Wind-driven Variability of the Nordic Seas Overflow and its Impact on AMOC

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The dense water masses that spill over the Greenland-Iceland-Scotland Ridge (GISR) from the Nordic Seas are major sources of the North Atlantic Deep Water (NADW). The Nordic Seas Overflow (NSO) is restricted by shallow sill depth along the GISR. Observations and model simulations indicate that wind stress is the main driver for seasonal-to-interannual variations in the overflow transport. A two-layer Nordic Seas Overflow model is used to investigate the sensitivities of overflow transports through Denmark Strait, Faroe Bank Channel and Iceland-Faroe Ridge to variations in wind stress. Wind stress affects overflow transports through several mechanisms. On interannual time scales, the Ekman pumping and sucking affect the height and dense water surface and modulate the hydraulically-controlled transport. Wind stress curl along Nordic Seas boundary forces exchanges between the deep-water reservoir and slope current – the main transport mechanism to the sill. On shorter time scales, variations in barotropic flow directly affects the transport of the dense water over the sill. Once over the sill, signals of NSO variability propagate southward as topographic waves along continental slope of interior bathymetric features. They affect deep-sea flows thus AMOC in lower latitudes. The pathways and impacts of such waves will be discussed in the context of a two-layer model.