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WMO SDS-WAS NAMEE Regional Center: Towards continuous evaluation of dust models in Northern Africa

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One of the most important activities of the Regional Center for Northern Africa, Middle East and Europe of the World Meteorological Organization's Sand and Dust Storm Warning Advisory and Assessment System (WMO SDS-WAS, http://sds-was.aemet.es) is the dust model intercomparison and forecast evaluation, which is deemed an indispensable service to the users and an invaluable tool to assess model skills. Currently, the Regional Center collects daily dust forecasts from models run by nine partners (BSC, ECMWF, NASA, NCEP, SEEVCCC, EMA, CNR-ISAC, NOA and UK Met Office). A multi-model ensemble has also been set up in an effort to provide added-value products to the users. The first problem to address the dust model evaluation is the scarcity of suitable routine observations near the Sahara, the world's largest source of mineral dust. The present contribution presents preliminary results of dust model evaluation using new observational datasets.

The current routine evaluation of dust predictions is focused on total-column dust optical depth (DOD) and uses remote-sensing retrievals from sun-photometric (AERONET) and satellite (MODIS) measurements. However, most users of dust forecasts are interested in the concentration near the surface (in the air we breathe) rather than in the total column content. Therefore, evaluation of the predicted surface concentration is also necessary. In this context, the initiative of the African Monsoon Interdisciplinary Analysis (AMMA) International Program to establish permanent measuring stations in the Sahel is extremely important. Tapered Element Oscillating Microbalance (TEOM) monitors continuously record PM10 in M'Bour (Senegal); Cinzana (Mali) and Banizoumbou (Niger). This surface model evaluation is complemented with the PM10 observation from the Air Quality Control and Monitoring Network (AQCMN) of the Canary Islands (Spain). The region, located in the sub-tropical Eastern Atlantic (roughly 100 km west of the Moroccan coast), is frequently affected by intrusions of Saharan dust. Regional Node are evaluated during two years (2013-2014) with observations recorded in the Sahelian region and Canary Islands. Additionally, since the data sets of weather records have an excellent spatial and temporal coverage, observations of horizontal visibility included in meteorological reports are used as an alternative way to monitor dust events in near-real-time (NRT). Recently, a new visibility product that includes more than 1,500 METAR stations has implemented in the SDS-WAS NAMEE Regional Center. The present contribution also will demonstrate how the visibility can complement the information provided by other observing systems (air quality monitoring stations, sun photometers, vertical profilers or satellite products) and numerical simulations presenting its application in tracking several dust episodes.

Otherwise, the vertical distribution of aerosol also influences the radiative effect at the top of the atmosphere, especially when aerosols have strong absorption of shortwave radiation. The free troposphere contribution to aerosol optical depth (AOD) and the altitude of lofted layers are provided thanks to the vertical profiling capability of the lidar/ceilomenter technique. Currently, a lidar located in Dakar (Senegal) and a ceilometer in Santa Cruz de Tenerife (Canary Islands, Spain) provide near-real-time (NRT) vertical profiles of aerosols, which are compared with those simulated by models.