Dust Cycle and SDS-WAS ongoing Initiatives

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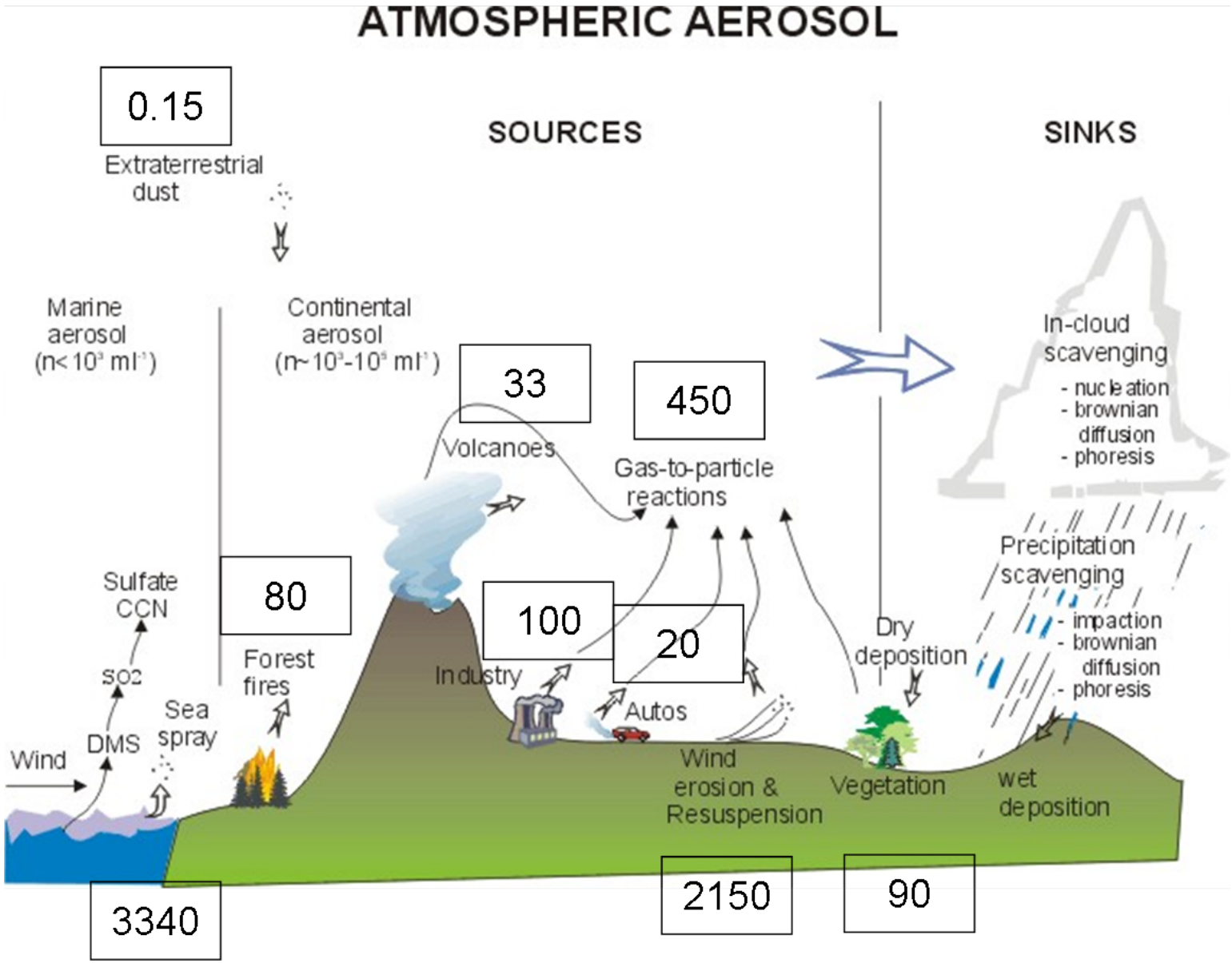
inDust: Desert Dust impacts on Air Quality in Europe
National Research Council of Italy (CNR)
Rome, Italy 11-12 March 2019

