

Title: On the spatial structure and temporal variability of poleward transport between Scotland and Greenland

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Abstract: We revisit an earlier 1999-2002 program of repeat and regular ADCP sampling of upper ocean currents (0-400 m) between Scotland and Greenland to determine patterns of flow in the northeastern North Atlantic. We then combine this 4-year study with 18 years of altimetric sea surface height (SSH) data to examine the region's temporal variability. The ADCP-measurements show that the Reykjanes Ridge serves as an effective separator of flow towards the Nordic and Labrador Seas, with near-equi-partition of transport west (~ 8.5 Sv) and east (~ 8 Sv) of the ridge. The Labrador Sea branch exhibits two parallel flows to the north on the western slope of the Reykjanes Ridge. The eastern branch has three sub-branches: along the Maury Channel, east of Bill Bligh Bank and along the Scotland Slope. Given the measurement uncertainties the total transport north east of the ridge accords surprisingly well with the Norröna estimate of transport into the Nordic Seas. The SSH data show good overall agreement with geostrophic sea level difference estimated from the repeat ADCP sections, but cannot resolve the fine structure of the topographically-defined mean circulation. SSH also reveals a strong anti-correlation of poleward flow west and east of the Reykjanes Ridge. SSH further reveals an anti-correlation of the eastern sub-branches, but offset in time with respect to the Labrador Sea branch such that all these variations cancel out for the

entire Greenland-Scotland section leaving a gradual decrease in sea level difference from 0.64 to 0.56 m over the 1993-2011 observation period.