Geophysical Research Abstracts
Vol. 18, EGU2016-5436, 2016
EGU General Assembly 2016
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Observation of oceanic heat flux to the sea ice using ice-tethered moorings: Canada Basin, Arctic Ocean

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It is important to figure out the physical mechanisms (e.g. shear, turbulence) below the sea ice, because of its direct influence on oceanic heat flux that is closely related to sea ice melt. A short-term (3.5 days) mooring was conducted in August 2014 to measure the vertical profiles of velocity, salinity and temperature within the sea-ice boundary layer. The mooring package consisted of an acoustic Doppler current profiler (ADCP) and 3 MicroCats. A long-term mooring of an ice-tethered profiler with modular acoustic velocity sensor (MAVS) was conducted to acquire vertical profiles of salinity, temperature, pressure and velocity in the marginal ice zone. The mooring data was analyzed to examine the role of the Pacific Summer Water (PSW) as a heat source, which can provide oceanic heat to the overlying layer.

The ADCP data showed distinctive upper-velocity fields induced by entrainment of the sea ice. It appeared up to about 15 m depth during the entire observation period. Periodical components of MAVS data were extracted through wavelet transform. Since sea ice extent is relatively low in summer, the wind forcing could be effectively delivered in the form of a near 12 hours period oscillation to the 60 m depth where the PSW was occupying. Even in winter, while the sea surface was fully covered with the sea ice, near 12 hours period oscillation was appeared at 60 m depth. In September and January, strong 12 hours period oscillation appeared up to a deeper layer, which is deeper than 150 m depth where the wind forcing is hard to reach. The relationship between the heat flux and the oscillation strength will be discussed during the presentation.