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EDITORIAL

Editorial

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Applications of remote sensing technologies have been proved as efficient in supporting sustainable agriculture. Advancements in Earth observation facilitate a monitoring of farmland across scales, times, and locations. The results lead to improved crop management practices, precise assessment of productivity, and effective monitoring of environmental quality. The developed methods are of high relevance to develop methods for operational information products to support the UN sustainable development goals in terms of food security and sustainable crop production. Especially with the launch of the Sentinel satellites, it is possible to monitor agricultural applications with a higher temporal and spectral resolution. The Sentinel satellites are the space component of the European Earth observation program Copernicus.

This Special Issue of Photogrammetry, Remote Sensing and Geoinformation Science (PFG) focuses on recent advances in various applications of remote sensing mainly in the development of sustainable agriculture in the *Durable Environmental Multidisciplinary Monitoring Information Network (DEMMIN)*. DEMMIN is a permanent Calibration/Validation (Cal/Val) test area which was designed specifically for remote sensing applications, focusing on agriculture. The data acquired in DEMMIN contribute specifically to strengthen the Copernicus in situ component in terms of quality assurance of the information products derived by remote sensing data. It is located in Northeastern Germany and covers an area of about 900 km^2 dominated by agricultural use, but with smaller areas of forest, rivers and lakes, centered by the city of Demmin (which intentionally coincides with the abbreviation of study area). The test site has been established in 2000, based on the partnership of the German Aerospace Center (DLR) and local farmers at the DEMMIN.

Since 2011, DEMMIN is part of the TERENO North Eastern Lowlands Observatory (TERENO-NE). In cooperation with the DLR, the Helmholtz Center Potsdam GFZ, the German Research Centre for Geosciences responsible for TERENO-NE, and the Research Center Jülich (FZJ) the existing environmental measurement network for the acquisition of environmental parameters was extended by further measurement stations, a lysimeter hexagon, a soil moisture network under agricultural used fields, and a scientific research crane platform in the forest (see Fig. 1). The permanent measurements are supplemented by in situ field campaigns for specific research objectives for, e.g., vegetation, soil or water parameter estimation and management information from local farmers. This large data base allows developing and validating remote sensing-based products. In 2017, DEMMIN became an official German test site of the Joint Experiment of Crop Assessment and Monitoring (JECAM—see http://www.jecam.org/) that is developed in the framework of GEO Global Agricultural Monitoring and GEO Agricultural Risk Management to reach a convergence of approaches, develop monitoring and report protocols and best practices for agricultural systems using remote sensing-based data. However, DEMMIN is not only an in situ observation site for agriculture. It can be also seen as a well-equipped agricultural landscape in cool-moderate climate conditions that is characterized by a wide range of ecosystems that are interconnected through the water and nutrients cycles.

