

The analysis of long-term Mooring observation records in the northernmost area of seasonal sea ice zone in the Southern Ocean

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The meridional overturning is thought to be the contributor for the stability of the climate system via latitudinal exchange of oceanic heat in the Southern Ocean. To clarify details of the meridional overturning, mooring observations using T/RV *Umitaka-maru* were conducted by physical oceanography group mainly constructed by Tokyo University of Marine science and Technology. In this study, we analyzed the one-year record of the mooring observation and CTD measurements obtained when the mooring system was deployed and recovered.

Results from current meter analysis shows the variability (from 30-day to 90-day cycle) of ocean current. Geostrophic velocity derived from sea level anomaly map distributed by AVISO/Altimetry also shows similar variability of ocean current due to eddies. Furthermore, the location of the mooring system was far from the main axis of the Antarctic Circumpolar Current (ACC). Those results suggest us that the variability of ocean current was resulted from the mesoscale eddy field.

Even though the variability of ocean current was recoded, results also indicate the meridional overturning. The progressive vector diagram based on current meter record illustrated poleward transport at about around 400db and eastward transport at about 4000db. One-year mooring observation also revealed ocean current shear structure (about 10cm/s at about 400db and 4cm/s at about 4000db) when poleward transport was continuously captured. During poleward transport with shear structure was captured, the increase in temperature over 2.1 °C from October to February at about 400db was frequently observed. Based on hydrographic data, warm water captured around 400db was identified as the Circumpolar Deep Water (CDW). Cross correlation analysis revealed that warm CDW intrusion occurred about 8-day following southward current at 400db. During the season when sea ice covered the ocean, similar event also happened but temperature at about 400db increased up to around 2°C. Our results indicate that CDW's southward transport is changing by seasonal and the event of mesoscale eddy passage.

Keywords: Southern ocean, Meridional circulation, Mooring observation, Mesoscale-Eddy