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IMPLEMENTATION OF MINERALOGY SENSITIVE ICE INITIATION PARAMETERIZATION IN DUST REGIONAL ATMOSPHERIC MODEL (DREAM)

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Abstract: Aerosols in the atmosphere and their interactions with clouds are the source of some of the largest uncertainties in climate sensitivity studies. Aerosols can play a role in cloud processes as cloud condensation nuclei (CCN) and ice nucleating particles (INP). They can have significant influence on the physical properties of clouds and their interaction with radiation, latent heat release, precipitation, and cloud electrification. Clouds typically glaciate at warmer temperatures when INPs are present. INPs in the atmosphere are available in much smaller amounts than CCN. The Sahara Desert is the major source of mineral dust, producing a significant part of atmospheric aerosol globally. Findings from field experiments, modelling and laboratory studies suggest that mineral dust particles are very efficient INPs even in regions distant from the desert sources. Several studies focused on the influence of mineral composition of dust on its ice nucleating ability. It has been shown that feldspar-containing particles are among the most efficient ice nuclei. Since quartz is a major component of atmospheric mineral dust, it has been studied as potential INP contributor and proven that it can be active as an INP. These results suggest use of mineralogy sensitive emission and transport schemes in numerical models and use of mineral specific INP parameterizations for feldspar and quartz components of mineral dust. In this study, mineralogy sensitive INP concentration parameterizations for feldspar and quartz minerals are used in Dust REgional Atmospheric Model (DREAM). We quantify relative contribution of feldspar and quartz to total INPC. Model results are compared to aerosol lidar, and cloud radar observations retrieved from ground based remote sensing instruments and satellite products in the Mediterranean.

Presentation link: https://www.youtube.com/watch?v=YrUrpBy0e6A