



Vertical profiling of precipitation with multi-channel passive microwave radiometers

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The object of this study was to make optimal use of the space-borne precipitation radar on TRMM and, soon, on GPM, to train the multiple-channel passive microwave radiometers to make quantitative estimates of the vertical profiles of rainfall. The vertical variability of rainfall as derived from the TRMM radar in each of six regions was first quantified, allowing the classification of the regions as "tropical-like" (i.e. where the first two principal components of the vertical precipitation account for about 90% plus 6% of the variability) or a "mediterranean-like" case (where the first two principal components account for 80% plus 11% of the variability). Then a Bayesian estimation approach was applied to the TRMM radiometer measurements, and produced, for the "tropical-like" regions, estimates of rain rates at 250 meter vertical increments which, when compared to the TRMM radar estimates, had a negligible bias and a standard deviation of between 60% and 70%. For the "Mediterranean-like regions", the biases and r.m.s. errors were large. The culprit is the inhomogeneity of the rain within the radiometer field of view, which we can detect and filter and thus produce vertical estimates from the radiometer that are as unbiased and accurate as those in the "tropical-like" regions.