



Exchange of warming deep waters across Fram Strait

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Current meters measured temperature and velocity on 11 moorings from 1997 to 2014 in Fram Strait between Svalbard and Greenland at the only deep passage from the Nordic Seas to the Arctic Ocean. The sill depth in Fram Strait is 2545 m. The observed temperatures vary between the colder Greenland Sea Deep Water and the warmer Eurasian Basin Deep Water. Both end members show a linear warming trend of $0.11 \pm 0.02^\circ\text{C}/\text{decade}$ (GSDW) and $0.05 \pm 0.01^\circ\text{C}/\text{decade}$ (EBDW) in agreement with the deep water warming observed in the basins to the north and south. At the current warming rates, GSDW and EBDW will reach the same temperature of -0.71°C in 2020. The deep water on the approximately 40 km wide plateau near the sill in Fram Strait is a mixture of the two end members with both contributing similar amounts. This water mass is continuously formed by mixing in Fram Strait and subsequently exported out of Fram Strait. Individual measurements are approximately normally distributed around the average of the two end members. Meridionally, the mixing is confined to the plateau region. Measurements less than 20 km to the north and south have properties much closer to the properties in the respective basins than to the mixed water on the plateau. The temperature distribution around Fram Strait indicates that the mean flow cannot be responsible for the deep water exchange across the sill. Rather, a coherence analysis shows that mesoscale flows with periods of approximately 1–2 weeks advect the water masses across Fram Strait. These flows are barotropically forced by upper ocean mesoscale variability. We conclude that these mesoscale flows make Fram Strait a hot spot of deep water mixing in the Arctic Mediterranean. The fate of the mixed water is not clear, but after the early 1990s, it does not reflect the properties of Norwegian Sea Deep Water. We propose that it currently mostly fills the deep Greenland Sea.