Dust Transport And Entrainment In Iberian Peninsula Planetary Boundary Layer

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SUMMARY

The Sahara Desert is one of the major sources of atmospheric mineral dust. These particles are known to travel long distances and are often found in a layer plume at a height between 4 and 6 km. This work aims to perform a dynamical analysis of the Saharan mineral dust transport towards the Iberian Peninsula, focusing on the interaction with the Levante gap wind, the thermodynamical land-ocean-land discontinuity and the convective mixing that allows for its entrainment in the planetary boundary layer.

Resumo

Over the last years full attention has been given to the modelling of aerosols by the scientific community with a special emphasis on Saharan dust outbreaks. Mineral dust plays an important role in the atmosphere by influencing its radiative properties and dynamics. For instance, dust aerosols are known to interfere with climate forcing by altering the radiation balance through the scattering and absorption of radiation, direct effects. In addition it can also affect cloud development and dynamics, acting as cloud condensation nuclei and changing the microphysical properties of clouds, indirect effects. Moreover, these particles are directly linked to air quality, affecting human health.

The main goal of this work is to perform a dynamical analysis of the Saharan mineral dust transport towards the Iberian Peninsula. It is known that the long range transport of mineral dust is made in a plume that is often located between an height of 4 to 6 km. However little is known about the interaction of local scale meteorological processes with this transport.

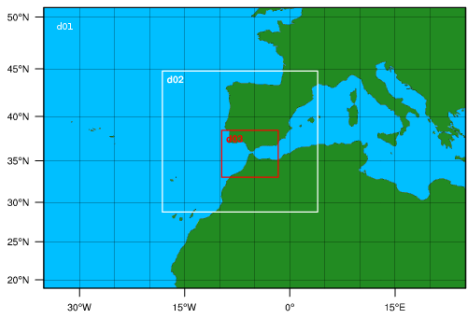

Figure 1: WRF triple nested domain.

To address this issue the WRF-Chem model was use to simulate a dust outbreak that occurred on the 27th of June, 2012 . A triple two-way nested domain ranging from 18 to 2 km resolution was configure and the period from 20th to 30th of June, 2012 was simulated – Figure 1.

The analysis of the meteorological variables have shown that both the land-ocean-land contrast, as well as, the Levante gap wind are locally dominant over the synoptic setting, playing an important role in the mineral dust distribution and transport over the southern part of the Iberian Peninsula. Furthermore, the ability of the planetary boundary layer to interact with higher levels, has shown an important role in the intrusion of dust into the boundary layer.

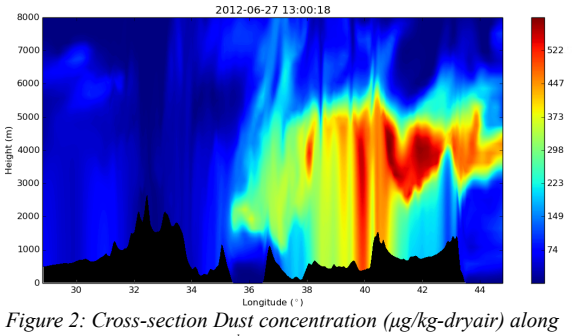

Figure 2: Cross-section Dust concentration (µg/kg-dryair) along 5º West for domain 2 at 27th June, 2012 at 1300 UTC.