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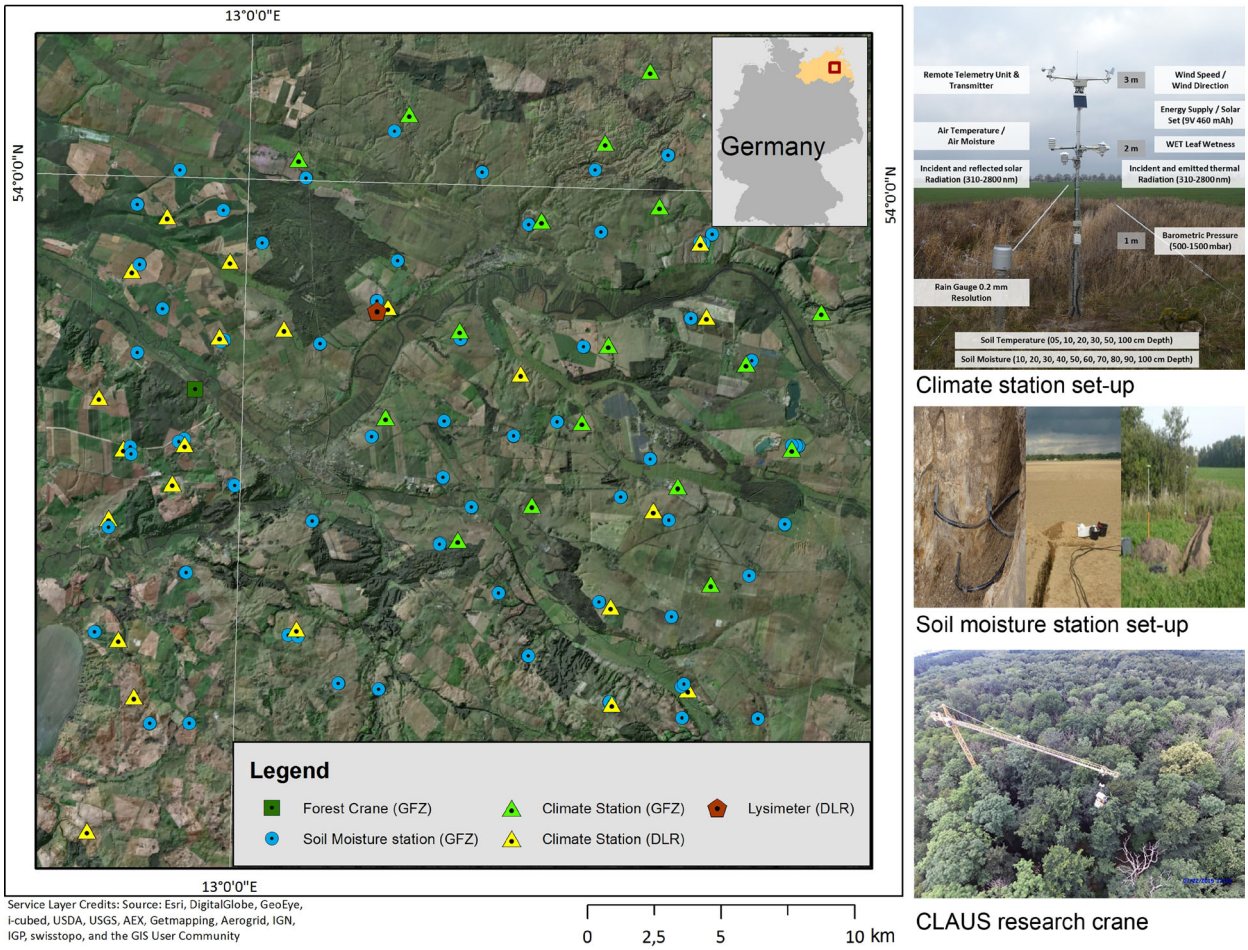

Fig. 1 Location of permanent measuring infrastructure at the DEMMIN test site

Within the special issue, selected studies on the state-of-the-art research at the DEMMIN research area are presented. Heupel et al. (2018) introduced a new method for progressive crop-type mapping that enables an evolving crop-type mapping from the beginning of the growing season with increasing level of detail and accuracy. Klinke et al. (2018) and Holtgrave et al. (2018) present two studies focusing on soil moisture estimation of grassland sites in the floodplain areas along the rivers Tollense and Peene. Whereas the work of Klinke et al. (2018) is based on a synergistic use of optical, thermal and SAR remote sensing data, Holtgrave et al. (2018) is using Sentinel-1 SAR time series. In addition, Dörnhöfer et al. (2018) focus on time series analysis of water quality variation of the Lake Kummerow, the seventh largest lake of Germany, which is located in the DEMMIN research area. Their study underlines the possibility of remote sensing to investigate the feedback of lake ecosystems in agricultural areas and the integrative character of the tool at the landscape scale.

Last but not least, the studies collected within the present special issue of PFG are by no means believed to cover all applications in remote sensing-assisted research at the DEMMIN area, but the editors believe that the special issue succeeds to give a short glimpse into the remote sensing-based application development in synergy of high-quality in situ data of the DEMMIN test field. The method development, research and practice in combination with increasing number of operational and free satellite and network-based data, linked with powerful processing and analysis routines will support the process of transfer from experimental and methodical studies into cost-effective, operational services. Other research groups are invited to participate in this cooperation with its wealth of in situ data in future research initiatives.

Guest editors

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