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WMO Sand and Dust Storm Warning System (SDS-WS) for Europe, Africa and Middle East: a GEO-oriented System

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A large portion of atmospheric particulate matter is derived from arid regions of the Earth and is distributed all over the globe. The most prominent example of this transport is the export of desert mineral dust from the Saharan region. The impact of mineral dust on air quality, climate and ecosystems represents a major scientific and societal issue. Estimates of the amount of dust exported annually from northern Africa (Sahara-Sahel region) are still not reliable, and range from 260 to 1500x10ˆ6 tons/year. Once in the atmosphere, dust particles interact with solar and thermal radiation, modulating the Earth radiation balance, and cause large uncertainties in assessing climate forcing by atmospheric aerosols. Dust interacts with clouds and affects photolysis rates and ozone chemistry by modifying the UV radiation. Saharan dust deposition also influences the biochemical cycles of both oceanic and terrestrial ecosystems. In the Caribbean, Saharan dust is believed to infect coral reefs with the sea fan disease. It is also thought to be linked to health risks, such as epidemics of lethal meningitis in the semi-arid sub-Saharan territory known as the Sahel belt.

In this context, the World Climate Research Programme and the Global Atmo-

spheric Watch (WWRP/GAW) Sand and Dust Storm (SDS) Project was established in September 2004. The purpose of the SDS Project is to achieve comprehensive, coordinated and sustained observations and modelling capabilities of the sand and dust storm, in order to improve the monitoring state of the sand and dust storm, increase the understanding of its the formation processes, and enhance prediction capabilities. Recently, the development of a SDS-EWS in East Asia was presented at the Third International Early Warning Conference, Bonn, Germany, 27-29 March 2006. A new proposal on WMO Sand and Dust Storm (SDS) Warning System extending the scope to two other regions was accepted at the Scientific Steering Committee meeting for SDS Project (November 2006 Shanghai, China). The main project objective is to establish a WMO-coordinated global network of SDS forecasting Centers delivering products useful to a wide range of users for reducing the impacts of SDS. For North Africa and Europe, Spain is currently creating a WMO Regional Centre for SDS. A partnership of three research institutions composes the regional centre: the Barcelona Supercomputing Center (BSC), the Spanish National Institute of Meteorology (INM) and the Earth Sciences Institute 'Jaume Almera' (IJA-CSIC). This Regional Center will deal with both operational and scientific aspects related to atmospheric dust monitoring and forecasting.

This contribution will be devoted to present the SDS-EWS current and future activities for Europe and North Africa. The initial state of the system is based on the Dust Regional Atmospheric Model (DREAM) which provides daily dust forecasts for North Africa and Europe (http://www.bsc.es/projects/earthscience/DREAM/). The model qualitative and quantitative verification studies performed so far, using data from observation networks such as the European EARLINET (lidars; http://www.earlinet.org/) and the international AERONET/PHOTONS (sun photometers; hhtp://aeronet.gsfc.nasa.gov), satellite and ground level PM levels have outlined the good skills of the model concerning both the horizontal and vertical extent of the dust plume in the geographic region of application. Ongoing activities involve the improvement of the dust model itself and the near-real time integration of observations into the system (Meteosat Second Generation dust products, lidars, sun-photometers, and surface concentration levels). The fast-track development, testing and implementation of the initial operational capability result from close cooperation among BSC, INM and IJA-CSIC. BSC researchers maintain and develop the DREAM model for accurate prediction of Saharan dusts events in the region by introducing improved parameterizations for the following physical processes: dust emission, dust particle size physics, wet deposition and radiative effects of mineral dust. In addition, the dust model computational efficiency is being improved by introducing a parallelised and non-hydrostatic version of the atmospheric model driver in order to increase model's spatial and temporal resolution for operational use. INM develops and provides op-

erational dust products for Nowcasting and Very Short Range Forecasting within the SAF-NWC (http://nwcsaf.inm.es/), contributes with instruments in the region to AERONET/PHOTONS network, and will use this data-set for dust watch and validation of both DREAM model and MSG-SEVIRI data in near real-time. IJA-CSIC provides current monitoring in-situ data and methods for operational verification, and forecast guidance for the administration in order to protect people from the harmful effects of poor air quality. Currently state and local air quality managers are using the forecast guidance in Spain as a tool in issuing local health-based air quality alerts. The extension of the guidance to the whole region will serve as a standard tool, for public and private, state and local forecasters who provide tailored forecasts for their communities, and will allow taking preventive measures to safeguard human health.