CDOM AS AN IMPORTANT COMPONENT IN THE ARCTIC FRESHWATER ECOSYSTEMS – A CASE STUDY FOR THE KOLA PENINSULA WATER OBJECTS

Anastasiia Pashovkina

Master Program Polar and Marine Sciences POMOR / 050406 Ecology and environmental management

Supervisors:
Prof. Dr. Anja Engel, GEOMAR Helmholtz Centre for Ocean Research Kiel
Dr. Irina Fedorova, Saint Petersburg State University

Nowadays, it is widely known that due to climate change significant intensification of thermal denudation and thermal erosion processes in the Arctic regions and subsequent increase of CDOM (Coloured Dissolved Organic Matter) concentrations in the water objects can be observed. CDOM is an important component of the natural water composition that influences the ecological state of freshwater ecosystems and optically measurable parameter of Dissolved Organic Carbon (DOC). The proposed Master thesis is focused on the estimation of CDOM parameters in the Kola Peninsula water objects and is based on the samples collected during the expedition “Apatity-2020”. CDOM samples were analyzed using dual-beam spectrophotometer SPECORD-200 (Jena Analytic©, Jena, Germany) in the Otto Schmidt Laboratory in the Arctic and Antarctic Research Institute (AARI) and subsequently compared with other hydrochemical and hydrophysical parameters measured for the same water objects. It was found that CDOM is correlating successfully with DOC, watercolor, permanganate oxidizability, $\delta^{18}O$ and d_{exs} and constraint equations for each of these correlations were created. These equations can be applied for estimating the above listed parameters using CDOM data or for comparing CDOM concentrations with more “classical” datasets transferring it, for example, in permanganate oxidizability data. Moreover, the seasonal dynamic of CDOM was followed. It was found that CDOM concentration in investigated water objects varied from 0.44 to 10.19 m^{-1}. Higher CDOM concentration was observed during the stable ice cover period, which can be explained mainly by slowing down of biological activity in the aquatic ecosystems in winter. Also, the predominance of allochthonous organic matter in the water objects was detected and photodegradation processes were observed in 7 out of 15 samples, which is more than in an earlier study (Pashovkina, Fedorova, 2020). In addition, a high fraction of humic acids in the compound of DOC was detected for swamps and swampy lakes. Furthermore, it was found that CDOM concentrations could be significantly affected by the anthropogenic impact. In general, this work provides additional information about CDOM nature and improves the general understanding of how CDOM affects the ecological state of the water objects located on the Kola Peninsula as a part of complex water system.