Simulation of FY-3D observations of Hurricane Maria

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In this presentation, we report on our efforts devoted to simulating FY-3D observations of Hurricane with a focus on understanding the impacts of hydrometeor models on the radiative transfer. The FY-3D houses three functioning instruments in the microwave regime, namely MWRI, MWHS, MWTS, whose channels are located at atmospheric windows, absorption lines of vapor and oxygen, respectively. Cases of simulation have been conducted and we found that applying the aspherical shapes mitigates the over-scattering in mid-frequencies (e.g., 30–50 GHz) slightly by reducing the extinction of Mie shape, and enhances the scattering in high-frequencies (e.g., 89–187 GHz) prominently by reducing the asymmetry factor and single scattering albedo (SSA) of Mie shape. These findings are similar to those reported in [1], except that the simulation results of Mie shape in mid-frequencies show no "black hole" as reported in [1]. We also report our efforts on studying the impacts of vertical inhomogeneity of particle shapes. Specifically, we apply the optical database of 10 ice crystal habit [2], with temperature dependence of ice refractive index as its feature, to the observational operator RTTOV (Radiative Transfer for TOVS) [3]. Hydrometeor profiles of GRAPES model have been used for simulation. Hurricane Maria and several other storms in West Pacific Ocean, at various stages of development, are chosen as cases. The vertical distribution of hydrometeors of storms in [4] is used for a reference.

References

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