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Very fresh lenses at the 1-km scale during Spurs2 Revelle cruise on November 9 2017, illustrating large intermittency of rain and resulting fresh lenses.

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During the 2017 SPURS-2 cruise, two multi-instrumented drifters drogued to the upper 60 cm of the surface were deployed for three hours. The drifters measured temperature and salinity in the top 50 cm, wave spectra and the noise of rain drops. During that time, the R/V Revelle did a short nearly-circular survey around them with a 1.8 km radius, measuring local weather and T-S stratification in the top 1 m (SSP). A SEA-POL radar also scanned the rain field except in the close vicinity of the ship. The radar captured a rain band moving to the west with small rainfall cells. The ship experienced short intense rain episodes totaling 1.3 cm accumulation, with mostly very low wind. The ship survey and the drifters showed large spatial heterogeneity, with maximum near-surface freshening of more than 8 psu measured at different times by the two drifters and at the ship. The freshening was also associated with large surface cooling. The vertical ocean structure also varied between these different low salinity events. In some cases, large surface freshening trapped to the upper 30 cm was observed despite no local rain. The salinity data suggest that some localized areas of less than 1 km horizontal scale likely experienced rain rates more than three times those measured on the ship. Furthermore, the spatial heterogeneity of salinity lasted for more than half an hour after the rain ended, probably associated with spreading and shallowing of the largest fresh pools, until the wind strengthened to the east of the cells. The structure of the rain cells and the likelihood of such large surface salinity heterogeneity is investigated.