ENSEMBLE DUST PRODUCTS: PROBABILITY MAPS

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TECHNICAL REPORT

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Summary

This document introduces a new probabilistic map product for Northern Africa, the Middle East and Europe. The probability maps are based on the multi-model median forecast produced by the SDS-WAS Regional Center for Northern Africa, Middle East and Europe (https://sds-was.aemet.es/forecast-products/dust-forecasts/ensemble-forecast).

The system has been designed and is operated by State Meteorological Spanish Agency (AEMET) and the Barcelona Supercomputing Center (BSC).

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1. Introduction

In 2007, owing to the societal needs for monitoring and forecasting dust events, and for assessing and mitigating their negative impacts, World Meteorological Organization (WMO) launched the Sand and Dust Storm - Warning Advisory and Assessment System (SDS-WAS, http://www.wmo.int/sdswas) with the mission to enhance the ability of countries to deliver timely and quality sand and dust storm forecasts, observations, information and knowledge to users through an international partnership of research and operational communities.

This document introduces the probabilistic map product for Northern Africa, the Middle East and Europe based on the models participating in the SDS-WAS model intercomparison (https://sds-was.aemet.es/forecast-products/dust-forecasts/forecast-comparison).

2. Probability Maps

The main objectives of multi-model and probabilistic products are to summarize the information provided for all the models available in our ensemble in a user-friendly way and also to offer an objective probability of an event happening or exceeding a given threshold. Every day, the Regional Center for Northern Africa, the Middle East and Europe of the WMO Sand and dust Storm – Warning Advisory and Assessment System (SDS-WAS, https://sds-was.aemet.es) is producing dust **probability maps** for three days (D run day, D+1 and D+2) for Northern Africa, the Middle East and Europe (see Figure 1).

These probability maps are produced using most of the available models that each day are participating in the model intercomparison of the SDS-WAS Regional Center for Northern Africa, Middle East and Europe (https://sds-was.aemet.es/forecast-products/dust-forecasts/ensemble-forecast). Models included in the multimodel products must provide geographical and temporal coverage for the total domain and forecast range.

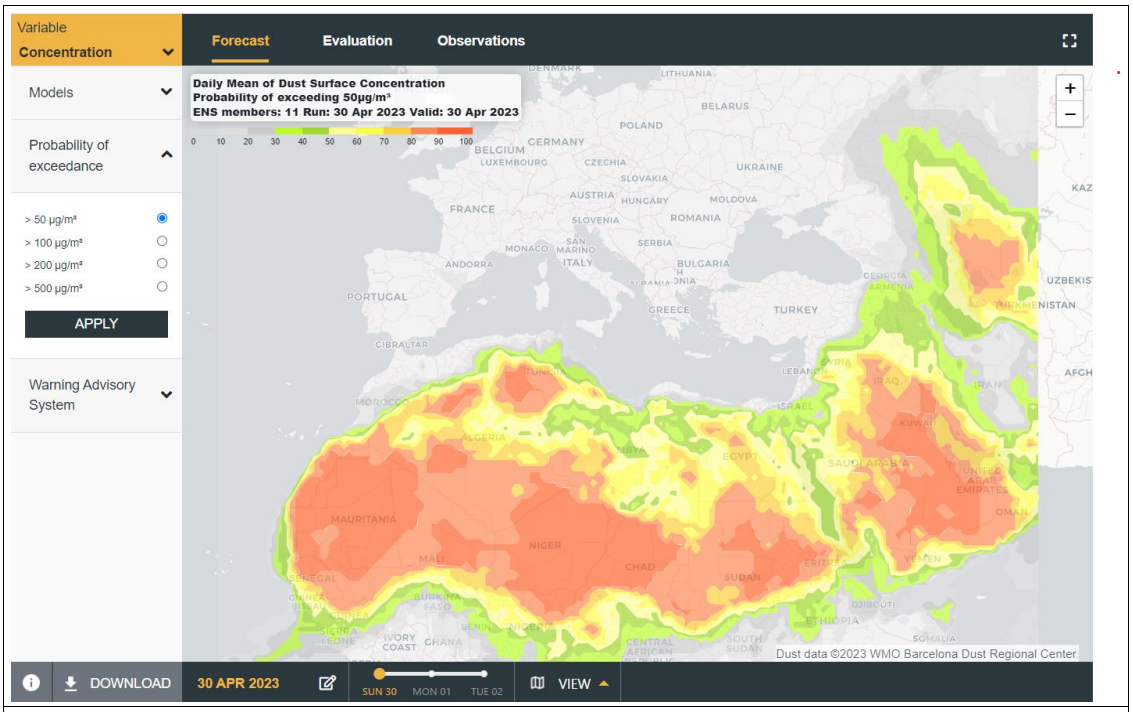

Figure 1: Probability forecast of exceeding daily mean dust SFC Concentration of 50 µg/m³

The probability maps show the probability of exceeding a given threshold of daily mean Dust Surface Concentration and daily mean Dust Optical Depth (Dust AOD), considering dust forecasts in 3hourly basis and a window of 24h (i.e. one day, D). Several thresholds have been set considering dust surface concentration and dust optical depth at 550 nm. In the near future more thresholds could be added depending in the feedback and needs of the users.

This clear, concise information is expected to help planning any activity vulnerable to airborne dust or activate services and procedures aimed at the mitigation of damages caused in agriculture, public health or any other vulnerable sector.

Link to the product:

https://dust.aemet.es/products/daily-dust-products?tab=forecast&section=prob

Appendix: Technical specifications

Parameter forecasted	Probability of exceeding a given threshold value of daily mean Dust Surface Concentration and Dust Optical Depth (Dust AOD)
Forecast product	SDS-WAS NAMEE RC ensemble (https://sds-was.aemet.es/forecast-products/dust-forecasts/forecast-comparison)
Spatial Resolution	0.5ºx0.5º
Forecast range	D (forecast run), D+1 and D+2
Forecast domain	Northern Africa, Middle East and Europe (NAMEE)
Available	Daily at 8:30-9:30 UTC

Thresholds Dust Surface Concentration [µg/m^3]	Thresholds Dust AOD[-]
50 - 100 – 200 -500	0.1 - 0.2 - 0.5 – 0.8

Color palette is divided into five colors showing probability (a colorblind friendly palette is in progress):

Grey	10-30%
Green	30-50%
Yellow	50-70%
Orange	70-90%
Red	90-100%