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Cloud and Saharan Desert Dust Aerosol Radiative Effects - A comparison between regional modelling and remote sensing measurements

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The aerosol and cloud effects on atmospheric dynamics, weather and climate are one of the central topics in contemporary environmental research. Aerosols and clouds influence the Earth's radiative energy budget by scattering, absorption and emission of solar and terrestrial radiation. Furthermore, they play key roles in the hydrological cycle. The present knowledge of clouds and aerosols and the complex atmospheric processes associated with them is very far from complete. Clouds, their representation and their interaction with aerosols and radiation constitute the greatest source of uncertainty in the estimation of future climate.

This work investigates the interaction between desert dust aerosols and cloud properties over the Iberian Peninsula and the Atlantic Ocean surrounding area, during the strong desert dust outbreak in April 2011. This study is carried out using regional atmospheric modelling and remote sensing data, provided by satellite and in situ measurements. The assessment of the aerosol properties provides information on the altitude of the aerosol layers and the cloud properties determination, influenced by the desert dust aerosols presence, gives information about the alterations that clouds may suffer. The aerosol and cloud radiative forcing at the top of the atmosphere and at surface levels are also estimated, based on model outputs.

The results of this study confirm that mineral aerosols alter cloud properties and change cloud amounts and quantify this effects for the April 2011 event. The research aims at providing a contribution in order to better understand the interaction of clouds/aerosols, their interaction with radiation, as well as to provide the quantification of the cloud/aerosol radiative effects.