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Near surface salinity stratifications from Aquarius, Argo and an ocean model

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By comparing a newly available Aquarius-derived sea surface salinity (SSS) with the Argo in-situ measurements and an ocean circulation model, we have examined the near surface salinity stratifications in the tropical Atlantic and Indian Oceans. We have focused on the three regions: (I) the western part of tropical Atlantic, (II) the southern Arabian Sea and (III) the southern tropical Indian Ocean. The comparisons show that the Argo SSS has much weaker annual amplitudes than those of Aquarius and model in Regions I and III, but not in Region II. Investigation of the underline physics with model simulations and data (GPCP and OAFlux) analyses reveals that large amount of river runoff and/or surface freshwater in Regions I and III significantly stratifies the ocean surface layer above 5m depth, resulting in the differences between the Aquarius and Argo. Differently, monsoon-wind driven ocean currents mix surface water down to the depth of 5m in the region II, maintaining the agreement between the two observations. This case study suggests that dynamical differences can lead to different vertical salinity stratifications locally, which therefore explain the differences between the Aquarius observations in the first cm of the sea surface, the Argo measurements at the 5m depth, and model's representation of the surface-layer averaged salinity.