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A streamwise view of the Norwegian Atlantic Slope Current

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The inflow to the Arctic Ocean and the Barents Sea is mainly constituted by water carried poleward by the Norwegian Atlantic slope current (NwASC). This barotropically locked shelf-edge current plays a major role in linking the North-Atlantic to the Arctic. Based on an almost 20-year satellite altimetry record and a strictly isobath-following geostrophic approach, we provide a detailed large-scale view of the NwASC, here defined as extending from the Faroe-Shetland Channel (FSC) up to Bjørnøya at the Barents Sea opening (BSO).

The study is initiated by examining current-meter data and isobath-following barotropic transport at three locations along the NwASC; Svinøy, Gimsøy and Bjørnøya. This inter-comparison yielded a good agreement, confirming the robustness of the altimetric along-isobath approach. The analysis is continued by decomposing the NwASC into a number of regions (FSC, Svinøy, Vøring, Lofoten and BSO) and conducting a probability-density (PD) analysis of their transports. In general, the southern regions show a broad range of transport variability (wide PD distribution), while the northern distributions are narrow. The southern distributions are most likely influenced by the large-scale exchange in the Nordic Seas, while the northern distributions are to a large extent caused by the steep bottom topography capable of stabilizing the flow. The transports are further discussed in relation to the isobath-following eddy kinetic energy (EKE) in the different regions. The most interesting relationship is found at the Lofoten slope, where the EKE appears to be extremely sensitive to increases of the barotropic transport (which has little variability). This has implications for how flow as well as hydrographic anomalies might be transferred through the Nordic Seas toward the Arctic, where intense eddy shedding in the Lofoten region appears to curtail these signals.