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Monitoring of small lakes: determination of chlorophyll a concentration with satellite data

Nathalie Karle and Thomas Wolf
Institute for Lake Research (ISF), LUBW, Germany (nathalie.karle@lubw.bwl.de, thomas.wolf@lubw.bwl.de)

Satellite data, which map large areas with high spatial and temporal resolution, can complement existing in situ monitoring programs and evaluation procedures. The usability of satellite data for official water monitoring is investigated in the joint project WasMon-CT. The subproject at the Institute for Lake Research (ISF) of the LUBW focuses on the satellite-based monitoring of chlorophyll a in lakes. Freely available data of spatially high-resolution satellites, e.g. Sentinel-2, open up new opportunities to monitor the water quality of a larger number of even smaller lakes. In addition, better information on spatial inhomogeneities of chlorophyll a distributions (patchiness) can be obtained. This poster presents the applicability of remote sensing data especially for very small lakes and for lakes which show difficult optical properties (e.g. high concentrations of yellow substances).

As part of the project WasMon-CT special measurement campaigns have been realised in small lakes. In order to achieve the best possible validation the in situ measurement dates are exactly matched to the satellite flight dates. Horizontal measurement profiles were recorded with physical probes to determine the patchiness. Further data from up to 15 different lakes and ponds with areas of 1-30 hectares from the SOS Lake Program (Remediation Program Upper Swabian Lakes) are included in the validation.
The spatially high-resolution satellite data are processed by the service provider EOMAP and are compared with in situ measurement data in a comprehensive validation study for parameters such as chlorophyll a and Secchi depth.

First results show a good agreement of remote sensing data and in situ data for chlorophyll a at least in the order of magnitude. Systematic and methodical differences between in situ and satellite measurements have to be taken into account comparing these data. Furthermore, regional cloud cover over small lakes can lead to a low number of valid satellite data, which can make a statistical evaluation difficult. However, with the launch of Sentinel-2A/2B and other planned satellite missions additional remote sensing data will be available in the future ensuring much higher temporal sampling rates.