Barcelona Supercomputing Center
Centro Nacional de Supercomputación

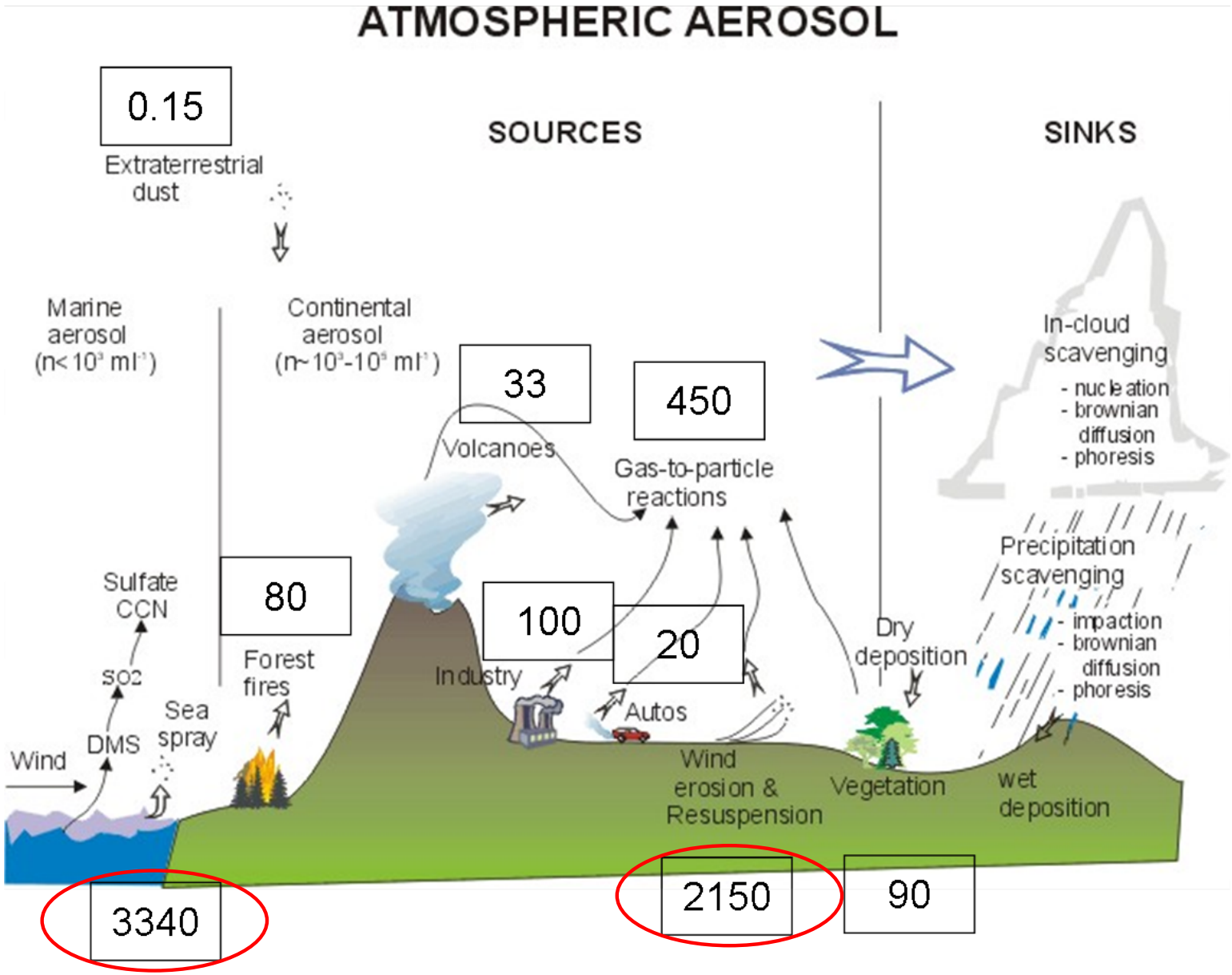
