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Taiyo Kobayashi

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Taiyo Kobayashi
Japan Agency for Marine-Earth Science and Technology
2-15 Natsushima-cho, Yokosuka 237-0061, Japan
E-mail: taiyok@jamstec.go.jp

Corresponding:
Taiyo Kobayashi
Research and Development Center for Global Change,
Japan Agency for Marine-Earth Science and Technology
2-15 Natsushima-cho, Yokosuka 237-0061, Japan
e-mail: taiyok@jamstec.go.jp

Abstract

Recent changes in the Antarctic Bottom Water (AABW) off the Adélie/George V Land coast, East Antarctica, were examined using 20-months observation with deep floats and historical hydrographic surveys. The salinity of the AABW along isopycnals was largely reduced by about 0.005 during the winter of 2011; since then, it had changed little until the end of the float observation in August 2014. The thickness of the AABW would have decreased since around 2011 by about 50 m yr^{-1}, which is about four to five times the average rate since the 1990s. The change of density structure in the deep ocean, including the rapid contraction of the AABW, is believed to have raised the local sea level by 5.0 mm yr^{-1} due to steric changes between depths of 1,900 and 4,000 dbar. This could explain the altimetric average increase of 5.8 (standard error; ±1.8) mm yr^{-1} for 2011–2014, coincident with a steric height change of 0.5 (±1.5) mm yr^{-1} for the upper ocean of 0–1,900 dbar and mass change of about 2.0 mm yr^{-1} . The most likely reason for the large change in the AABW is the collapse of the Mertz Glacier Tongue in February 2010. The rapid contraction of the AABW could be due to the reduced supply of the Adélie Land Bottom Water (ALBW) after the calving and the associated decrease in sea ice production. The rapid contraction may continue for a long time because the drastic change of the icescape could prevent the ALBW supply from recovering to its pre-calving volume. The glacier collapse might prevent the AABW from freshening for a long time, even though the collapse would have initially resulted in the large isopycnal freshening of the AABW. Because it may take a decade or so for the supply of the ALBW to recover to pre-calving levels, the moderate freshening of recent decades could yield within 10 years an AABW that is fresher than the freshened AABW observed by the deep floats.