Increasing fresh water impact on Sea Level Rise in Australian-Antarctic Basin

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Significant warming and freshening of Antarctic Bottom Water (AABW) in the Australian-Antarctic Basin are reported in previous studies. The reported changes are, however, based on repeated hydrographic data with 5-10-year interval, and hence, may be subject to temporal aliasing due to shorter time scale variability. In this study, we have assessed temperature and salinity using repeated hydrographic data with 1-2-year interval. The Conductivity-Temperature-Depth (CTD) data are obtained by the training and research vessel Umitaka-maru along 110°E, where locates slightly west of WOCE section I09s.
In the region south of 60°S, both warming and freshening trends in deep layers (e.g., below 2000 m) are clear since 1990s and they are consistent with previous studies. However, it is found that temperature and salinity changes are not strongly correlated. Linear freshening trend is clearly intensified to bottom (~ -0.01 PSS-78/decade). However, warming trend includes shorter vertical scale variations; taking maximum at 3000-3500 m (~0.025 ℃/decade), but weakened toward bottom. In deep layers below 2000 m, as for freshening, linear trend component explains over 90% of standard deviation. As for warming, however, it explains only about 50 % on average, meaning that shorter time scale variability effects only for temperature variations. Finally, impact of linear warming and freshening trends on Sea Level Rise (SLR) are estimated. Reflecting the dominant linear trend component, impact of freshening in deep layers explains 60% of overall SLR trend. This implies that deep freshening can be main component that induces SLR in near future.

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