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A reanalysis-based study of desert dust in Northern Africa, the Middle East and Europe in a recent decade

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Desert dust aerosols are highly variable in space and time, and, therefore, require a continuous monitoring by measurements done either in-situ or remotely by satellite, air-borne and ground-based sensors. Due to the sparse nature of observations, a four dimensional reconstruction of past dust conditions is best done by combining observations with short-range forecast reruns while using a consistent modelling scheme over time. Such observation- and model-based reconstructions are known as reanalysis datasets.

We will discuss the spatial and temporal distribution of desert dust in a recent decade based on a high-resolution regional reanalysis which has been recently produced by the Barcelona Supercomputing Center (BSC). The reanalysis covers the domain of Northern Africa, the Middle East and Europe at a horizontal resolution of 0.1° and a time resolution of 3 hours. This dataset has been obtained by combining satellite remote sensing observations of dust based on MODIS Deep Blue retrievals of Aerosol Optical Depth [1] with a dynamical model, more specifically, the dust module of the MONARCH chemical weather system [2,3].

In particular, we will show here that the dust annual cycle is well reproduced through the different years of the study period (2007-2016). To support further our findings, we will discuss a thorough validation of the reanalysis dataset with AERONET observations.

The good quality of the BSC desert dust reanalysis makes it a useful tool in support of climate research and services, as well as for the development and refinement of environmental monitoring and mitigation strategies.

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