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Using multispectral satellite sensors and polarimetric radar to infer cloud microphysical structure

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In the last years several works have proved the relevance of visible (VIS), near-infrared (NIR) and infrared (IR) satellite measurements to characterize cloud-top structures. The availability at geostationary scales of VIS-NIR-IR radiances from SEVIRI makes possible to observe the evolution of cloud top parameters following the cloud lifecycle, and assess closer relations with precipitation at the ground. Polarimetric ground-based radars, on the other side, provide a detailed view of the vertical cloud structure in terms of hydrometors classification and a more reliable estimate of precipitation amount.

In this work satellite observations of convective clouds in the Mediterranean area are co-located with polarimetric radar derived classification of cloud particles to: 1) assess the relative consistency of the two observations, 2) derive a reliable description of the cloud structure evolution and 3) evaluate the potential of such physical cloud top characteristics for satellite-based rainfall estimation algorithms. Results show that satellite and radar observations agree for most of the cases in describing 3D cloud structure and provide complementary observation suitable to be merged for a better description of convective cloud structure and dynamics. The relationship between cloud top particles effective radius and precipitation areas at the ground is quantitatively assessed.