Evaluation of Underwater Rainfall Estimation through Comparison with Dual Polarization Radar Rainfall Measurements in the Ionian Sea Rainfall Experiment

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Rainfall on the sea surface generates a loud and distinctive sound underwater. This sound propagates downward and attenuates, producing an effective listening area, or an equivalent "catchment basin" for a listening device that is a function of depth and frequency. Acoustical measurements of rainfall are reported from four Passive Acoustic Listeners (PALs) at 60, 200, 1000 and 2000 m depths from a mooring in the Ionian Sea off the southwestern coast of Greece (37N, 21.5E) from January to April 2004. These measurements are compared with co-located high-resolution dual-polarization X-band radar (XPOL) rainfall measurements. The XPOL, which is calibrated by a 2-Dimensional Video Disdrometer located at the coast some 10km from XPOL, reports the spatial distribution of rainfall variability over the listening areas of the PALs. Six quality controlled rainfall events, including drizzle, squall line, and heavy localized rainfall were recorded. The XPOL rainfall fields are spatially averaged over the mooring and compared with the four different acoustic measurements at depths. To understand the issue of spatial averaging quantitative comparisons is presented showing a high correlation between the acoustic measurements and area averaged radar estimates at corresponding resolutions. The study will present a number of XPOL-PAL rainfall comparison statistics at the matching radar averaging scales to demonstrate the ability to measure area averaged rainfall at depth.