

### **1<sup>st</sup> lecture on Primary production in the Arctic**

Spaceborne one month averaged data, predominantly from the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) and partly from the Moderate Resolution Imaging Spectroradiometer (MODIS), were used to investigate changes in primary production (PP) by phytoplankton in the Arctic Ocean from 1998 to 2010. Several PP retrieval algorithms were tested against the collected in situ data, and it was shown that the algorithm by Behrenfeld and Falkowski gave the best results (with the coefficient of correlation,  $r$ , equal to 0.8 and 0.75, respectively, for the pelagic and shelf zones). Based on the performed test, the Behrenfeld and Falkowski algorithm was further applied for determining both the annual PP in the Arctic and the PP trend over the above-mentioned time period. Results of our analysis indicate that PP in the Arctic has increased by 15.9% over 13 years (1998–2010). This finding, as well as the absolute annual values of PP remotely quantified in the present study, is at odds with analogous numerical assessments by other workers. These disagreements are thought to be due to differences in the applied methodologies of satellite data processing such as cloud masking and determination of phytoplankton concentration within (1) overcast areas and (2) areas of massive growth of coccolithophores as well as (3) in the shelf zone prone to a significant influence of land and river run-off.

### **2<sup>nd</sup> lecture on Lake Ladoga:**

Multi-decadal extensive ship borne biochemical investigations conducted by the Limnological Institute in St. Petersburg (Russian Academy of Sciences) have shown that since the mid-1980s the ecosystem of Lake Ladoga (at that time a mesotrophic water body) has undergone significant and multifaceted alterations primarily as a result of a dramatic cutting of external phosphorus input enforced by the administrative measures taken at the Russian federal and regional levels. Using the SeaWiFS data for the time period 1998–2004, the seasonal dynamics of spatial distributions of phytoplankton chlorophyll and dissolved organic matter in Lake Ladoga have been documented and analyzed. It is shown that the hydro-optical characteristics of the lake's water have undergone appreciable modifications as compared to the mid-1980s. Contrary to expectations that these changes would bring about some amelioration of the lake's ecological state, ship-based and spaceborne observations indicate that the attained decrease in phosphorous input has not resulted in “healing” of the lake's ecology. It is proposed that during the lake's mesotrophic period, a specific mechanism of phosphorus release from dissolved organic matter has gradually developed. As a result, the lake's phosphorous concentrations have continued to be higher than expected. In addition changes in local atmospheric forcing are manifested not only in remotely sensed color data but also in the inter-annual behavior of the spring thermal bar derived from the AVHRR multi-year observations.