Time-series observation of subsurface chlorophyll *a* maximum in the seasonal ice zone of the Southern Ocean

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A persistent subsurface chlorophyll *a* maximum (SCM) is often found during the summer-fall season after the ice-edge bloom in the seasonal ice zone of the Southern Ocean, so that SCM would be considered important for biogeochemical cycling through the lower trophic levels. The relevant studies, however, have been qualitative in nature. This study aimed to reveal the dynamics and ecological role of the SCM in the seasonal ice zone.
We carried out Lagrangian observations using a drifter with two time-series sediment traps, an Acoustic Doppler Current Profiler (ADCP) and four sensor flames (Fig. 1). The drifter was deployed at 63.5˚S, 110.0˚E in January 14th 2019, and 5-day continuous observation was performed. In the vicinity of the drifter, 4 ship-based observations including net sampling and CTD casts were made until the drifter was recovered. Physical environments were measured by CTD, and sea water samples were collected for measurements of chlorophyll *a* (chl. *a*) concentration, nutrients, particle organic carbon, dissolved organic carbon, abundance of phytoplankton, micro-zooplankton, bacteria and nano-/pico-phytoplankton. We also conducted an incubation experiment for determining net primary production.
The temperature minimum layer, found between 37 and 52 m depth, decreased from -0.82 ºC to -1.28 ºC during the study period. The maximum chl. *a* concentration (1.0-2.0 μg/l), comparable to that in typical ice edge blooms, was observed at 40 m depth (Fig. 2). Such a high chl. *a* concentration might have important roles for food web and for material cycling. We will discuss especially on phytoplankton dynamics showing results of microscopic and chemical analyses.

Keywords: subsurface chlorophyll a maximum , the Southern Ocean

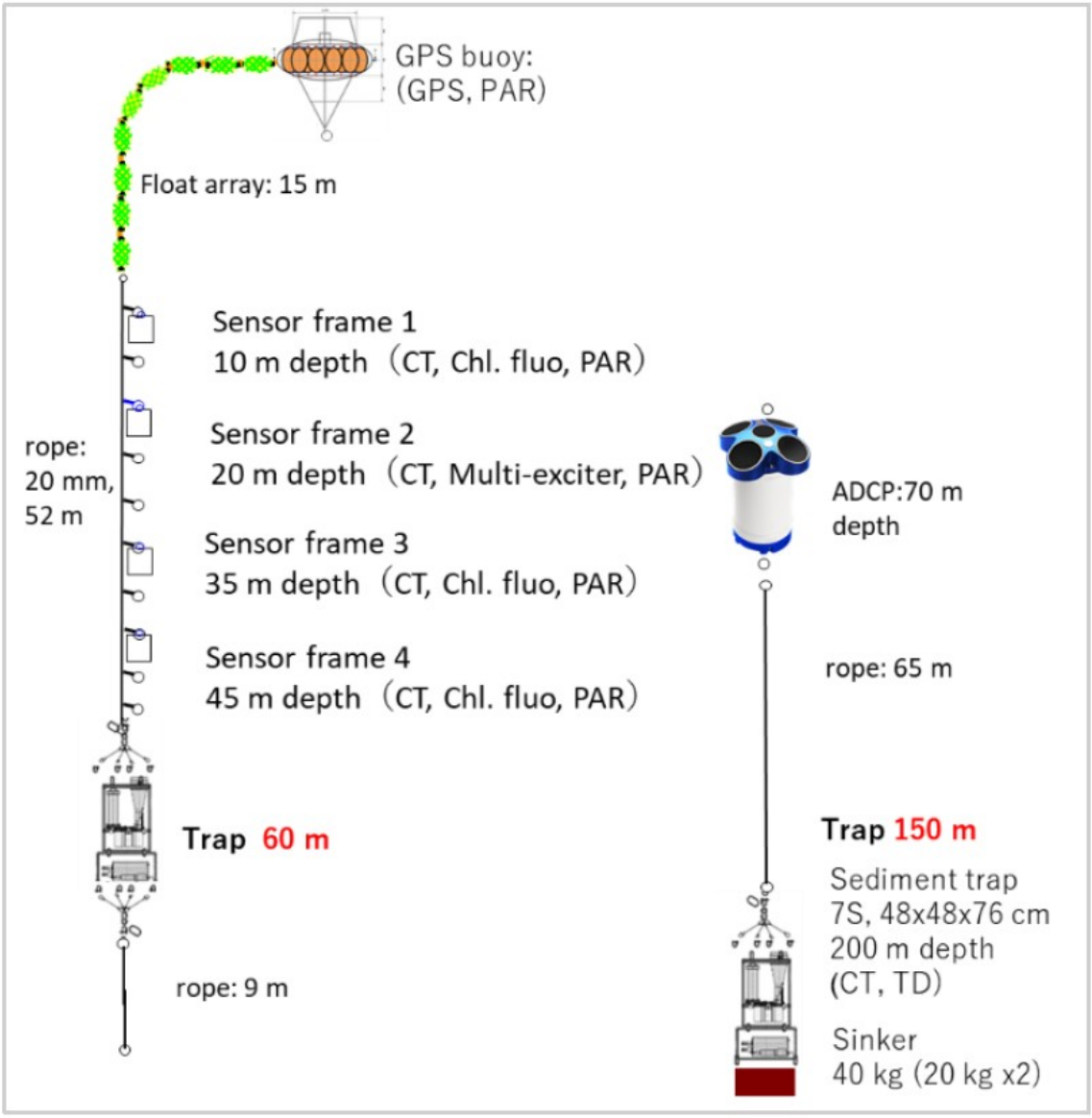

Fig. 1 A schematic image of the drifter