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# Water Mass Modification within the Indonesian Archipelago

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The Indonesian throughflow (ITF) transports Pacific water masses to the Indian Ocean with significant modification of their properties within the Indonesian archipelago. Due to the importance of the ITF on variations not only in the tropical Indo-Pacific oceans and climate systems but also in the global thermohaline circulation, a mean magnitude of the net transport and its variability has been studied extensively, using both observations and simulations. However, modification of water mass properties within the archipelago and mechanisms responsible for it are not well understood.
It has been shown that, in a state-of-art eddy-resolving OGCM, some unrealistic features in the water mass structure within the Indonesian archipelago are observed. This is mainly due to the lack of strong vertical mixing associated with the tidal processes in this region. We estimate appropriate magnitude and locations of enhanced vertical mixing in the archipelago using a simple two-dimensional advection-diffusion model, combined with results from the OGCM. One order of magnitude larger than a typical background vertical mixing coefficient, i.e. Kz=1 $cm^2/s$, in the whole region of the archipelago can make the water properties closer to the observed ones, while further enhancement of the uniform mixing coefficient does not improve the situation significantly. Increase of the coefficient to Kz=10 $cm^2/s$ in several key regions, e.g. south of Makassar Strait, reproduces water mass properties realistically. Mixing with saline thermocline water with fresh surface water from Java Sea in the western part of Flores Sea is crucial for water mass modification along the main route of the ITF. This low-salinity Java Sea water is attributed to river discharge into the South China Sea. On the other hand, the water mass modification can affect regional atmospheric conditions through the sea surface temperature change, suggesting the important interactions between the river runoff and the ocean circulations.

Keywords: Indonesian archipelago, Water mass modification, Indonesian througflow