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Monitoring the surface inflow of Atlantic Water to the Norwegian Sea using Synthetic Aperture Radar

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Zonal and meridional sea surface velocities are estimated from range Doppler velocities from Envisat Advanced Synthetic Aperture Radar (ASAR) acquisitions between 2007 and 2011, covering the Norwegian Sea, the North Sea, and the Skagerrak Sea. After systematic corrections, the inflow of Atlantic Water to the Norwegian Sea, via the two branches of the Norwegian Atlantic Current, is investigated. Distinct expressions of the eastern branch, the Norwegian Atlantic Slope Current, are revealed with a speed of 20–40 cm/s and a clear manifestation of topographic steering along the 500 m isobath. The western branch, the Norwegian Atlantic Front Current, is also depicted but with lower surface velocities. Moreover, parts of the Norwegian Coastal Current are also detected with time-averaged speed reaching up to 40 cm/s. At a spatial resolution of 10 km, the root mean square errors of these velocities are estimated to be less than 5 cm/s. The retrievals are assessed and compared to other direct and indirect estimates of the upper ocean current, including surface Lagrangian drifters, moored recording current meter measurements, and surface geostrophic current inverted from several mean dynamic topography fields. The results are promising and demonstrate that the synthetic aperture radar based range Doppler velocity retrieval method is applicable to monitoring the temporal and spatial variations of ocean surface circulation, provided the imaging geometry is favorable.