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On the relationship between mineral dust transport and hail properties in deep convective clouds

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Synoptic-scale systems are the main driver for dust events in many extratropical source regions, such as the Euro-Atlantic area where the long range transport of mineral dust is determined by the displacement of tropical air masses primarily from Sahara but also from western Asian regions (Karakum) or Arabian Peninsula. Long range transport allows the contribution of dust aerosols in cloud processes away from the source areas. The scientific community has recognized mineral dust particles as a major contributor for cloud condensation nuclei (CCN) and ice nuclei (IN) activation during the cloud formation. Numerous studies have investigated the role played by CCNs and INs in convective developments and precipitations at mid-latitude storms. Although the significant knowledge regarding the influence of aerosols as CCNs and INs on convective clouds, several important convection-related events such as hailfalls have been sparsely investigated. This study aims to examine whether the mineral dust presence within different troposphere layers has any influence on hail occurrence during the convective processes. The following questions are addressed: Can mineral dust be considered a robust precursor within the initiation phase and/or during the development of deep convections? If so, to what extent the dust particles contribute to the hail growth? What are the variables that influence more the convection triggering and intensification?
The study is based on the use of hail reports provided by the European Severe Weather Database – ESWD, and Dust Aerosol Optical Depth at 550nm from MACC Reanalysis. The assessments were performed within the atmospheric domain framed between 25°N - 60°N latitude and 10°W - 50°E longitude for a time range of 6 years (2007-2012). First results suggest that there is a correlation between hail events and the presence of mineral dust, especially for Southern, Central and Eastern Europe regions. Further results will be discussed during the conference.

Keywords: dust-clouds interactions, deep convective clouds, precursor, hail

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