ICE WATER PATH STUDY USING PASSIVE MICROWAVE SENSORS DURING THE CLOUD LIFE CYCLE

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ABSTRACT

This research focuses on the possible relationship between Ice Water Path (*IWP*) retrievals using satellites and the life cycle stage of convective clouds and its possible application on satellite-based rain rate retrievals. In the first part of this work, it is analyzed the relationship between *IWP* and cloud area expansion rate using 235K isotherm. The *IWP* is retrieved using the Microwave Surface and Precipitation Products System (MSPPS), which use high frequency channels (89 and 150 GHZ) from AMSU-B and MHS sensors (NOAA 15-19), while the cloud expansion rate analysis was calculated using FORTRACC algorithm, which makes possible identify and track the evolution of mesoscale convective systems from thermal infrared images (10.7µm) on board geostationary satellites. In a second step, it was analyzed the relation between clouds convective fraction and rain rates (using radar data) and the cloud life cycle. The region selected for this study was São José dos Campos region (23.2ºS, 45.95ºW) at the Brazilian southeastern regions. The CHUVA project radar data was used for cloud classification and rain rate measurements in this region. It was found that, during the selected period, 84% of precipitant clouds have ice in their structure, according MSPSS algorithm. The results of this research shows that, while convective systems are intensifying (area is expanding and temperature is decaying), larger *IWP* values tends to be observed. Larger rain rates and convective fraction is also measured with radar retrievals when convection is in the early stage compared with mature systems. The ice particles effective diameter (*De*) doesn't have large variation in function of cloud life cycle. However, for systems in dissipating process (DIS) the *De* distribution tends to have, in average, higher values, even for lower *IWP*. This result suggests that for DIS stage the ice particles are mixed with water and air, which cause the density decreasing and the ice size rise, even when *IWP* is low. An update for the current methodology is proposed for precipitation retrievals applying high frequency channels from AMSU-B/MHS sensors using *De* and *IWP*. The proposed methodology showed a significant improvement compared with the global algorithm developed at MSPPS.