Outline

Outline

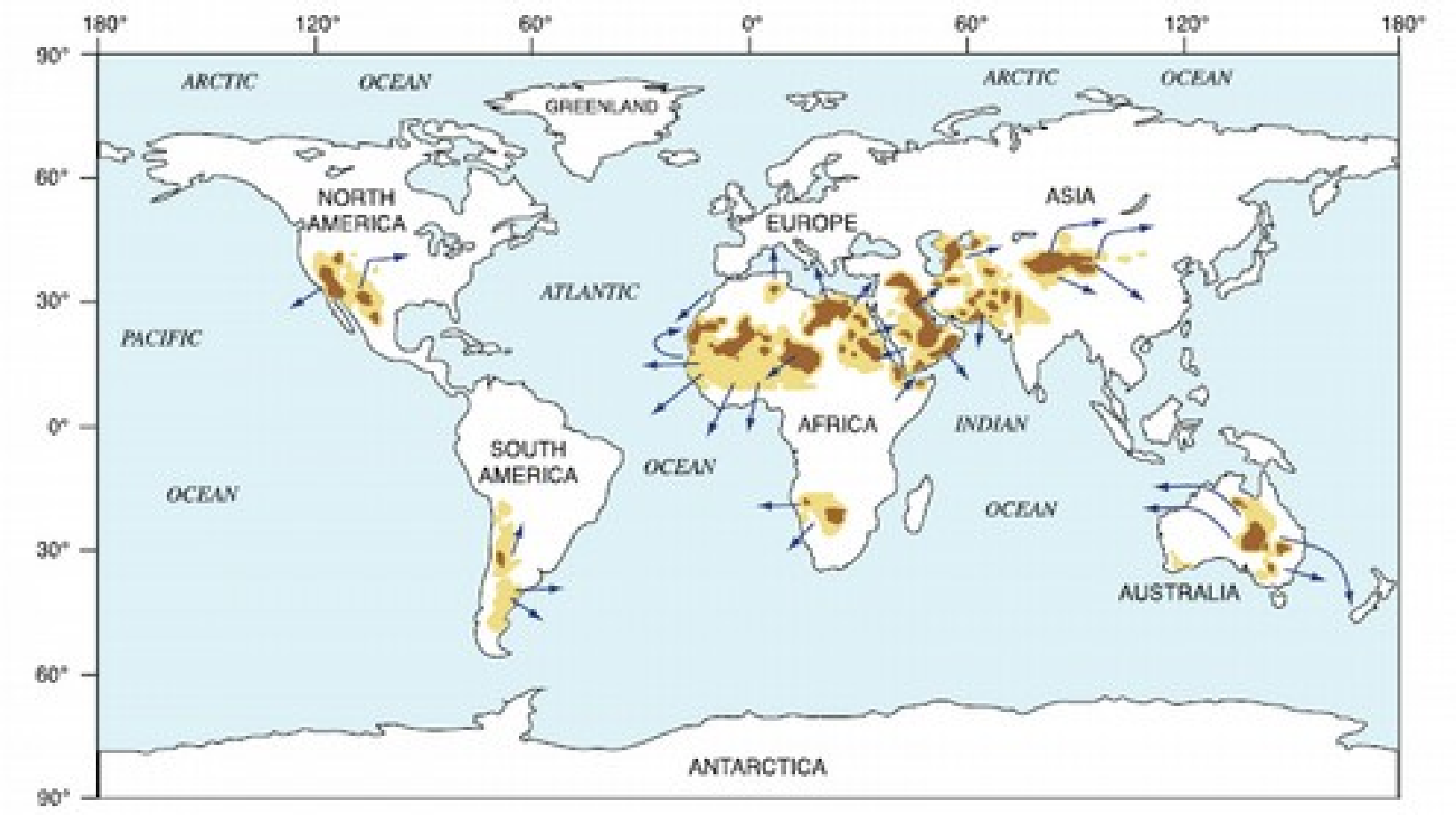
Aerosol Distribution: IPCC 2001 [Tg]



