



## **Spatial patterns of water quality parameters in upper layer of the Kara Sea in summer 2016 based on laser remote sensing**

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The paper represents results of remote sensing by means of Laser Induced Fluorescence LiDAR during the expedition in Kara Sea in summer 2016.

The expedition took place in Western and Southern parts of Kara Sea including Ob and Yenisei areas from June, 14 to August, 20 2016. The LiDAR observations were obtained from the research vessel Mstislav Keldysh and included 4600 km of almost continuous measurements and 94 complex stations. As a result now there is a vast LiDAR database available for scientific purposes. The data were processed and recalculated providing a set of high resolution maps of distribution of main oceanographic water quality parameters including chlorophyll "a", total organic carbon and total suspended matter in surface layer.

The proceeded maps give a precise information about the location of frontal zones between Ob and Yenisei waters and Kara Sea waters, provide a detailed picture of complex surface water structure in central Kara Sea and other locations and present data about spatial distinction of concentrations of measured water parameters.

The LiDAR measurements were afterwards compared to data, obtained by underway flow-through CTD measuring system and satellite images providing adjunct information on water parameters' distribution features.

The instruments of UFL (Ultraviolet fluorescent LiDAR) series were developed by the Shirshov Institute of Oceanology, Moscow, Russia, and have been successfully used in lots of scientific expeditions in different water areas.

UFL LiDARs take measurements with sampling rate up to 2 Hz from the vessel under way in any weather or sunlight conditions. The measurements are linked to a GPS, and so all data are geo-tagged and can be used to create interpolated maps of the measured parameters.

The instrument analyses backward signal from dual excitation (355, 532 nm) laser pulses emitted at 2 Hz. The signal is detected across 11 bands in series (355, 385, 404, 424, 440, 460, 499, 532, 620, 651, 685 nm) on stations, and across 4 bands at the same time (355, 404, 440, 685 nm) in transect mode while the vessel is moving. Fluorescence intensities at 440 and 685 nm and backscattering of the 355 nm laser pulse are normalized to Raman scattering at 404 nm, and then calibrated using a set of laboratory-measured concentrations to derive total organic carbon, chlorophyll a and total suspended matter concentrations.