Zooplankton vertical distribution during sea ice melting season in the Southern Ocean

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Zooplankton plays important roles as secondary producers in marine food web and are drivers of biological carbon pump in the Southern Ocean ecosystem. They undertake a daily/seasonal vertical migration (DVM/SVM), enhancing an export of organic materials from surface productive layer to deeper layers. These functions of zooplankton have been studied by ship-based snap-shot observations by net tows and ship-mounted echosounder or time-series observation using a mooring system equipped with an echosounder. Our knowledge on time-series variabilities in their vertical distribution has been limited so far due to difficulties to ensure higher temporal and spatial resolutions especially in the surface layers. We conducted a drifter observation with various sensors and an upward-looking acoustic doppler current profiler (ADCP) in the seasonal ice zone during austral summer. The observation was conducted from 9 December 2019 to 16 February 2020 during ice braker *Shirase* cruise. A drifter was deployed at 64.26˚S, 115.98˚E, where sea ice concentration was higher than 90%, and retrieved at 64.55˚S, 104.79˚E. The ADCP was deployed at around 70 m depth; raw data obtained (20 vertical bins) were converted to volume backscattering strength (SV). We used ten minutes mean SV for analyzing temporal changes in vertical distribution patterns of relative zooplankton biomass.
The highest SV was recorded mainly at subsurface layer through the observation period. SV near the surface layer of 10-20 m depth was relatively higher when sea ice concentration rapidly decreased (from end of December to early January). During the period, marked peak of chlorophyll fluorescence at 20 m depth was found. So, it is thought that they would become shallower to feed on prey from sea ice, although there is the another possible reason that ice-associated organisms, habiting just under the sea ice, moved into water column. After sea ice retreat, their distribution became deeper to around at 40 m depth. Clear DVM was not found until 7-8th February. These suggested that zooplankton distribution in this period was strongly affected environment related to sea ice.

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