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# Improved measurements of mean sea surface velocity in the Nordic Seas from synthetic aperture radar

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The warm and saline surface Atlantic Water (AW) flowing into the Nordic Seas across the Greenland-Scotland ridge transports heat into the Arctic, maintaining the ice-free oceans and regulating sea-ice extent. The AW influences the region's relatively mild climate and is the northern branch of the global thermohaline overturning circulation. Heat loss in the Norwegian Sea is key for both heat transport and deep water formation. In general, the ocean currents in the Nordic Seas and the North Atlantic Ocean is a complex system of topographically steered barotropic and baroclinic currents of which the wind stress and its variability is a driver of major importance.

The synthetic aperture radar (SAR) Doppler centroid shift has been demonstrated to contain geophysical information about sea surface wind, waves and current at an accuracy of 5 Hz and pixel spacing of $3.5 - 9 \times 8$ km$^2$. This corresponds to a horizontal surface velocity of about 20 cm/s at $35^\circ$ incidence angle. The ESA Prodex ISAR project aims to implement new and improved SAR Doppler shift processing routines to enable reprocessing of the wide swath acquisitions available from the Envisat ASAR archive (2002-2012) at higher resolution and better accuracy than previously obtained, allowing combined use with Sentinel-1 and Radarsat-2 retrievals to build timeseries of the sea surface velocity in the Nordic Seas.

Estimation of the geophysical Doppler shift from new SAR Doppler centroid shift retrievals will be demonstrated, addressing key issues relating to geometric (satellite orbit and attitude) and electronic (antenna mis-pointing) contributions and corrections. Geophysical Doppler shift retrievals from one month of data in January 2010 and the inverted surface velocity in the Nordic Seas are then addressed and compared to other direct and indirect estimates of the upper ocean current, in particular those obtained in the ESA GlobCurrent project.