



Tracing continental discharges in the Kara Sea: Anomalous spreading of river runoffs in the fall of 2007

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The Kara Sea is the one most strongly exposed to river inflows of all the marginal Arctic seas (and, perhaps, of all the seas on Earth). Two of the great Siberian rivers, Ob and Enissey, and a number of smaller rivers altogether bring to the Sea as much as about 1300 km³ of fresh water on the long-term average. The runoffs are highly variable at both the seasonal and the interannual scales. Not surprisingly, the buoyant continental discharges play an exceptional role in forming the physical regime of the Kara Sea. They also are a major source of suspended terrigenous matter, nutrients, and (at least, potentially) anthropogenic pollutants. The “normal” pattern of fresh water spreading in the Kara Sea implies the eastward propagation of the river plumes from the Ob and Enissey mouths, along the southern coast of the Sea. This, however, was not the case in the summer and fall of 2007. A research cruise in the Kara Sea was conducted by R/V “Akademik Keldysh” of the Shirshov Institute of Oceanology, Russia, on September 1-30, 2007. Continuous measurements of the thermohaline structure and water sampling revealed little or no continental waters in the southwestern portion of the sea. Instead, a large isolated “lens” of low salinity water (about 15 psu) was observed far away from the estuaries, adjacent to the shore of Novaya Zemlya island in the northern extremity of the Sea, where a sharp frontal zone between the “continental” and “oceanic” waters was also identified. Chemical properties of the low salinity water, in particular, the content of Si, indicated that it must have originated from Enissey rather than Ob, even though the Ob estuary is closer to the location of the observed freshwater plume. We hypothesize that this unusual dynamical situation resulted from anomalous wind forcing conditions during the summer of 2007, and develop a conceptual model for the plume propagation in the Ekman layer.