ANALYSIS OF 166 GHZ ICE SCATTERING SIGNAL IN SNOWFALL EVENTS OVER OCEAN

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Snowfall retrieval algorithms for spaceborne microwave (MW) radiometers on board Low Earth Orbit (LEO) satellites have been developed and refined in recent years, but many complicating issues still affect their accuracy and reliability. For example, previous work showed that within the Global Precipitation Measurement (GPM) mission, the Goddard PROFiling (GPROF) algorithm snowfall retrieval performance strongly depends on the snowfall type. Shallow cumuliform snowfall, which accounts for 36% of the global frequency of solid precipitation with values reaching 70% over some oceanic regions, is very difficult to detect and retrieve. Multi-channel passive MW observations evidence that the scattering signal from the solid precipitation layers can be contaminated by the background surface signal or supercooled cloud liquid water emission. In this study, we develop a scattering index (SI) approach that exploits the GPM Microwave Imager (GMI) dual-polarization 166 GHz window channels over oceanic regions. The scattering index is used to filter out the surface contribution to the upwelling radiation and enhance the scattering signal related to the precipitating clouds. The 166 GHz SI behavior in the presence of shallow cumuliform precipitation over ocean is analyzed and compared to 89 GHz SI results. Its potential to isolate the snowfall scattering signal in extremely dry conditions is also explored. Case studies show promising results, although some issues are still observed in the presence of supercooled liquid water.