# The Heart of the East AnTarctic Cryosphere-Ocean Synergy System (HEAT-CROSS)

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The future response of Antarctic ice sheet melting is a major uncertainty in future projections of global sea level rise. The melting of the Antarctic ice sheet has been observed not only in West Antarctica, but also in East Antarctica, which has a huge ice volume in recent years. Warm water inflow and associated melting has already been observed at Shirase Glacier, Amery Ice Shelf and Totten Ice Shelf. For the Totten shelf, efficient poleward transport processes of warm Circumpolar Deep Water by the standing cyclonic eddies in the Australian-Antarctic Basin have been revealed (Mizobata et al., 2020; Hirano et al., 2021). Current climate models do not incorporate this process at least in East Antarctica. Spatiotemporal variability of the warm water inflow and its dominant factors need to be clarified in order to predict the future response of ice sheets. In addition, freshwater discharge due to the enormous ice sheet melt will not only raise sea level but also cause changes in the quality of sea ice produced, lower density of Antarctic Bottom Water (Shimada et al., 2022), and changes in marine ecosystems and carbon cycles (Takahashi et al., 2022). We will focus on the cryosphere-ocean synergy system and coastal-open ocean interaction, and conduct in-situ observations by research vessels such as SHIRASE in coastal and open ocean regions for the next six years. For the field observations, we plan to install mooring systems to enable year-round observations, in addition to the usual hydrographic observations. Satellite observations and numerical modeling will also be incorporated to optimize the design of field observations and the integration of findings. Through these efforts, the causes and effects of the melting process of the East Antarctic ice shelves, especially the Totten Ice Shelf, will be clarified.

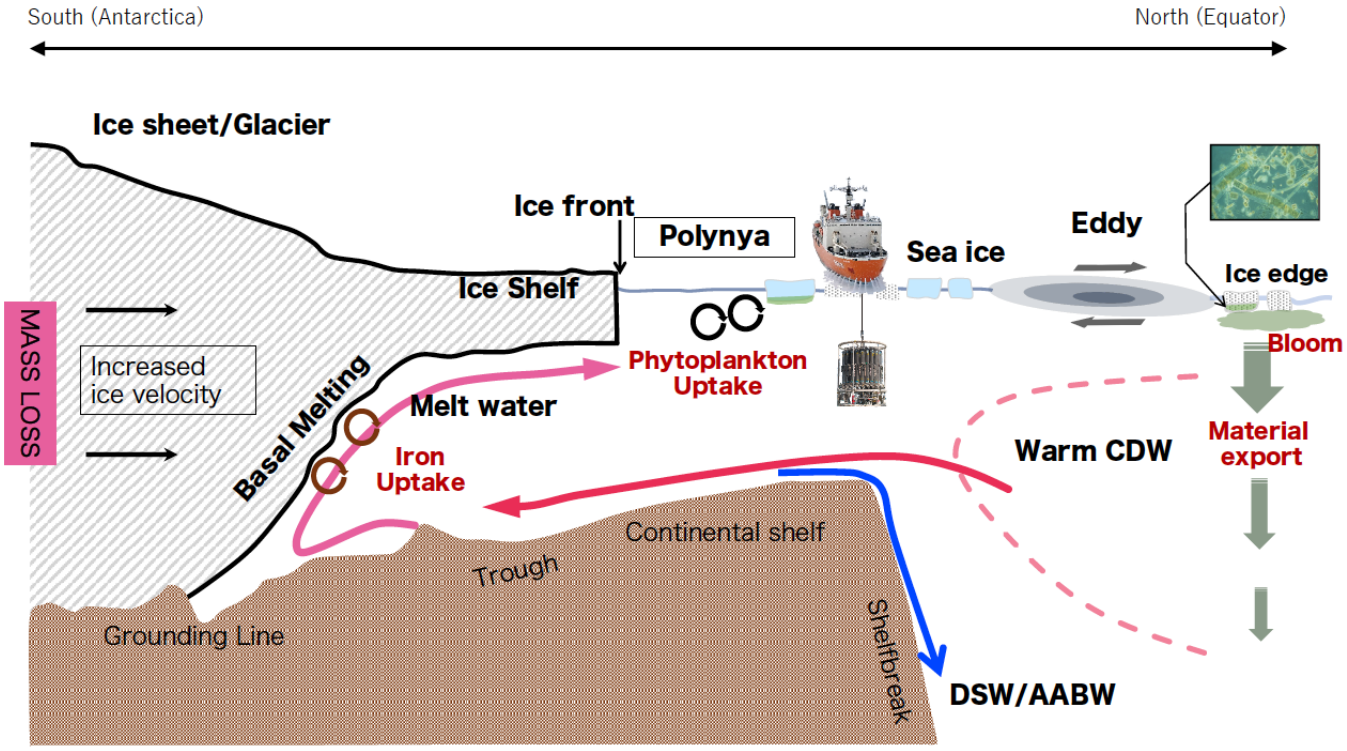


Figure 1. Various processes to be focused on in this project.

**References**

Hirano, D., K. Mizobata, H. Sasaki, H. Murase, T. Tamura and S. Aoki, Poleward eddy-induced warm water transport across a shelf break off Totten Ice Shelf, East Antarctica. *Commun Earth Environ*, 2, 153 (2021).

Mizobata, K., K. Shimada, S. Aoki and Y. Kitade, The Cyclonic Eddy Train in the Indian Ocean Sector of the Southern Ocean as Revealed by Satellite Radar Altimeters and In Situ Measurements. *J. Geophys. Res.* 125, e2019JC015994, 2020.

Shimada, K., Y. Kitade, S. Aoki, K. Mizobata L. Cheng, K. Takahashi, R. Makabe, J. Kanda and T. Odate, Shoaling of abyssal ventilation in the Eastern Indian Sector of the Southern Ocean. *Commun Earth Environ*, 3, 120, 2022.

Takahashi, K.D., R. Makabe, S. Takao, H. Kashiwase and M. Moteki, Phytoplankton and ice-algal communities in the seasonal ice zone during January (Southern Ocean, Indian sector). *J Oceanogr*., 78, 409–424, 2022.