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GOCE studies of mean dynamic topography and ocean circulation in the Nordic Seas

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By combining the GOCE (Gravity field and steady-state Ocean Circulation Explorer) derived Mean Dynamic Topography (MDT) and altimetric sea level anomalies (SLA) with hydrographic data an estimate of the mean and variables transport of Atlantic Water entering the Nordic seas is obtained for the period 1993 – 2010 at a spatial resolution of 100 km. The mean inflow of Atlantic Water (Salinity >35) through the Faroe-Shetland Channel is estimated to approximately 4.1 Sv (1 Sv = 10̂6 m̂3ŝ-1). Across the Iceland Faroe Ridge the mean volume transport of Atlantic Water is 3.5 Sv. In comparison, the mean transport of the two branches of Atlantic Water crossing the Svinøy section the Norwegian Atlantic Slope Current and the Norwegian Atlantic Front Current is respectively 3.8 Sv and 3.0 Sv. This is in close agreement with previous estimates. Taking benefit of the temporal variability observed in the SLA and hydrography data the seasonal cycle in the transport of the inflowing Atlantic Water reveals a consistent pattern with a maximum of 9.3 Sv during the winter months (Des – Feb), and a minimum of 5.4 Sv during the summer months (Jun – Aug). The winter maximum was almost twice as large as the summer minimum, and a preliminary analysis suggests that the strength of Atlantic flow toward the Arctic reflect the strength of the regional wind forcing (NAO).