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Assessing the contribution of atmospheric aerosols' optical properties in the development of deep convective clouds with hail

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During the last decades, an increasing number of thunderstorms with hail have been registered, causing major damages in many economic sectors. Previous studies suggested that, besides the state of the atmosphere (convective instability, moderate wind shear, high atmospheric humidity), an important role in hail production is played by the presence of aerosols in the air. These particles exert a significant influence on the microphysical properties of water and ice clouds, which affect the processes that lead to rain, hail, and other forms of precipitation occurrence. The present work is focused on study of hail events registered in Măgurele – Romania (44.35N, 26.03E, 93m ASL) during four convective seasons (between 2012 and 2015). A number of 13 cases have been identified and analysed using atmospheric and remote sensing data. The atmospheric conditions were evaluated using ERA Interim Reanalysis, atmospheric soundings and satellite imagery. Two collocated remote sensing instruments - a Raman lidar (RALI) and a ceilometer CL31 - were used to detect aerosols layers and their optical properties. The main goal of our study was to evaluate whether the presence of aerosols could be taken into consideration as predictors for hail formation, and to which extent a certain type of aerosol could enhance the hail growing. A correlation analysis between stability indices and extensive and intensive optical parameters computed from lidar and ceilometer aerosols measurements has been carried out. Preliminary results show that the presence of fine aerosols have a significant contribution to the formation of hail. An extended database is needed for a better understanding of aerosols role in hail production.