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Influence that Interannual Variations in Siberian River Discharge have on Redistribution of Freshwater Fluxes in Arctic Ocean and North Atlantic

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A numerical simulation with a coupled sea-ice model of the Arctic and North Atlantic oceans is used to study the influence that the interannual variations in the Siberian river discharge have on the distribution and propagation of freshwater in this region. In numerical experiments we compared simulations with the use of observational data on the discharge of the most significant Siberian rivers (Ob, Yenisey, and Lena) against the results of climatic seasonally average variations of their discharges. This comparison showed that the interannual variations may have significant consequences despite their smallness when compared with oceanic scale water transport. These consequences include (1) the intensification of either cyclonic or anticyclonic components of motion of the near-surface Arctic Ocean waters and, as a result, the redistribution of freshwater fluxes from Arctic regions between the Fram Strait and the straits of the Canadian Archipelago. A change in the store of fresh Arctic Ocean waters due to interannual variations in the Ob, Yenisey, and Lena discharges is approximately $\pm$400 km3, whereas the volume of water redirected in this regard, which forms a link between some straits, reaches 15 thousand km3. On the other hand, (2) insignificant changes in the propagation direction of freshwaters are multiply enhanced in the process of their motion in the North Atlantic as part of the subpolar gyre because of their smaller or larger involvement in the processes of vertical mixing. As a result of this, anomalies of freshwater develop considerably far from the river mouths, like in the region of the Azores islands, and are 5–6 times larger than the maximum values of the accumulated variability volumes of the river discharge.