Variability of sea surface salinity in the tropical Indian Ocean as inferred from Aquarius and *in situ* data sets

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Abstract: Sea surface salinity (SSS) is one of the key components of the Earth's global water cycle. Reliable information on SSS is very important for ocean modelling, data assimilation, and ocean and climate research applications. In this study, SSS variability in the tropical Indian Ocean (TIO) was analysed using the Aquarius instrument on board the SAC-D satellite and *in situ* observations from the Research Moored Array for African–Asian–Australian Monsoon Analysis and Prediction (RAMA) buoys and Array for Real-Time Geostrophic Oceanography (ARGO) data sets for the period 2012–2013. Comparison of two recent versions (V2 and V3) of Aquarius-based SSS estimates to nine RAMA buoys on a daily timescale showed excellent mutual agreement. The systematic underestimation of SSS by satellite-based V2 products over the TIO shows a clear advantage for the new version product (V3). A larger root-mean square error of the order of 0.50 psu in the satellite-based SSS was observed over the highly variable (larger standard deviation) Bay of Bengal region as compared with ARGO data sets. In the eastern equatorial Indian Ocean region, satellite-based SSS overestimated SSS below 34 psu and underestimated SSS of 34–35 psu as compared with ARGO data. However, the V3 SSS from Aquarius showed marginal improvement over V2 SSS. Monthly variation and fast Fourier analysis of the satellite-based SSS estimates are in reasonably good agreement with *in situ* observations which suggest that Aquarius is able to capture SSS variability in the TIO. The Aquarius-based V3 SSS showed a temporal autocorrelation of 0.6 over most parts of the TIO up to day 10, and decreased gradually with time. Overall analysis suggests that Aquarius-derived V3 SSS can detect variability in SSS satisfactorily in the TIO and is in reasonably good agreement with *in situ* observations.