The investigation into the Ice shelf-Ocean Interaction of East Antarctica with special focusing on the Ocean Circulation

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Mass loss of the Antarctic ice sheet is directly linked to sea level rise which is a global issue that all mankind will face in the future. Beginning with the accelerated melting of the West Antarctic ice sheet, researchers around the world have concentrated their observations in the West Antarctica. On the other hand, the East Antarctic ice sheet has been considered to be relatively stable. However, in recent years, mass loss of the Totten Ice Shelf has also been revealed by satellite observations. Behind the Totten Ice Shelf, there is a huge ice sheet that raises the sea level by 4 meters when it melts. The monitoring of West Antarctica alone no longer can assess the contribution of Antarctic ice sheet melting to sea level rise.
The main causes of the ice sheet mass loss are the calving and basal melting (Rignot et al., 2013; Depoorter et al., 2013). Basal melting is significant in the mass loss of ice sheet facing the West Antarctica, especially the Amundsen Sea and Bellingshausen Sea, where the Antarctic Circumpolar Current with warm Circumpolar Deep Water (CDW) approaches the continental shelf. In contrast, the continental shelf in the East Antarctica is generally considered as a cold shelf (Schmidtko et al., 2014), but the basal melting contributes more to the mass loss of Totten Ice Shelf, Moscow University Ice shelf, and Shackleton ice shelf than the calving. The driver of the basal melting is the CDW which is originally located offshore and is somehow carried to ice shelves. What we don't know are 1) how the CDW is transported from offshore to the continental shelf of the East Antarctica, 2) how the CDW can access the ice shelves, and 3) how ice sheet mass loss with freshwater release affect downstream oceans, sea ice production/formation of Antarctic Bottom Water, carbon cycle, and marine ecosystem. We propose to tackle these unsolved issues through the interdisciplinary research integrating field observation, satellite observation and numerical modelling.

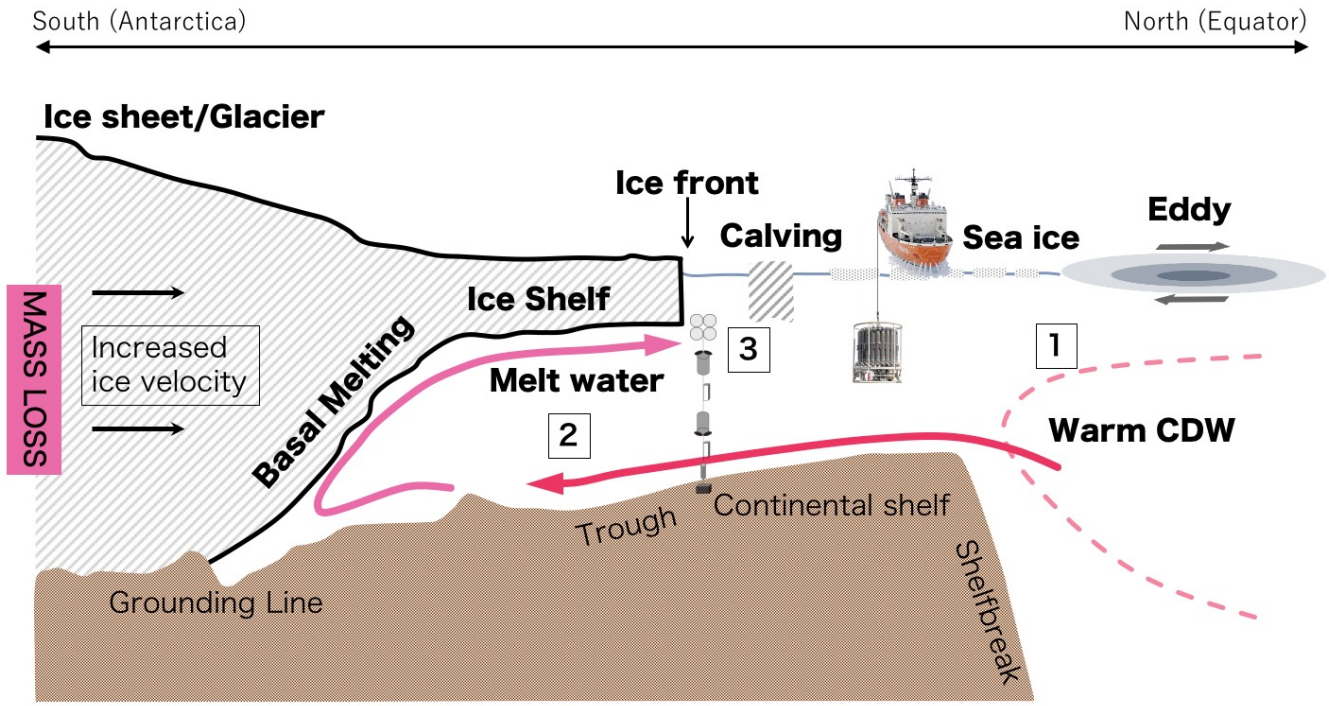

Figure 1. Conceptual diagram of ice sheet-ocean interaction which this proposal focuses on. Numbers 1 to 3 in the figure indicate areas and processes listed in this proposal.

References

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