information Systems & Services.

#### WGISS Webinars

The Technology Exploration Interest Group of the CEOS Working Group on Information Systems & Services (WGISS) is a forum for technical information exchange and lessons learned experience about current and trending software technologies, services, and other internet-related software technologies. Their webinar series is publicly available online. Recent topics include the burgeoning role of python for Earth Observation data analysis and the use of data cubes for large-scale data analytics. [Read more...](#)

#### 2019: Future Data Access & Analysis Architecture Initiative Webinar

The CEOS Future Data Access and Analysis Architecture (FDA) initiative has resulted in a range of new approaches for Earth observation (EO) data access and analysis being deployed globally by CEOS Agencies. Many of the pilot activities are now practical implementations with new standards for Analysis Ready Data (ARD), advanced user-programmable Exploitation Platforms, and vast amounts of data readily available on cloud platforms with open source analytics tools like the CEOS Open Data Cube (ODC). Many of these components allow user algorithms to be brought to the data, rather than having to download and run locally, thus opening new opportunities for researchers, industry, and government use. The FDA ecosystem is still evolving and challenging to navigate, and the CEOS Working Groups are collaborating closely to make it simpler to not only discover EO data, but also to exploit it using the various elements of FDA. Watch the recording [here](#).

<https://ceos.org/ourwork/workinggroups/wgcapd/>





## UN SPIDER Knowledge Portal

- Collection of best practise guides for e.g. disasters
- Vast collection of resources, data sources etc.

Go to  
UN SPIDER

English

United Nations | Office for Outer Space Affairs  
UN-SPIDER Knowledge Portal

Home About Us Space Application Links & Resources Risks & Disasters Advisory Support Network Projects News & Events Admin

Google Earth Engine Search places and datasets...

UN-SPIDER and DNPC of Niger Organise a Virtual Training Course  
UN-SPIDER and the National Directorate of Civil Protection of Niger (DNPC) join forces to carry out a virtual training course on the use of UN-SPIDER's Recommended Practice for rapid flood mapping.

Explore the Knowledge Portal

How can space technology be applied in disaster and risk management? | Where can I access satellite data, products and other resources? | Who are the users of space technology in disaster and risk management? | Which services can UN-SPIDER offer to Member States?

Stay Up to Date

News

Thu Sep 2 2021  
WMO releases Atlas of impacts of weather, climate and water extremes 1970-2019

Tue Aug 24 2021  
UN-SPIDER Bonn International Conference, 16 to 18 November 2021

Upcoming Events

11/10/2021 to 14/10/2021  
Fifth Arab Regional Platform for Disaster Risk Reduction

11/10/2021 to 15/10/2021  
ESA Earth Observation Phi-Week 2021

02/11/2021 to 06/11/2021  
Kyoto, Japan

<https://www.un-spider.org/>

# Weiterführende Angebote

- Konzeption und Entwicklung von individuellen Lernangeboten
- Spezifische Fernerkundungskurse (vor Ort oder virtuell)
- Seminare und Schulungen in Themen der Medienkompetenz  
und der Erstellung von Lernmaterialien



Robert Eckardt  
University of Jena |  
ignite education

