Hyperspectral imaging and field spectroscopy
PhD course
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Hyperspectral imaging (HSI) combines scanning or non-scanning imaging with spectroscopic techniques. Technical developments in the last decades have brought the capacity of HSI to provide spectrally, spatially and temporally detailed geodata. The latter crucially relates to rapid data acquisition, favoured by hyperspectral snapshot technologies and spectral mobile mapping devices. Furthermore, the development of miniaturized hyperspectral sensors has fostered their applications with lightweight unmanned aerial vehicle (UAV) platforms. HSI sensor technology and applications with 3D reconstruction capacities are of high interest in spatial sciences (geosciences, agriculture, ecology, etc.). This course helps better understand and integrate the available technologies, theories and practical use.

Main topics
1. Basics of radiometry
2. Hyperspectral remote sensing
3. Spectral data chain
4. Non-imaging spectroscopy
5. Imaging spectroscopy
6. Field spectroscopy
7. Snapshot hyperspectral imaging
8. Spectral field campaigns
9. Spectral sampling
10. Spectral libraries
11. Platform technologies and AI
12. UAV based imaging spectroscopy
13. Airborne sensors
14. Spaceborne sensors
15. Spectral mapping and applications

Prerequisite
- Basic knowledge in remote sensing or optics
- Basic knowledge in spectroscopy or related fields
- Basic knowledge in earth observation

Suggested literature

- Vohland, M., Jung. A. 2020: Hyperspectral Imaging for Fine to Medium Scale Applications in Environmental Sciences. *Remote Sensing*, *12*(18), 2962.
- Thenkabail, P.S. and Lyon, J.G. eds., 2016. Hyperspectral remote sensing of vegetation. CRC press.
- Eismann, M., 2012. Hyperspectral remote sensing. Society of Photo-Optical Instrumentation Engineers.
- Grant, B., 2011. Field guide to radiometry. SPIE.
- Grahn, H. and Geladi, P. eds., 2007. Techniques and applications of hyperspectral image analysis. John Wiley & Sons.
- Chang, C.I., 2003. Hyperspectral imaging: techniques for spectral detection and classification (Vol. 1). Springer Science & Business Media.