



Observations of a Downward Mixing of Rainfall with the ASIP Microstructure Profiler

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Rainfall can affect air-sea exchanges by stabilizing the upper ocean and inducing a shallow mixed layer. The upper few metres of the ocean can experience significant freshening from a single precipitation event, before it eventually becomes mixed into the bulk waters, typically after a period of hours. However, detailed observations of the downward mixing of rainwater are scarce because of the very shallow vertical scale over which it initially occurs.

Here we present observations from the Air-Sea Interaction Profiler (ASIP), an autonomous upwardly-rising microstructure profiler capable of resolving the small-scale variability within centimeters of the air-sea interface. During this Indian Ocean deployment, an intense rainfall event (peak rainfall rate >30 mm/hr) was captured by ASIP, with a corresponding reduction in salinity and temperature in the upper 10 m. This stabilising effect permitted the rainfall to remain for the remainder of the 14-hour deployment. Estimates from SMOS and ARGO observations have suggested a freshening rate on -0.14 psu/mm/hr, but our results indicate that this is much less.