メルツ氷河舌崩壊後に観測された南極アデリーランド沖の南極底層水の急激な変化

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Rapid changes of Antarctic Bottom Water off the Adélie/George V Land Coast, Antarctica, after Mertz Glacier Tongue collapse

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The recent changes of Antarctic Bottom Water (AABW) off the Adélie/George V Land Coast, Antarctica, were examined mainly with observations of deep floats for December 2012 to August 2014. During the period, AABW there varied temperature and salinity seasonally at the core isopycnal surface but showed no clear trends. Its thickness was decreased quickly by the rate of around 50 m yr^{-1}, which was several times as large as that for the recent decades (about 10-15 m yr^{-1}). The repeat hydrographic surveys there suggested that AABW had decreased its thickness by almost the same rate since around 2010-2011 and that its salinity decreased largely by around 0.005 in 2011 to the level observed by the deep floats. The rapid changes of AABW ought to have raised the sea level there; the change of the steric height of the deeper component (1900-4000 dbar) was evaluated by 5.0 (1.8-8.5) mm yr^{-1}. The evaluation agreed well with the other components derived from the independent observations within errors: 5.7 mm yr^{-1} of the total sea level rise (from the satellite altimetry, AVISO), 0.5 mm yr^{-1} of the steric height of the shallower component (0-1900 dbar, Argo), and 1.8 mm yr^{-1} of the water mass component (from Earth's gravity field anomalies, GRACE) as the averages for 2011-2014. The collapse of Mertz Glacier Tongue in February 2010 was expected to lead the large changes of AABW. The rapid decrease of its thickness (i.e. volume) would be caused by the smaller supply of Adélie Land Bottom Water (ALBW) due to the smaller sea ice production there and it would continue for a longer time because the revolutionary change of the ocean conditions (i.e., size and activity of the polynyas there) would hinder ALBW supply from recovering to the similar level before the collapse. However, the freshening of AABW might be changed less by the collapse from a longer-term view. The collapse would lead AABW freshened immediately and the salinity reduction (by 0.005 in 2011) would be fairly large at an event, indeed. However, it could be comparable to the freshening due to the global warming (e.g., 0.75×10^{-3} yr^{-1} for the recent 20 years) for about 5-6 years, and then very small changes would be expected to follow for years.