Geophysical Research Abstracts
Vol. 17, EGU2015-15710, 2015
EGU General Assembly 2015

Small-scale variability of chlorophyll, CDOM, and suspended matter in the Lake Balaton as obtained by shipborne UV fluorescent lidar

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Despite a long history in oceanography, few attempts have been made to
use fluorescent lidars to evaluate water quality in lakes. We report lidar
measurements taken on the Lake Balaton over the period of five days in August, 2012. Lake Balaton, the largest lake in Central Europe in area (597 km2), is very shallow (average depth of 3.5m). The lake is mesotrophic exhibiting a strong trophic gradient from SW to NE.

The UV fluorescent lidar UFL-9 used in this study was developed at the Shirshov Institute of Oceanology. It can be used for CDOM, organic pollutants, chlorophyll, and suspended matter concentrations measurements at very high spatial resolution (up to $\sim$1 m). The data were collected continuously during daytime while the boat was travelling. The entire area of the lake was covered by the measurement. The lidar data were calibrated against those obtained in situ through water sampling and then converted from the optical units into the mass concentrations of the above mentioned constituents.

Based on this data set, we mapped and investigated in detail the small-scale spatial variability of CDOM, chlorophyll-a, and suspended matter concentrations. In particular, the characteristics of patchiness for the selected parameters were quantified and inter-compared, and their relations with the background forcing conditions were analyzed. We also discuss the applicability of lidar techniques for assessing the hydrological and ecological conditions in shallow inland water bodies.

The study was partly supported by the Russian Science Foundation, Grant 14-50-00095.