



African Dust Outbreaks

Impacts on air quality

Methodology for detection and quantification

CENSE

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Objectives

Saharan desert wind storms inject a great amount of sand and dust in the atmosphere (Fig 1). These particles travel long distances. African Dust Outbreaks (ADO) contribute with large amounts of particulate matter in the troposphere, which have impacts on human health.

Concerning air quality, the influence of ADO on levels of Particulate Matter (PM) is specially relevant in Southern Europe and there is still a need to quantify this long range transport.

In the present work, a methodology has been established to identify these episodes and quantify the contribution of North African dust sources on PM, over Portugal, using several tools.

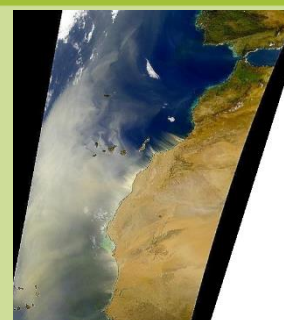


Fig1: Satellite image of an African Dust Outbreak (source: SeaWiFS/NASA)

Methodology

Detection of ADO over the Iberian Peninsula is based on tools (Fig2) that identify the transport pathways and evaluate the natural contribution on PM₁₀ levels, such as:

- Satellite imagery (SeaWIFS, MODIS-Terra, TOMS),
- Modelling (NOAA HYSPLIT, BSC-Dream, Skiron, NAAPS Global Aerosol Model)
- Air quality monitoring data (PM₁₀ daily concentrations)

Quantification of natural contribution - *net dust load* - for each day of the list of ADO is then based on the following steps:

- Calculation of local/regional PM₁₀ contribution (LRC, without African origin). LRC is determined by an algorithm (associated with previous correlation found between clean air days and Atlantic advection)
- The *net dust load* for a given day with African dust influence in one regional background station is determined as: PM₁₀ concentration - LRC

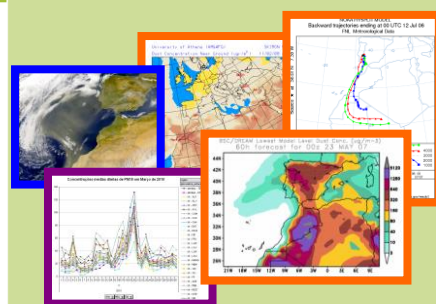


Fig2: Different types of tools are used to identify and quantify African Dust Outbreaks

Expected Results

NDO are identified and quantified for each year in analysis. In Portugal, between 2006 and 2012, NDO have occurred in 13% to 24% of days in the year.

A list of *net dust load* values, for each day and regional background station, is produced. These values of natural dust contribution can be subtracted to each PM₁₀ daily mean registered in other air quality monitoring stations of the same region (Fig3).

This methodology allows to determine the PM fraction (in an annual mean and a daily mean basis) due to natural sources. This is relevant also for demonstration and subtraction of exceedances attributable to natural sources under the Directive 2008/50/EC on ambient air quality and cleaner air for Europe.

This methodology is currently applied by the Ministries of the Environment from Portugal and Spain, and was approved by European Commission for reporting purposes.

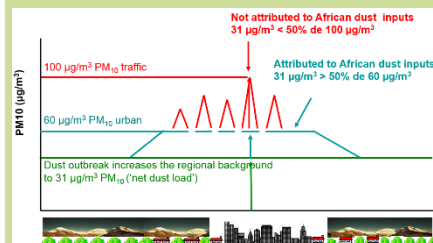


Fig3: Application of the methodology to quantify the *net dust load* attributable to natural sources (Source: X. Querol)

Funding:

