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Use of satellite microwave observations for Hail detection in the Mediterranean

Stavros Dafis (1), Chantal Claud (1), Vassiliki Kotroni (2), Konstantinos Lagouvardos (2), Jean-François Rysman (1), and Beatriz M. Funatsu (3)

(1) LMD/IPSL, CNRS UMR 8539, École Polytechnique, Université Paris Saclay, ENS, PSL Research University, Sorbonne Universités, UPMC Univ Paris 06, Palaiseau, France , (2) National Observatory of Athens, Institute for Environmental Research and Sustainable Development, Penteli, 15236 Athens, Greece, (3) CNRS, Université de Nantes, UMR 6554 LETG, Nantes, France

Hailstorms often occur in the Mediterranean basin throughout the year, and large hail can be life-threatening and destructive. The remote sensing of hail from ground-based systems, such as weather radars, remains the most commonly used technique. Due to the sporadic nature of this phenomenon and the even more rare reports of hail that reaches the ground, the validation of remote sensing techniques remains challenging.
The current study makes use of spaceborne observations to investigate the relationship between extremely low microwave brightness temperatures and occurrence of large hail on the surface. This is achieved by utilizing the brightness temperature (TB) measured by the Advanced Microwave Sounding Unit-B (AMSU-B), the Microwave Humidity Sounder (MHS) and the Advanced Technology Microwave Sounder (ATMS) between 1999 and 2017 over the Mediterranean Sea. A simple threshold algorithm is used to extract the hail climatology based on all available satellite observations and results are validated against dense surface reports. Statistics on the results are promising, showing a good correlation between detection of hail and surface reports, although the algorithm is also able to detect large concentrations of graupel/ice and hail that do not eventually reach the surface. Moreover, deep convection diagnostics are employed to study the presence of deep convective clouds with overshooting tops when hail is detected.