

A COMPARISON OF ARMAR AND PR MEASUREMENTS DURING TRMM FIELD CAMPAIGNS

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The Airborne Rain Mapping Radar (ARMAR) participated in TEFLUN-B/CAMEX-3 and KWAJEX. ARMAR operates at the PR frequency of 14 GHz and uses the same cross-track scanning geometry as the PR, making direct comparison of PR and ARMAR data possible. Such comparisons can provide information on the relative calibration of the two systems. More importantly, the higher resolution and sensitivity of ARMAR allow resolution and sensitivity effects in the PR data to be assessed. Of particular concern for the PR is the effects of non-uniform filling of its 4.3 km cross-beam footprint. The effects of non-uniform beam-filling (NUBF) have been previously considered theoretically and using ground-based and airborne data. Results from these previous studies indicate that the nonlinearity of the relations between rainrate and reflectivity and attenuation can result in biases.

This study begins with a discussion of radar calibration and then discusses features of the ARMAR and PR observations for a total of seven cases from TEFLUN and KWAJEX. We first provide a description of each case and comparisons of several radar products. This includes the classification of the rain type, the maximum height of radar echo, the reflectivity vertical structure, and, for stratiform rain, the height and intensity of the bright band. We then take advantage of the three-dimensional nature of the ARMAR data to do direct simulations of individual PR measurements. This involves locating each PR beam within the ARMAR data and then performing a three-dimensional integration of the ARMAR data to simulate the PR observation. This allows direct evaluation of the effects of NUBF. Finally, we present conclusions concerning the effects of the PR resolution and sensitivity on its measurements.

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