PROFILE-BASED SWATH BROADENING TECHNIQUE FOR PR-TMI TRMM SENSORS

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Detailed cloud-mesoscale model simulations, that form the basis of TMI-based rain profile algorithms, require extensive computational resources and analysis before they can be used to define reliable microphysical relationships. Thus, in practice, few cloud-mesoscale simulations characterizing the microphysics and thermodynamics of precipitation systems, have been performed for the TRMM facility algorithms requiring cloud microphysical databases. This means the relatively few microphysical profile datasets gathered for the TRMM cloud-radiation database must be assumed invariant in characterizing any possible horizontal-vertical rain structure in tropical and sub-tropical precipitation environments. However, it is well known, particularly for slanted viewing geometry, that the resulting 3-dimensional radiation field (i.e., upwelling radiation signals at the top-of-atmosphere) depend on the relative spatial relationships between vertically distributed microphysical profiles. Therefore, retrievals of precipitation profiles would ideally be guided by 3-dimensional microphysical structure information inherent to the observed storm system and embodied in the cloud-radiation database. This investigation explores a technique for generating microphysical profile simulations applicable for TMI-based retrievals over the wide swath region on an event-by-event basis, with the aid of 3-dimensional fields of liquid water content established by PR measurements over the narrow swath region. Thus a dynamically-adjusted cloud radiation database resulting from 3-dimensional radiative transfer analysis of PR measurements is used to broaden the database information from narrow to wide swath. Radar measurements from the NCAR S-Pol radar are used to validate rain retrievals over the TMI-only portion of the wide swath for a pre-hurricane rain situation in Florida on August 20, 1998.