



On the modified Circumpolar Deep Water upwelling over the Four Ladies Bank in Prydz Bay, East Antarctica

Chengyan Liu (1), Zhaomin Wang (2), Chen Cheng (1), and Yang Wu (2)

(1) Nanjing University of Information Science & Technology, International Polar Environment Research Laboratory, School of Marine Sciences, Nanjing, China (250107302@qq.com), (2) International Polar Environment Research Laboratory, College of Oceanography, Hohai University, Nanjing, China.

Analyses of hydrographic observation data sets revealed that modified Circumpolar Deep Water (mCDW) tends to flood the western flank (73°E-78°E, 67°S-68°S) of the Four Ladies Bank (FLB) in Prydz Bay. In this study, we investigated the mechanism responsible for mCDW upwelling over the FLB based on an eddy-resolving coupled ocean-sea ice-ice shelf model in conjunction with the latest high-accuracy bathymetry. It was found that zonal step-like declines in the seabed over the FLB are crucial for the mCDW onshore upwelling, through topographic dynamic effects on the alongshore Antarctic Slope Current (ASC). In the presence of meridional cross-shelf $\sigma\theta$ isopycnals, warm mCDW at ~500 m depth in the deep sea can make its approach to the shallower continental shelf (~200-500 m depths), characterized as a warm layer (> -1.8 °C) bounded by the cross-shelf $\sigma\theta$ isopycnal surfaces of 27.5 kg m⁻³ and 27.7 kg m⁻³. The simulated outflow of the Prydz Bay gyre is concentrated to the eastern flank of the Prydz Channel. These results suggest that, in addition to the depressions and troughs around the Antarctic, smaller topographic features such as step-like declines in the seabed near the ASC are also favorable for onshore mCDW intrusion. This study demonstrates that mCDW onshore transport around the Antarctic continental shelf might be significantly underestimated by numerical models with coarse spatial representations of the topography.