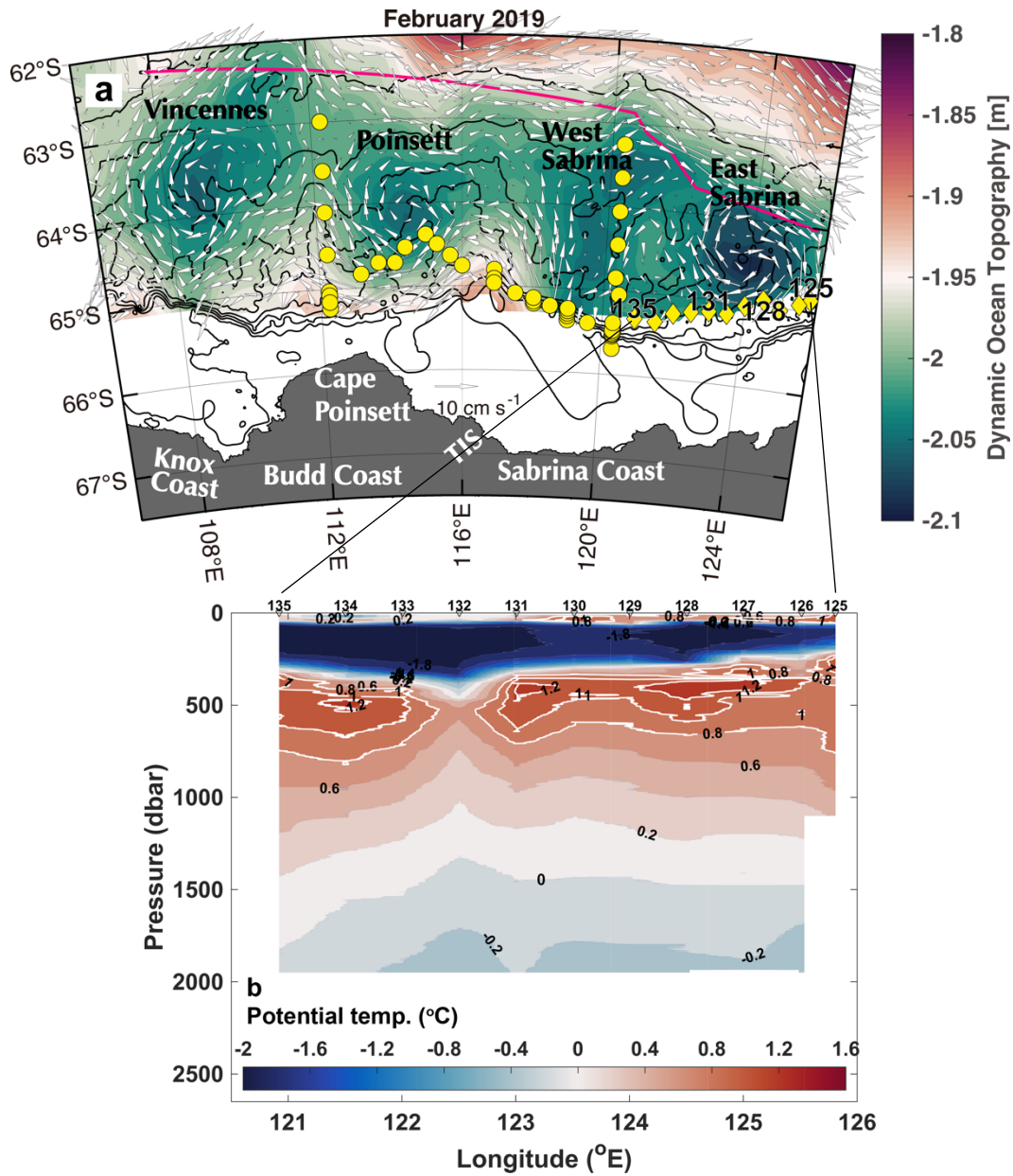


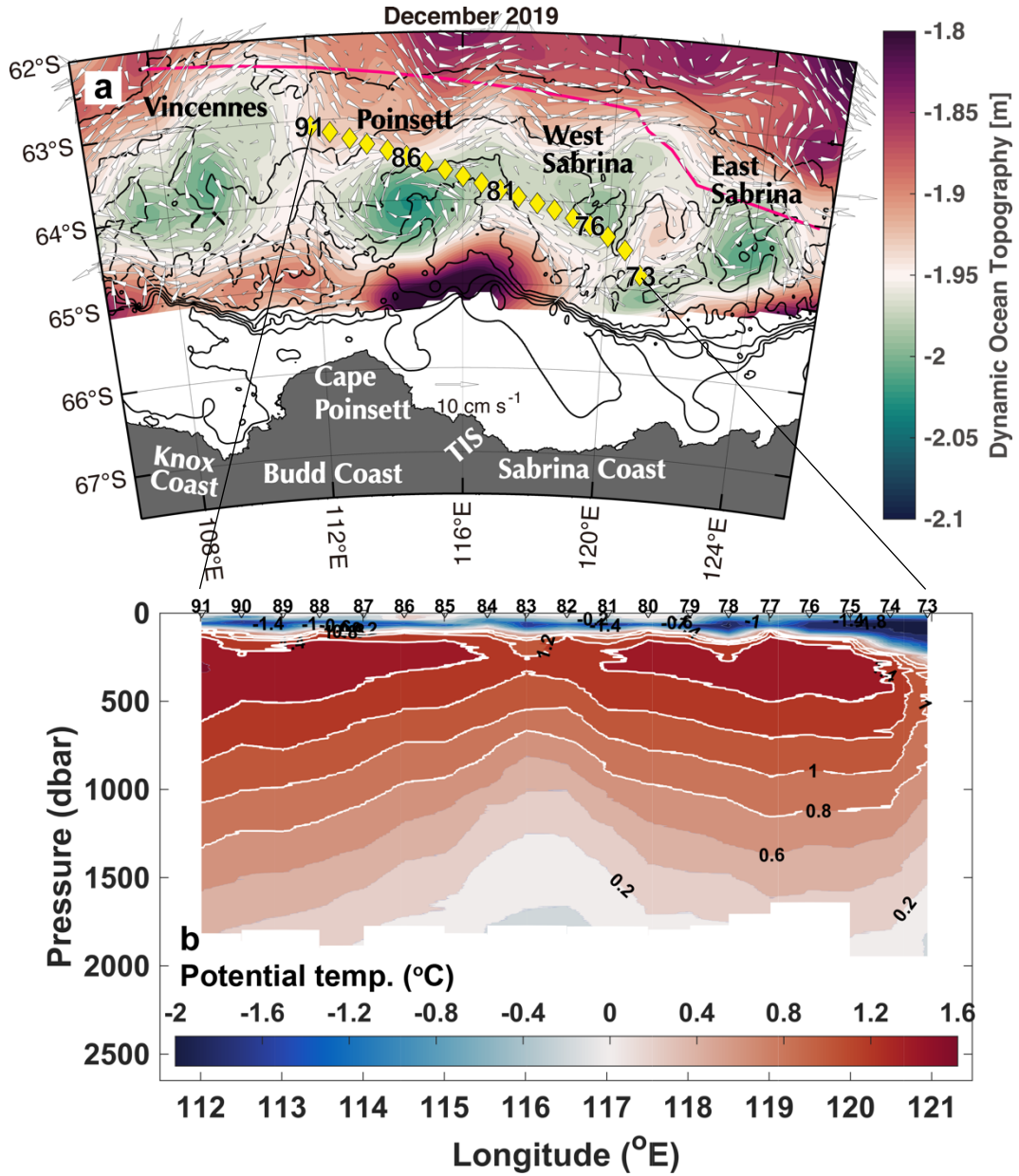
Supplementary Information for

**“Poleward eddy-induced warm water transport
across a shelf break off Totten Ice Shelf, East Antarctica”**

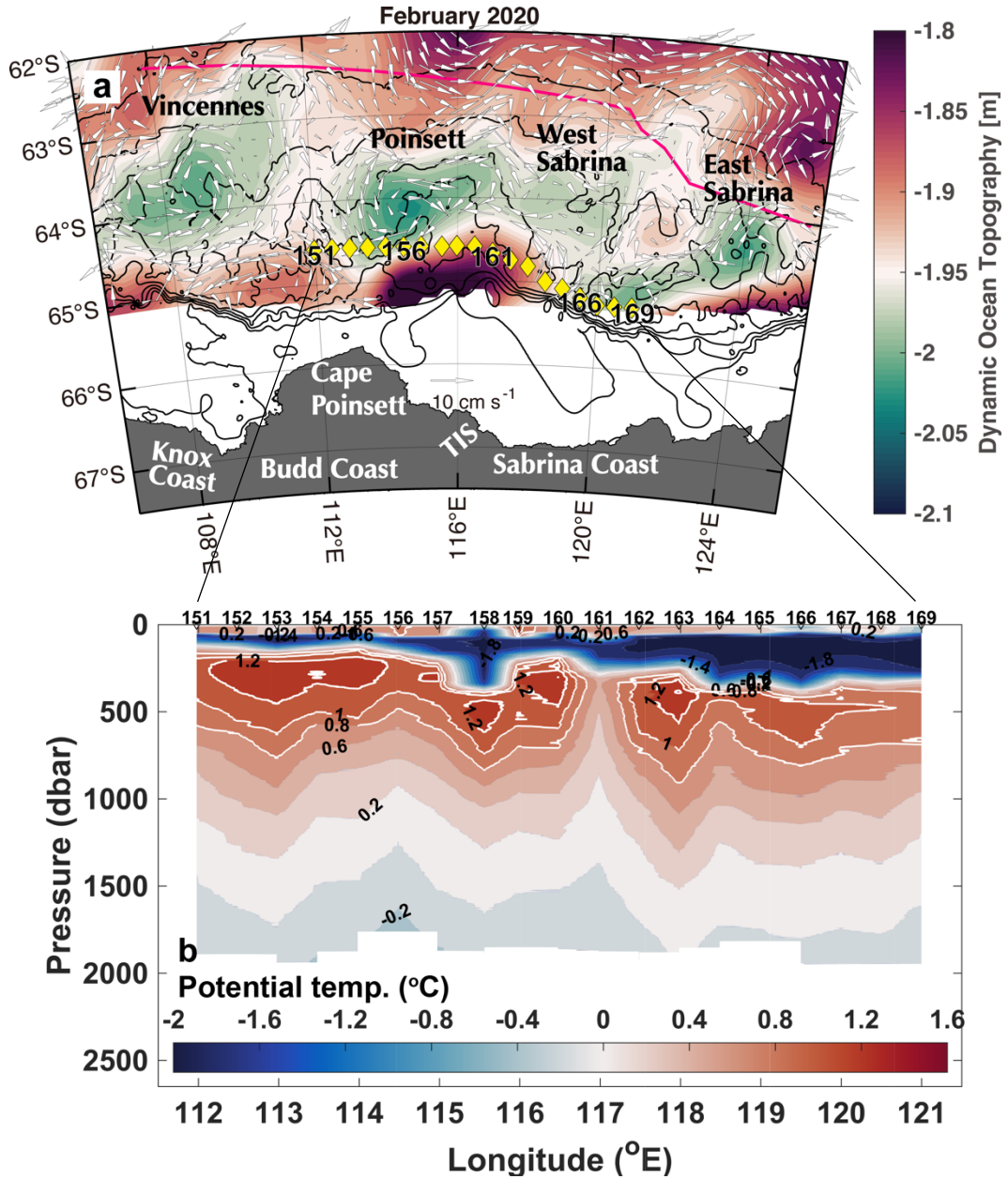
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Supplementary Fig. 1 | (a) Spatial distribution of satellite-derived dynamic ocean topography (DOT, color) and surface velocity (vector) in February 2019 (corresponding to the period of the XCTD observations at Sta.125–135). Yellow diamonds represent the positions of XCTD observations at Sta.125–135, and yellow circles are the positions of CTD observations of the *Kaiyo-Maru* cruise (Fig. 1b, 2; Methods). Pink line represents the southern boundary of the Antarctic Circumpolar Current¹. From west to east, cyclonic eddies comprising “eddy train” are the Vincennes Eddy, Poinsett Eddy, West-Sabrina Eddy, and East-Sabrina Eddy². (b) Zonal hydrographic sections of potential temperature (°C) obtained by XCTD observations shown in (a). As in Fig. 3, warm cores with potential temperature higher than 0.8°C are highlighted in white.



