Response of the ocean mass variation in the Antarctic Coastal Current to ENSO

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The Antarctic Coastal Current is the southernmost current. It flows westward on continental slope parallel to the Antarctic coast line. The current is an important component of the very active air-sea exchange in the Southern Ocean. It has characteristic annual/seasonal variation due to sea-ice growth and melting. The mass variations in this area have not been well understood because of the difficulty of year-round in-situ observation with ship and buoy.

JARE(Japanese Antarctic Research Expedition) has deployed the in-situ observation of the ocean bottom pressure (OBP) off Lutzow-Holm Bay since December 2004. The area that installed the OBP recorder is in the northern margin of the Antarctic Coastal Current. As another observation of ocean mass variation, Satellite gravimetry with GRACE is available to investigate global and regional water mass variations. Ocean signals are typically weaker than land signals by factors of 2 or 3. Reacently improving the data post-processing has made it possible to research ocean mass variation. In this study, we investigate the ocean mass variations of the Antarctic Coastal Current and the vicinity with these observations and the ocean model (ECCO model).

It was found that from the in-situ OBP data the seasonal variation dominates for first two years (2005-2006) and the variation in 2007 deviates from annual cycle. GRACE and ECCO model in this area are consistent with in-situ OBP with the correlation coefficients of about 0.7 and 0.9, respectively. GRACE data and ECCO model are available from Summer 2002 and January 1993, respectively. The annual/seasonal cycle typically dominates for these almost all periods. In ECCO model the deviation from the annual/seasonal cycle was also found before or after 1999. These epochs in 1999 and 2007 were during the episodes of La Nina. Climatic phenomenon like El Nino/La Nina may affect ocean mass fluctuation in this area. The sea surface temperature of the Southern Ocean is known to make a response to ENSO. It is not well understood whether it affects the ocean mass variation of Southern Ocean. We investigates the response of the other area within the Antarctic Coastal Current and the vicinity to meteorological phenomena like ENSO with GRACE and ECCO model. We investigate the deviation in the other area of Antarctic Coastal Current using GRACE and ECCO model. The relation with meteorological phenomena like ENSO is discussed.