Geophysical Research Abstracts
Vol. 18, EGU2016-6809, 2016
EGU General Assembly 2016


# Upper Arctic Ocean velocity structure from in-situ observations

Beatriz Recinos (1), Benjamin Rabe (2), and Ursula Schauer (2)

(1) Universität Bremen, Institut für Geographie, AG Klimageographie, Bremen, Germany, (2) Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar und Meeresforschung, Bremerhaven, Germany

The gross circulation of the upper and intermediate layers of the Arctic Ocean has been inferred from water mass properties: the mixed layer, containing fresh water from the shelf seas, travels from Siberia towards the Atlantic sector, and the saline and warm layer of Atlantic origin below, follows cyclonic pathways along topographic features. Direct observations of the flow below the sea ice are, however, sparse and difficult to obtain.

This research presents the analysis of a unique time series/section of in situ velocity measurements obtained by a drifting ice-tethered platform in the Transpolar Drift near the North Pole.
Two instruments were used to obtain in situ measurements of velocity, temperature, salinity and pressure: an Ice-tethered Acoustic Current profiler (ITAC) and an Ice-tethered Profiler (ITP). Both systems were deployed in the Amundsen basin, during the Arctic Ocean expedition ARK XXII/2 of the German Research Vessel Polarstern in September 2007. The systems transmitted profile data from the 14th of September to the 29th of November 2007 and covered a maximum depth range of 23 to 400 m. The results are compared to observations by a shipboard Acoustic Doppler Current Profiler (ADCP) from the 2011 Polarstern expedition ARK-XXVI/3, and wind and ice concentration from satellite reanalysis products. The data set allows an overview of the upper and intermediate circulation along the Lomonosov Ridge.

Near-surface velocity and ice drift obtained by the ITAC unit are consistent with the Transpolar Drift Current. Ekman transports calculated from the observed ice drift and assumed ice-ocean drag behaviour suggest that Ekman dynamics influenced velocities at depths greater than the Ekman layer.
Direct velocity observations in combination with water mass analyses from the temperature and salinity data, suggest the existence of a current along the Eurasian side of the Lomonosov Ridge within the warm Atlantic layer below the cold halocline. At those depths (between 200 m and 400 m) we found a distinct geostrophic baroclinic component in the flow alongside the Lomonosov Ridge. The direction of this flow is consistent with the circulation of the surface Atlantic water layer presented in previous studies, which has been inferred from the observed distribution of temperature, salinity and other tracers but not been measured directly.