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Tracing river runoff and DOC over the East Siberian Shelf using in situ CDOM measurements

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The Great Siberian Rivers integrate meteorological and hydrological changes in their watersheds and play a significant role in the physical and biogeochemical regime of the Arctic Ocean through transport of fresh water (FW) and carbon into the sea. Since 1994, the Laboratory of Arctic Research POI in cooperation with the IARC UAF investigate the fresh water and carbon fluxes in the Siberian Arctic land-shelf system with the special emphasize in the East Siberian Arctic shelf (ESAS) which represents the widest and shallowest continental shelf in the World Ocean, yet it is still poorly explored. The East Siberian Sea is influenced by water exchange from the eastern Laptev Sea (where local shelf waters are diluted mostly by Lena River discharge) and by inflow of Pacific waters from the Chukchi Sea. This region is characterized by the highest rate of coastal erosion and significant volume of the riverine discharge and exhibits the largest gradients in all oceanographic parameters observed for the entire Arctic Ocean. Here we demonstrate a connection among Chromophoric (or Colored) Dissolved Organic Matter (CDOM) which represents the colored fraction of Dissolved Organic Carbon (DOC), salinity, and pCO2. Our data have documented strong linear correlations between salinity and CDOM in the near shore zone strongly influenced by riverine runoff. Correlation coefficient between CDOM and salinity in surface waters was equal to -0.94, -0.94 and -0.95 for surface water stations in September of 2003, 2004, and 2005, respectively. Combined analysis of CDOM and DOC data demonstrated a high degree of correlation between these parameters (r=0.96). Such close connection between these characteristics of waters in this region makes it possible to restore the distribution of DOC according to our original CDOM data of the profiling systems, such as CTD-Seabird equipped by WETStar CDOM fluorimeter. It is shown that the CDOM can be used as a conservative tracer to follow the transport and fate of FW across the Arctic shelf through a combination of remote sensing and field observations. This work accomplished under auspice of the Russian Academy of Sciences, NOAA, US National Science Foundation, and Russian Foundation for Basic Research. Future work will be targeted towards a key, unresolved issue of climate change in the Arctic which can be cast as a scientific question that is fundamentally cross-disciplinary and synthetic: How does the Arctic hydrological and carbon cycle respond to global change?