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Editorial

Special Issue on Geodata Processing at the Institute of Surveying, Remote Sensing and Land Information at BOKU in Vienna

The Institute of Surveying, Remote Sensing and Land Information (IVFL) is part of the Department of Landscape, Spatial and Infrastructure Sciences (RaLI) at the University of Natural Resources and Life Sciences (BOKU) in Vienna, Austria. The institute is mentioned first in 1875 and has nowadays about twenty scientific and technical staff.

IVFL is involved in a number of Bachelor and Master study programs at BOKU such as Forest Sciences, Landscape Architecture and Landscape Planning, Environment and Bio-Resources Management and Environmental Engineering. The main topics taught are in surveying, GIS, remote sensing and photogrammetry. Additional courses are provided in Land Administration.

The work published in this issue of PFG is intended to give a concise overview of our current research activities. These are centred on the acquisition, processing, analysis, interpretation and visualization of geodata. In Tab. 1, the ten papers presented in this special issue are categorized in terms of (main) instruments and scale of application, along with the main methodologies applied.

As demonstrated by the paper contributions presented in this special issue, we conduct research in a wide range of topics such as:

- Measurement of soil roughness
- Forest height and yield class estimation
- Mud structure mapping
- Forest vitality assessment
- Modelling of crop water requirements
- Detection of illicit crops
- Wide-area land cover mapping
- Land surface phenology characterization
- Optimization of spectroradiometric measurements
- Wildlife migration modelling

In the work of Grims et al. (2014), low-cost cameras are used in a field-setting for deriving soil surface roughness indicators using photogrammetric methods. We demonstrate the potential of this simple and low-cost method for assessing soil roughness, which itself is an important input to model soil erosion.

Photogrammetric methods are also used in the work of Windisch et al. (2014) where the potential of digital aerial images is analysed for deriving forest height and yield classes. Through comparison with airborne laser scanning techniques (ALS) we show that important information about the forest structure can be derived from this source of information.

Three-dimensional information is also derived in the work of Heine et al. (2014). In contrast to the previous work, however, we use acoustic instruments (sonar) mounted on boats and sounding the lake bed. In this way it is possible not only to measure water depth but also to characterize the lake's mud layer.

Immitzer & Atzberger (2014) use pattern recognition techniques such as random forest (RF) to detect bark beetle infestations in Norway spruce. We demonstrate that using 8-band very high resolution WorldView-2 imagery it is possible to detect infestations in an early stage of development, which has important implications for an efficient disease control.

Multi-temporal and multi-spectral images from medium-resolution (DEIMOS-1) satellites are used in Neugebauer & Vuolo (2014) to map bio-physical land surface characteristics such as leaf area index (LAI) and albedo. Together with local agrometeorological data, we use this information to infer crop water consumption for agriculture.

Using data with similar spatial resolution (Landsat-5 and ETM+) but acquired at a higher temporal frequency, Mattiuzzi et al. (2014) monitor and detect illicit crops (based on time series of vegetation greenness – NDVI). The study enables us to optimize the acquisition window for relatively expensive (commercial) very high resolution (VHR) satellites.

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Tab. 1: Coarse categorization of manuscripts presented in this issue and prepared by members of the Institute of Surveying, Remote Sensing and Land Information (IVFL) in Vienna, Austria.

Instrument	Spatial resolution	Wavelength range	Scale			
			In situ	Sub-regional	Regional	Continental
Low-cost digital cameras	mm²	VIS	Photogrammetry (Grims et al.)			
Digital, aerial cameras	cm²	VIS-NIR		Photogrammetry (Windisch et al. 2014)		
Very high resolution satellites	m²	VIS-NIR		Pattern recognition (Immitzer & Atzberger 2014)		
Medium resolution satellites	ha	VIS-NIR-SWIR		Pattern recognition (Neugebauer & Vuolo 2014)	Pattern recognition (Mattiuzzi et al. 2014)	
Coarse resolution satellites	km²	VIS-NIR				Time series analysis (Vuolo & Atzberger 2014, Klisch & Atzberger 2014)
Spectroradiometer	cm²	VIS-NIR-SWIR	Spectroradiometry (Einzmann et al. 2014)			
Sonar instruments	m²	Acoustic		Acoustic echo sounding (Heine et al. 2014)		
GIS	n.a.	n.a.			GIS modelling (Suppan & Frey-Roos 2014)	

Again using time series analysis combined with pattern recognition techniques, Vuolo & Atzberger (2014) map major land cover classes across Europe at 250 m spatial resolution. We demonstrate that our land cover map outperforms (globally available) alternative products by using training data derived from Google Earth and NDVI time series from MODIS.

In Klisch & Atzberger (2014), MODIS-derived NDVI time series are used to map and monitor the start of season (SOS) across Europe. Through comparison with other published work and plausibility checks, we are able to demonstrate the feasibility and reliability of such an approach for mapping land surface phenology.

In the work of Einzmann et al. (2014), we assess different measurement protocols for using portable field spectrometers for collecting needle spectra in the field/laboratory. The collection of reference samples is for example necessary when using airborne imaging spectroscopy for mapping forest vitality.

GIS techniques are used in Suppan & Frey-Roos (2014) to model the movement of large mammals (deer). The necessary resistance maps are derived from remotely-sensed land use and land cover maps as well as expert knowledge regarding the animals' migration behaviour with respect to favourable and unfavourable conditions.

Together these ten technical and research papers provide an overview of our ongoing research activities. The reader will recognize the broad area of covered topics, as well as instrumentation and methodology. For the future, we strive to further integrate the different research topics and make better use of existing synergies between various sensors and approaches. Whenever possible, we try to integrate our research findings in teaching and education activities.

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