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Evaluation of Underwater Acoustic Estimates of Raindrop Size Distribution through Comparison with Dual-Polarization Radar Measurements

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Different sized raindrops splashing on a water surface produce sound underwater that is distinctive and can be used to measure the drop size distribution (DSD) in rain. In this study an inversion of the underwater sound to measure the DSD in rain is described and demonstrated. Acoustical measurements of DSD retrieved from four Passive Acoustic Listeners (PALs) deployed at 60, 200, 1000 and 2000 m depths in the Ionian Sea off the Southwestern coast of Greece (37N, 21.5E) are reported for the period of January to April 2004. These measurements are compared to DSD estimates from high-resolution X-band dual-polarization radar (XPOL) measurements. XPOL reports the spatial distribution of rainfall variability over the listening areas of the PALs. Four quality controlled rainfall events that include drizzle, squall line, and heavy rainfall are presented in this study. The estimated DSDs from XPOL is spatially averaged over the mooring and compared against the four different acoustical DSD retrievals at depths. For independent verification purposes, XPOL DSD estimates are evaluated with corresponding measurements from an *in-situ* disdrometer locate at a similar radar range from the PALs. This technique has inherent applications in remote oceanic regions where measurements of rainfall are needed to help establish knowledge of the global distribution and intensity of rainfall and for validation of satellite

retrievals.