# Carbon cycling associated with formation and transport of Cape Darnley Bottom Water

Naoyuki Tamura and Michiyo Yamamoto-Kawai
*Tokyo university of Marine Science and Technology, Japan*

Antarctic Bottom Water (AABW), which is formed by a mixing of Dense Shelf Water (DSW) and modified Circumpolar Deep Water (mCDW), has a role in transporting carbon from the continental shelf to the deep ocean. Quantitative understanding of carbon cycle associated with AABW formation is thererfore important in determining the global carbon budget. In this study, we have investigated distribution of dissolved inroganic carbon (DIC) near the formation region of the Cape Darnley Bottom Water (CDBW), a newely indentified AABW [1]. We observed DIC, total alkalinity (TA), and nutrients in the area around Cape Darnley from January-February 2019 (KH19-01) and January-February 2020 (KH20-01). In addition, historical data (30˚-90˚E, 60˚-70˚S) were obtained from GLODAPv2 database[2].

Observations show that DIC of DSW is lower than that of mCDW. This indicates a net removal of DIC on the continental shelf in the course of modification from mCDW to DSW. The low DIC signal extends from the the Cape Darnley coast to the northwest (Figue 1). A clear contrast with old and DIC-enriched AABW from the east through the Princess Elizabeth Trough ($AABW_{pet}$) shows a renewal of AABW by the input of CBDW. In order to evaluate DIC change due to biological processes during the transport of CDBW, the mixing ratio was calculated from the potential temperature and salinity of three water masses, CDBW, Weddell Sea Deep Water (WSDW), and $AABW_{pet}$. Then, DIC expected from the mixing ($DIC_{mix}$) was compared with the observed DIC ($DIC_{obs}$). The results showed no significant difference between $DIC_{mix}$ and $DIC_{obs}$, suggesting that there is little biological increase of DIC in AABW in the study area.

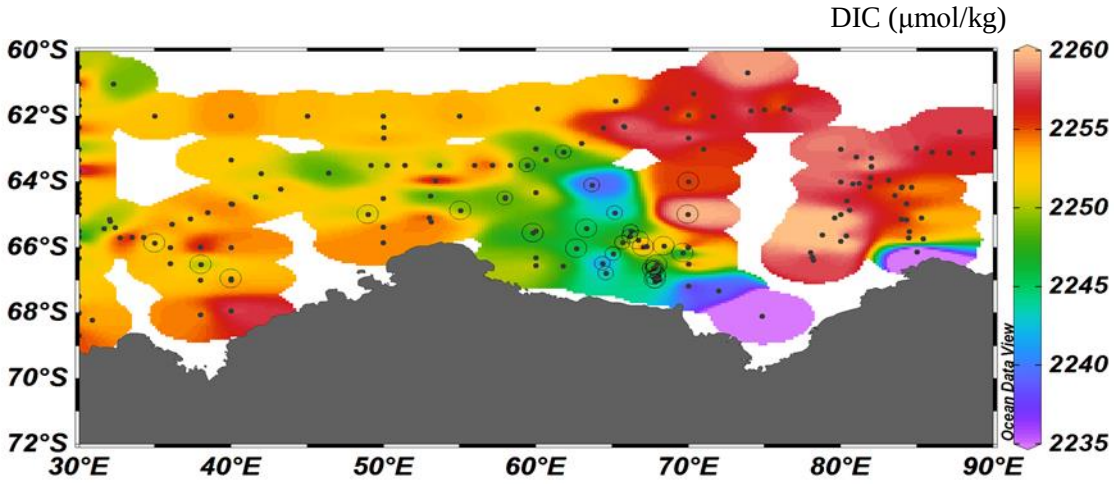


Figure 1. Spatial distribution of DIC concentration in bottom layer ($\gamma^n > 28.27$). Data are from KH19-01/KH20-01 cruises (◉), and from GLODAP database (●).

**References**

[1-] Ohshima et al., (2013) Antarctic bottom water production by intense sea-ice formation in the cape Darnley polynya. *Nat. Geosci*., 6 (3), 235-240.

[2] Olsen et al., (2016) The Global Ocean Data Analysis Project version 2 (GLODAPv2) - an internally consistent data product for the world ocean, *Earth System Science Data*, 8, 297-323.