

# Freshening of Indonesian Upper Water and Salinification of Indonesian Intermediate Water in the Indian Ocean during the last decade

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The Indonesian region, also known as a central part of the “Maritime Continent” is located at the tropical region between the Pacific Ocean and the Indian Ocean. The water in Indonesian seas mostly consists of North Pacific waters (North Pacific Intermediate Water, NPIW and North Pacific Subtropical Water, NPSW) with the small fraction of South Pacific waters (South Pacific Intermediate Water, SPIW and South Pacific Subtropical Water, SPSW). During transit through the Indonesian seas, the saltier NPSW is modified due to atmospheric and oceanic forcing, i.e., evaporation/precipitation and tidal mixing, becoming fresher water.

The water from Indonesian seas can be distinguished in the Indian Ocean as low salinity water from the surface to the thermocline, called with Indonesian Throughflow water (ITW) or Indonesian Upper Water (IUW) and intermediate low salinity water known as Banda Seawater (BSW) or Indonesian Intermediate Water (IIW). Temporal variations of properties of these water masses in the South Eastern Indian Ocean over the last decade is investigated by using the gridded monthly mean of Argo dataset, MOAA-GPV and profile dataset in World Ocean Database (WOD). The freshening trend of the Indonesian Upper Water (IUW,  $23 \sigma_\theta$ ) and salinification trend of the Indonesian Intermediate Water (IIW,  $27.3 \sigma_\theta$ ) are detected. These trends are opposite with the salinification trend of North Pacific Subtropical Water (NPSW) and freshening trend of North Pacific Intermediate Water (NPIW) in the Pacific inflow region of ITF. The opposite trends between the inflow and outflow of ITF are at least partly explained as follows.

The freshening in the IUW is consistent with the low E-P within Indonesia region. High freshwater input in the Indonesian Seas from E-P on the last decade was proposed as one of the contributors to the freshening of IUW. Using simple Lagrangian estimation, as much as one to two third freshening are coming from this freshwater input. The salinification of IIW is drawn roughly by vertical salinity convergence due to vertical mixing between the top (400m) and bottom (1200m) of the intermediate layer. The enhanced vertical mixing due to salinification of water just above IIW is proposed as a major contributor to the salinification of IIW.

Keywords: Indonesian Seas, Indonesian Upper Water, Indonesian Intermediate Water