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How does atmospheric forcing drive the variability of the Arctic/North Atlantic exchanges?

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We investigate the variability of the exports of volume, heat, freshwater and sea-ice from the Arctic Ocean to the North Atlantic, which is known to possibly affect the deep convection regions and thus the global thermohaline circulation. An Arctic/North Atlantic regional ocean/sea ice model with an average resolution of 25 km grid in the Arctic Ocean is used in this regard. Our reference simulation over the 1958-2001 period, forced by ERA40 atmospheric fields, is shown to represent fairly well the Arctic/North Atlantic exchanges, compared to available observations. We find that the volume transports on each sides of Greenland, through Davis Strait and Fram Strait, are strongly anticorrelated, which is possibly due to the variability of the wind stress over the Arctic. The relative influences of the different atmospheric fields (wind stress, heat and salt flux) on the exchanges variability are also examined, as we run sensitivity experiments where interannual variability of the different forcing is globally or regionally removed. We find that the interannual frequency is mainly wind driven, and we discuss the mechanisms that drive lower frequencies.