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Wind-driven Variability of the Atlantic Water Transport to the Nordic Sea

Jiayan Yang
United States (jyang@whoi.edu)

The Greenland-Iceland-Scotland Ridge (GISR) is a major barrier for oceanic heat transport from the Atlantic to the Arctic Ocean. The mean transport is believed to be driven by the buoyancy forcing, i.e. the northward transport of the Atlantic Ocean water is drawn into the Nordic Seas to compensate the southward overflow transport across the GISR. Seasonal to decadal variability, however, is strongly affected by the wind stress in both the Atlantic Ocean and the Nordic Seas. In this study, analyses of both in situ and satellite observations, data-assimilated model products and numerical modeling experiments are used to elucidate the key forcing mechanisms and processes. It is found that transport is enhanced when the wind-stress curl is anomalously positive over the GISR area and in the subpolar North Atlantic Basin. The wind-stress curl inside the Nordic Sea also exerts a strong influence on the transport over the GISR through its impacts on the East Greenland Current and on the overflow transport. Our analyses indicate that the wind-stress forcing is a main mechanism for season-to-decadal variability of the transport cross the GISR.