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Observational and numerical study of a giant hailstorm in Attica, Greece, on October 4, 2019

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On October 4, 2019, giant hailstones of 11 cm were reported in northern parts of Attica in southern Greece. During the same day, multiple large hail reports of hailstones larger than 3 cm as well as 5 tornadoes were reported in the European Severe Weather Database along the track of a long lived supercell thunderstorm that formed over northeastern Peloponnese and moved northeastwards to Attica and Euboea. In this study, we investigate the synoptic and mesoscale weather conditions that led to this rare event by using upper-air measurements from the Athens International Airport, satellite retrievals from METEOSAT, and reanalysis data from ERA5.

Furthermore, the predictability of this rare event is studied through high-resolution simulations performed with BOLAM, MOLOCH and WRF-ARW models, which are used operationally by the METEO unit at the National Observatory of Athens. The models were able to reproduce the mesoscale environment associated with these severe weather events, showing a highly unstable environment in Saronic gulf with more than 3000 J kg^{-1} MLCAPE overlapped by more than 25 m s^{-1} 0–6 km Bulk Shear. However, the models were not able to fairly reproduce the triggering, track and timing of the supercell formation highlighting the great uncertainties associated with the initiation of deep moist convection over areas with complex terrain. Here, we attempt to constrain these uncertainties by applying a diagnostic tool for predicting hail size using an ensemble of high resolution simulations and we discuss its operational usage.