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Tropical near-surface stratification during intense rainfall

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The analysis of TAO and PIRATA mooring data in the tropical Atlantic and Pacific Ocean show that during and after high rainfall events, a significant haline stratification forms between 1m and 10m depths. This stratification can barely be sensed with the current array of ARGO floats which don't measure correctly in the upper 5m from the surface. A comparison of SMOS satellite mission salinity retrievals with ARGO salinities suggests that salinities near the surface in tropical regions of high rainfall can be largely underestimated, and thus that the current in situ network underestimates the amount of freshwater stored in the tropical ocean upper layer.

To complement the observations from TAO and PIRATA moorings towards the surface, we examine data collected from an array of drifters measuring salinity and temperature. We first focus of joint salinity and temperature observations at depths near 17-20 cm and 50-60cm, for which we sampled 15 rainfall-induced salinity drops in the tropical Indian and Atlantic Oceans. These data indicate that salinity stratification is only noticeable in this layer in the first hour, when it can reach up to 1 unit in practical salinity. This is also associated with a temperature drop, indicating both direct cooling due to lower rain-drops temperature and high ocean stratification. Average impacts of these heavy rainfalls on upper ocean salinity is then investigated, using in particular one-year long trajectories under the Atlantic ITCZ and the south Pacific SPCZ.