HYPER EDU A new online learning platform for hyperspectral remote sensing Saskia Foerster, Theres Kuester, Arlena Brosinsky, Luis Guanter Remote Sensing and Geoinformatics Section, GFZ German Research Centre for Geosciences, Potsdam, Germany

Background

Hyperspectral imagers have been demonstrated to be a source of accurate and quantitative information about terrestrial and aquatic ecosystems required in various application fields. While the current availability of hyperspectral image data is still limited in both temporal and spatial coverage, data availability is expected to increase substantially in the near future with a rising number of imaging spectrometers deployed on airborne platforms and the launch of space-borne imaging spectroscopy missions (e.g. PRISMA and EnMAP). In view

Objectives

Therefore, the development of HYPERedu, an online learning platform for hyperspectral remote sensing to be hosted on EO College has started as part of the education initiative within the EnMAP mission (www.enmap.org). HYPERedu will provide presentations, hands-on tutorials and short films on principles, methods and applications of imaging spectroscopy at Master's level, addressing students as well as professionals in research, companies, and public agencies. First content will be published in mid 2019 and subsequently extended. In addition,

of these developments, an increasing need for Earth Observation education and training activities with a focus on hyperspectral imagery is expected in the next few years. the development of a first Massive Open Online Course (MOOC) with several modules and certificate is planned for 2020.

Hosting and Content



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EnMAP-Box

Therefore, the development of HYPERedu, an online learning platform for hyperspectral remote sensing to be hosted on EO College has started as part of the education initiative in the frame of the EnMAP mission (www.enmap.org). HYPERedu will provide presentations, hands-on tutorials and short films on principles, methods and applications of imaging spectroscopy at Master's level, addressing students as well as professionals in research, companies, and public agencies. First content will be published in mid-2019 and subsequently extended. In addition, the development of a MOOC with several modules and certificate is planned for 2020.

Furthermore, the EnMAP-Box, a free and open-source QGIS plug-in for visualizing and processing imaging spectroscopy data and spectral libraries, is now available in the latest version EnMAP-Box 3.

EO College website hosting HYPERedu

Contents: Annotated slide collections, hands-on tutorials and educational films on principles, methods and applications of imaging spectroscopy; Development of a MOOC with several modules and certificate Target group: Students and professionals at Master's level (English language) Hosting: EO College online learning platform (eo-college.org) Licence: All content is provided free of charge and under a Creative Commons Attribution-ShareAlike 4.0 International License



Envisioned content of the HYPERedu online learning platform (may be further extended in the future)

Basics

Principles of imaging spectroscopyPrinciples of sensor technology & data acquisitionData preprocessingPreprocessing

Sensor simulation





Airborne imaging spectroscopy data is well suited for urban mapping. The high spectral and spatial resolution enhances the separability of surface types and preserves the spatial detail of many urban features. This exercise...

· provides an insight into ho introduces a hierarchical cla Start QGIS and click the 🛝 icon in the toolbar to open the EnMAP-Box. The GUI of the introduces basic functional EnMAP-Box consists of a Menu and a Toolbar, panels for Data Sources and Data Views, and the interface, and you will learn QGIS Processing Toolbox including the EnMAP-Box geoalgorithms basic navigation tools Duration: 15 min 🔹 💽 🗐 🚾 🖑 🗩 🔎 🥬 🎵 🛼 🍘 🛝 🍀 🛛 Toolbar 🕽 🖾 📽 🗱 😡 QGIS Processing Data Source 2. Load data The EnMAP-Box offers simple drag & drop capabilities to load data from an external explorer Data Views Drag the following datasets from your explorer into the Data Sources panel Raster: hymap_berlin.bsq, enmap_berlin.bsq • Vector: landcover_berlin.shp Spectral library: library_berlin.sl ect View Tools Applications Processing H 🛔 🗛 📵 🗾 🖑 🕫 🗢 🕫 🌆 🥃 🚯 歳 · Visually explore your fraction map. You may open 'enmap_berlin.bsq' in a separate Map Window 0 🖾 🖆 🕸 Q for comparison. You may use the Identify tool together with the Identify cursor location values option to display fraction values 😽 🍘 🛝 👬 of pixels

Program benda
Progr

GFZ German Research Centre for Geosciences for Geosciences federal Ministry for Eponemic Atl Definition of Imaging Spectroscopy or Hyperspectral Remote Sensing 2 Radiation Spectroscopy is the study of the inter action between matter and radiated en 4 Multispectr specifically looking at what wavelengths vs. hyperspect ight are emitted or absorbed by an object order to characterize materials maging spectroscopy refers to airbor 6 Further Readin or spaceborne imaging spectrometer measuring the spectrum of solar radiat reflected by earth materials in many contiguous waveband Electromagnetic radiation (I) 01 Electromag All electromagnetic radiation behaves in predictable ways and has 02 Radiation transfer fundamental properties 03 Interaction o Components include a sinusoidal electrical wave (E) that varies in magnitude radiation and a similar magnetic wave (M) at right angles, both being perpendicular to 04 Multispectr the direction of propagation. Both waves travel at the speed of light (c) vs. hypersper 5 Surface Reflectance)6 Further Readin age Credits & References **Examples of first (annotated) slides**

Methods Classification methods Quantification methods Radiative transfer models

Applications

- Vegetation
- Forests
- Agricultural areas
- Natural ecosystems and gradients
 Soils
 Geology
- Urban areas
- Water Atmosphore and
- Atmosphere and gases Ice and snow

Software and data Data sources (lab, field and imag

Data sources (lab, field and imaging spectroscopy) EnMAP Box introduction

Time schedule of the HYPERedu development

May 2019 Presentation of HYPERedu at the LPS

Q3/Q4 2019 Extension of the HYPERedu resouces by further slide collections and tutorials



EnMAP-Box software

Also developed under the EnMAP science program: The **EnMAP-Box**, a free and opensource plug-in for QGIS for visualizing and processing imaging spectroscopy data and spectral libraries, is **now available** in the latest version EnMAP-Box 3 from https://enmap-box.readthedocs.io.





EnMAP-Box

Also present at ESA LPS 2019, Session C7.01 Board 356 Okujeni et al.: The EnMAP-Box 3 – a free and open-source toolbox for imaging spectroscopy data processing



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