Geophysical Research Abstracts
Vol. 20, EGU2018-17956, 2018
EGU General Assembly 2018

Implementation and validation of low-cost miniature optical spectrometer for environmental research

Bert Palm (1), Hannes Mollenhauer (1), Paul Remmler (1), Andreas Jechow (2,3), and Jan Bumberger (1)

(1) Helmholtz Centre for Environmental Research, Monitoring and Exploration Technologies - MET, Leipzig, Germany, (2) Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Department Ecohydrology, Berlin, Germany, (3) Helmholtz Centre Potsdam – GFZ German Research Centre for Geosciences, Section Remote Sensing, Potsdam, Germany

Optical remote sensing (spaceborne, airborne up to close-range) is one of the key methods for observing changes and conditions in environmental systems. Nevertheless, in-situ measurements are necessary to validate and calibrate remotely sensed data. For this purpose, it has been proven effective and economical to carry out ground-level optical monitoring at short intervals and large scales, such as is often implemented with wireless sensor networks. Therefore, a high number of relatively inexpensive sensors are often required in order to accomplish such a network. Typically, sensors of specific small wavelength ranges are used to derive specific indices. The present work examines whether a low-cost miniature spectrometer (Hamamatsu C12880MA) with multiple wavelength detection is more suitable for this purpose in order to generate additional information. Therefore, a cost-effective sensor platform prototype for integrating the miniature spectrometer was developed and angle dependence, repeatability, resolution and sensitivity were characterized at the laboratory scale. First test on field scale for close-range remote sensing of inland water surface water show the suitability of the miniature spectrometer for close-range remote sensing in environmental research. In comparison with a standard ASD field spectrometer, a coefficient of determination higher than 0.8 was achieved. In particular the results of the field experiments establish a usage as a sufficient and economical alternative to high cost spectrometers in long-term monitoring applications.