



## **Freshening of the South Indian Ocean during the Argo period: observations, causes, and impact on regional sea level change**

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Steric sea level change has been identified as one of the major contributors to the regional sea level changes. This contribution varies in space and time. Temperature (thermosteric) contribution to sea level has been found to be generally more important than salinity (halosteric) effect. Based on temperature and salinity data from Argo floats during 2005-2013 and coincident sea level measurements from satellite altimetry, we found that the central-eastern part of the South Indian Ocean stood out in the entire world ocean as a region that had a more dominant halosteric contribution to sea level change. The conspicuously large halosteric contribution was associated with a freshening in the upper few hundred meters. Neither local atmospheric forcing nor halosteric signal transmitted from the Pacific can explain this freshening. An observed strengthening of the Indonesian throughflow since early 2007 and the enhanced precipitation in the Indonesian Seas inferred from various precipitation estimates compounded by strong tidal mixing are the likely causes of the freshening of the South Indian Ocean. The findings also have implications to the potential influence of regional water cycle and ocean currents in the maritime Continent region to sea level changes in the South Indian Ocean prior to the Argo era and sea level projection in the future in response to climate change. Sustained measurements of sea surface salinity from satellites will significantly enhance our capability to study the impact of regional water cycle in the Maritime Continent region to related changes in the marginal seas and the Indian Ocean.