Multi-Sensor Synergies For Monitoring Agriculturally Relevant Crop Traits

Tobias Hank, Matthias Wocher, Martin Danner & Katja Berger

Dept. of Geography | LMU Munich
Introduction to the EnMAP Mission & Preparation Program

The Mission
- 420 - 2450 nm
- 30 m spatial resolution
- 30 km swath width
- 30° off-nadir pointing
- Launch: 1st Q of 2022

Science Projects
- Forests & Ecosystems
- Geology & Soils
- Coastal & Inland Waters
- Ecosystem Transitions
- Agriculture & Vegetation

Edu-Program
- HyperEDU Slid Collections
- HyperEDU Workshops
- HyperEDU Tutorials
- HyperEDU MOOCs
- EO College
Europe → Southern Germany → Bavaria → Near Straubing → Center Coordinates: 48.81° N | 12.73° E
Test Site Irlbach: Data Availability 2020

01.04.2020 (PRISMA)  24.06.2020 (DESIS)  27.06.2020 (PRISMA)  27.06.2020 (DESIS)

31.07.2020 (PRISMA)  06.08.2020 (PRISMA)  04.09.2020 (PRISMA)  09.10.2020 (PRISMA)
Test Site Irlbach: Data Availability 2021

- 25.02.2021 (DESIS)
- 26.03.2021 (PRISMA)
- 14.06.2021 (DESIS)
- 10.04.2021 (DESIS)
- 13.06.2021 (DESIS)
- 26.03.2021 (PRISMA)
- 21.06.2021 (PRISMA)
- 03.07.2021 (PRISMA)
- AVIRIS_NG on May 30th
Test Site MNI: DESIS/PRISMA Spatial Agreement

Coregistration uncertainties...
Test Site Irlbach: DESIS/PRISMA Radiometric Agreement

Irlbach 27.06.2020 DESIS vs. PRISMA

DESIS acquisition time: 08:36 UTC (morning)
PRISMA acquisition time: 10:22 UTC (noon)
EnMAP Agriculture & Vegetation Variables of Interest

Canopy Water Content (CWC)


Canopy Nitrogen Content (CNC)


Non-Photosynthetic Vegetation (NPV)

Introduction to the EnMAP-Box


Introduction to the EnMAP-Box Agri-Apps

Interactive Visualization of Vegetation Reflectance Models (IVVRM)
Create Look-up-table
Invert Look-up-table
Vegetation Indices Toolbox
Plant Water Retrieval (PWR)
Analyze Spectral Integral (ASI)
interactive Red-Edge Inflection Point (iREIP)
Vegetation Processor
The EnMAP-Box ASI Tool

a) Potatoes (63ha)
b) Sugar Beet (31ha)
c) Winter Wheat → Legumes (55ha)
d) Winter Wheat → Legumes (26ha)
Test Site Irlbach
DESIS, June 14th 2021

- Carotene/Chlorophyll \([C_{ar}/C_{ab}]\)
- Chlorophyll Content \([C_{ab}]\)
- Water Content \([H_2O]\)
a) Winter Wheat (63ha)  

b) Winter Wheat (31ha)  
c) Potatoes (55ha)  
d) Sugar Beet (26ha)
a) Winter Wheat (63 ha)

b) Winter Wheat (31 ha)

c) Potatoes (55 ha)

d) Sugar Beet (26 ha)

Chlorophylls
Carotenes
Water

2021
Conclusions

- Many successful acquisitions 2020 and 2021 for both of our test sites (Irlbach and MNI). Thank you!
- Based on this data, the user-friendly environment of the EnMAP-Box software has successfully been updated to allow for the processing of DESIS images.
- Using the EnMAP-Box, biochemical variables that are of relevance for agricultural practice can be derived from DESIS data.
- DESIS can successfully be used in conjunction with other hyperspectral sensors, such as PRISMA.
- Some discrepancies between PRISMA and DESIS data exist, especially in the blue VIS and in the NIR.
- DESIS can help in the VIS (e.g. for pigment detection) where PRISMA data is (too) dark.
- Can the parallel acquisitions of DESIS and PRISMA help to correct some issues in the PRISMA data?
Thank You for Your attention!

tobias.hank@lmu.de

www.geographie.uni-muenchen.de

www.enmap.org