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Numerical modelling and observational analysis of the characteristics of an intense thunderstorm over Northern Greece

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A series of thunderstorms developed over northern and central Greek area during the afternoon hours of May 13, 2018. Large amounts of rain were recorded by meteorological stations in the area. Seeding operations for the prevention of hail commenced in the context of the National Hail Suppression Program (NHSP) of Hellenic Agricultural Insurance Organization (ELGA). In this study observation and model data are used to examine the development and predictability of those intense phenomena.

In the first part of the study the initiation and subsequent evolution of the storms are presented. Using synoptic scale analyses and forecasts, the large scale environment in which the thunderstorms developed is examined. Surface and upper air observations are used to describe the thermodynamic status of the atmosphere before the onset of the thunderstorms. More detailed description of the phenomenon is carried out using data from the C-band weather radar located at Filyro and used for the operations of NHSP.

In the second part of the study, the results of convection allowing simulations are presented. Using the WRF atmospheric model (WRF-ARW 3.9.1.1) a set of simulations is performed using different parameterizations of the model. A light setup, which can be used in cases where the computational power is limited and two heavier setups better tailored to the study of intense phenomena. The simulation results are compared to radar observations using neighbourhood statistics methods to avoid the errors, inherent in point statistic methods. The results show that the light setup is able to perform satisfactory about the spatial characteristics of the thunderstorms while the heavier setups provide improvement regarding the temporal evolution of the phenomenon.