Supplementary Fig. 2 | (a) Spatial distribution of satellite-derived dynamic ocean topography (DOT, color) and surface velocity (vector) in December 2019 (corresponding to the period of the XCTD observations at Sta.73–91). Yellow diamonds represent the positions of XCTD observations at Sta.73–91 of the 61st Japanese Antarctic Research Expedition. Pink line represents the southern boundary of the Antarctic Circumpolar Current¹. From west to east, cyclonic eddies comprising “eddy train” are the Vincennes Eddy, Poinsett Eddy, West-Sabrina Eddy, and East-Sabrina Eddy². (b) Zonal hydrographic sections of potential temperature (°C) obtained by XCTD observations shown in (a). As in Fig. 3, warm cores with potential temperature higher than 0.8°C are highlighted in white.



Supplementary Fig. 3 | (a) Spatial distribution of satellite-derived dynamic ocean topography (DOT, color) and surface velocity (vector) in February 2020 (corresponding to the period of the XCTD observations at Sta.151–169). Yellow diamonds represent the positions of XCTD observations at Sta.151–169 of the 61st Japanese Antarctic Research Expedition. Pink line represents the southern boundary of the Antarctic Circumpolar Current¹. From west to east, cyclonic eddies comprising “eddy train” are the Vincennes Eddy, Poinsett Eddy, West-Sabrina Eddy, and East-Sabrina Eddy². (b) Zonal hydrographic sections of potential temperature (°C) obtained by XCTD observations shown in (a). As in Fig. 3, warm cores with potential temperature higher than 0.8°C are highlighted in white.

Supplementary References:

1. Orsi AH, Whitworth T, Nowlin WD. On the Meridional Extent and Fronts of the Antarctic Circumpolar Current. *Deep-Sea Research Part I-Oceanographic Research Papers* **42**, 641-673 (1995).
2. Mizobata K, Shimada K, Aoki S, Kitade Y. The Cyclonic Eddy Train in the Indian Ocean Sector of the Southern Ocean as Revealed by Satellite Radar Altimeters and In Situ Measurements. *Journal of Geophysical Research: Oceans* **125**, e2019JC015994 (2020).