Holocene sea-level changes in the Spermonde Archipelago, Indonesia: implications for vertical land movements

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We surveyed the elevation and age (¹⁴C) of paleo sea-level indicators in five islands of the Spermonde Archipelago. We describe 24 new sea-level index points from fossil microatolls, and we compare our dataset with both previously published proxies and sea-level predictions from a set of 54 Glacial Isostatic Adjustment (GIA) models, using different assumptions on both ice melting histories and mantle structure and viscosity. We then investigate the implications of our data and models in terms of vertical land movements in the study area, with two main results.

First, data from the heavily populated island of Barrang Lompo are significantly lower (ca. 80 cm) than those at all the other islands. In absence of instrumental data (e.g., GPS or tide gauges) in any of the islands, we advance the hypothesis that this difference may be due to groundwater extraction and loading of buildings on Barrang Lompo, that would cause this island to subside at rates in the order of ~3-11 mm/a.

Second, Common Era data (0-400 a BP) seem to indicate that the islands in the archipelago may be affected by tectonically-driven vertical land motions in the order of -0.88±0.61 mm/a (1-sigma), albeit slight uplift cannot be excluded. Different assumptions on vertical land motions affect, in turn, the assessment of which GIA model shows the best match with Late Holocene (ca. 4-5 ka) sea level data. Tectonic stability or slight uplift would favor iterations of ANICESELEN (De Boer et al., 2014), while subsidence would cause the sea level data to fit better with iterations of ICE-6G (Peltier et al., 2015).

References


Peltier, W. R., D. F. Argus, and R. Drummond. Space geodesy constrains ice age terminal

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