Geophysical Research Abstracts
Vol. 12, EGU2010-13081-1, 2010
EGU General Assembly 2010

Transport and fate of terrestrial organic carbon in the East Siberian land-shelf system: Riverine input vs. coastal erosion.

Igor Semiletov (1,2), Oleg Dudarev (2), Irina Pipko (2), Alexander Charkin (2), Svetlana Pugach (2), Natalia Shakhova (1,2), and Orjan Gustafsson (3)

(1) International Arctic Research Center, University of Alaska Fairbanks, Fairbanks, Alaska, USA (igorsm@iarc.uaf.edu), (2) Laboratory of Arctic Studies, V.I. Il'ichev Pacific Oceanological Institute , Vladivostok, Russia, (3) Department of Applied Environmental Science and the Bert Bolin Climate Research Centre, Stockholm University (SU), Sweden

We present some results of our biogeochemical and hydrological studies conducted in the East Siberian Arctic seas (ESAS) in 1994-2008, and along the Lena River stream during July-August, 2003 and after flood season in late August-early September, 1995 and 1998. We focus on the carbon cycle, including horizontal dissolved and particulate organic and inorganic carbon and vertical carbon dioxide (CO2) and methane (CH4) fluxes, and the geochemistry of the surface seafloor sediments in connection with the effects of coastal erosion and riverine solid and liquid discharge. We directly observed particulate matter (PM) fluxes along the Lena River down to the Laptev Sea during late August – early September of 1997 and 1999, and June-August of 2003. Our results demonstrate that almost all riverine PM settles in the delta; this was true even during the spring/summer floods that occurred in June-July 2003. Values of PM, particulate organic carbon (POC), and d13C in POC ranged between –30%■ and -25%■ with a mean value near –27%■. A similar range of d13C/POC variability was found by Rachold and Hubberten in 1999 in the Lena, Khatanga, and Yana basins. In general, the riverine POC had a light "terrestrial signature", while a few samples contained small particles of coal which is common in this area. Using mean PM concentration = 20 mg/l and annual Lena discharge = 525 km3 we calculated "mean" solid discharge to the delta channels to be 10.5 Tg, The annual discharge of POC may be evaluated as equal to 0.38 Tg, if we use a mean POC value = 0.75mg/l; this value was obtained in 2003 along the entire Lena River. If we accept the Lisytsin statement (1994) that 85-95% of total PM (and POC) precipitates on the marginal "filter", only about 1Tg of PM, and 0.03-0.04 Tg of POC reaches the Laptev Sea with the Lena River (flood season is not considered). In summer-fall the solid discharge of the major East Siberian Sea rivers, the Indigirka and Kolyma, is also limited by the near-mouth areas (Ivanov and Piskun, 1999). Thus, we suggest that the modern solid river discharge plays only a small role in sedimentation of terrestrial OC in the entire ESAS area, but the Lena plays a major role in transporting dissolved organic carbon (DOC). It has been found also that the seabed is a major CH4 source over the ESAS while the riverine export is negligible (N.Shakhova et al., this session). Results of our earlier studies performed in the Dmitry Laptev Strait in 1999 and 2000 demonstrate the existence of high rates of seaward PM flux, up to 189-290 mg/l km, which are similar to those found near the Mekong River delta. The most recent evaluation demonstrates that about 4 Tg of POC is transported into the Laptev and East-Siberian seas along with coastal eroded material (M. Grigoriev, this session). Thus, we argue that transport of eroded material plays a major role in the accumulation of carbon in this part of the Arctic Ocean. Moreover, the eroded carbon is biodegradable and its oxidation plays an important role in CO2 supersaturation, with respect to the atmosphere, in the shallow ESAS (I.Pipko et al. and I.Semiletov et al., this session)

References

Ivanov, V.V. and A.A. Piskun (1999), Distribution of river water and suspended sedimentloads in the deltas of rivers in the basins of the Laptev and East-Siberian Seas, In: Land-Ocean Systems in the Siberian Arctic: Dynamics and History, edited by H. Kassens et al., Springer-Verlag, Berlin, pp. 239-250.
Lisytsin, A.P. (1994) Ocean marginal filters, Oceanologiya, 34 (5), 735-747 (translated in English).
Rachold, V., and H.-W.Hubberten (1999), Carbon isotope composition of particulate organic material in East Siberian rivers, In: Land-Ocean Systems in the Siberian Arctic, edited by H. Kassens et al., Springer-Verlag,

Berlin , pp. 223-237.