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Modeling Kara Sea freshwater and export

I .H. Harms (1) and M.J. Karcher (2,3)

(1) Centre for Marine and Climate Research, University Hamburg, Germany (harms@ifm.uni-hamburg.de), (2) Alfred-Wegener-Institute for Polar and Marine Research, Bremerhaven, Germany, (3) O.A.Sys, Ocean-Atmosphere-Systems, Hamburg, Germany

A regional coupled ice-ocean model for the Kara Sea, forced with boundary conditions from a large scale North Atlantic / Arctic Ocean Model is used to study dispersion and export of freshwater from Ob and Yenisei rivers towards the Arctic Ocean and the Laptev Sea, for the period 1996-2001. The years 1998 and 1999 were characterized by a strong positive sea level pressure (SLP) anomaly in the Siberian part of the Arctic Ocean. Due to prevailing north-easterly winds, the SLP anomaly caused a blocking situation, which suppressed the otherwise eastward freshwater export to the Arctic Ocean and Laptev Sea. This reversal of the prevailing circulation scheme led to a dramatic freshening of the Kara Sea through accumulation of low saline river water in the central and western parts. Additionally, the Kara Strait inflow from the Barents Sea, which presents the main source for saline Atlantic derived water, was reduced and partly even reversed. The suppressed freshwater export during winter 1998/99 recovered in the following winter 1999/2000 when a significant pulse of low saline surface water left towards the Laptev Sea. The variability of the river discharge plays a minor role for the investigated period because the inter-annual variability of runoff rates is generally too low to explain the observed hydrographic changes. The results underline the importance of local shelf sea processes for the variability of the freshwater export from the Arctic Shelves to the central Arctic Ocean.