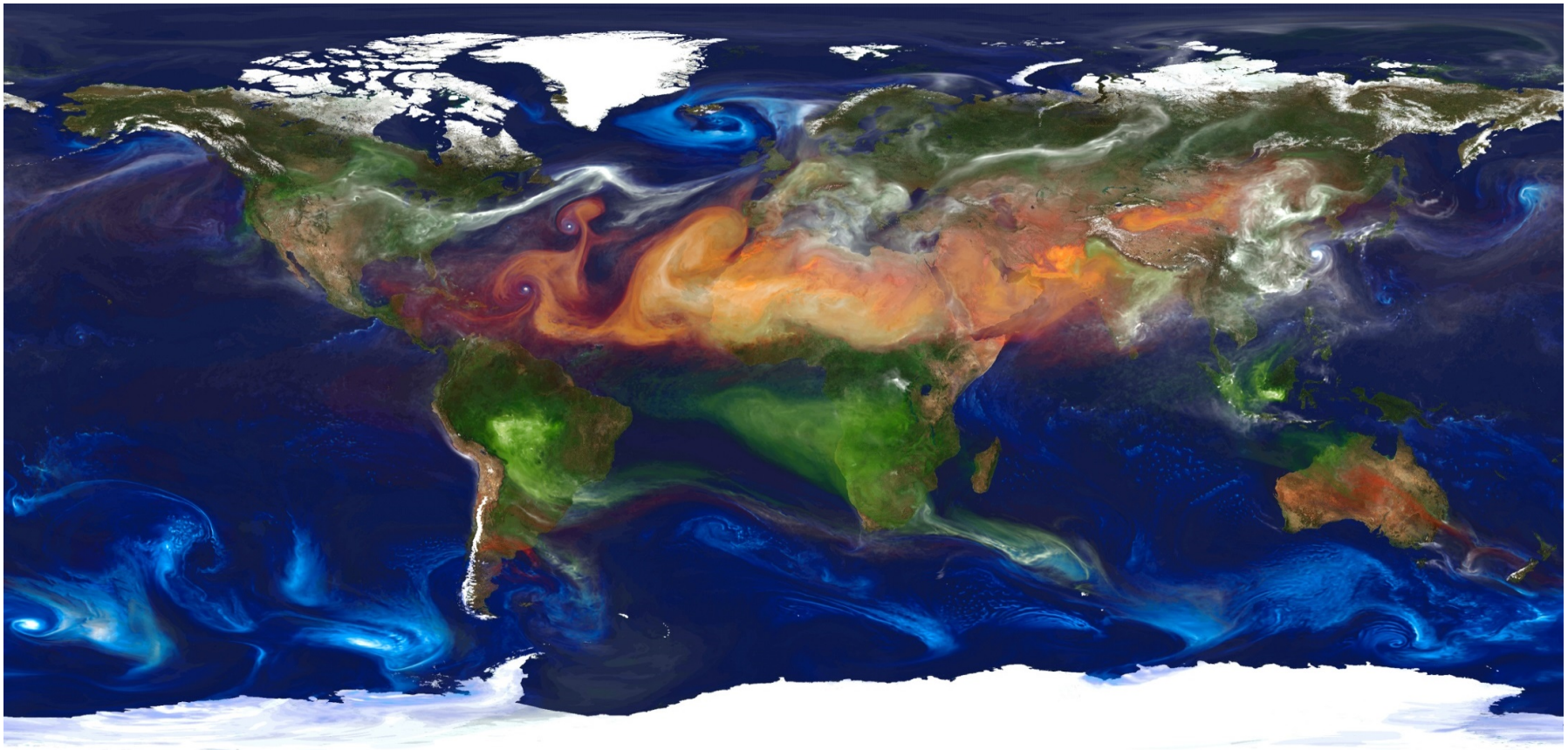
Aerosol Distribution: IPCC 2001 [Tg]



Main mineral dust sources



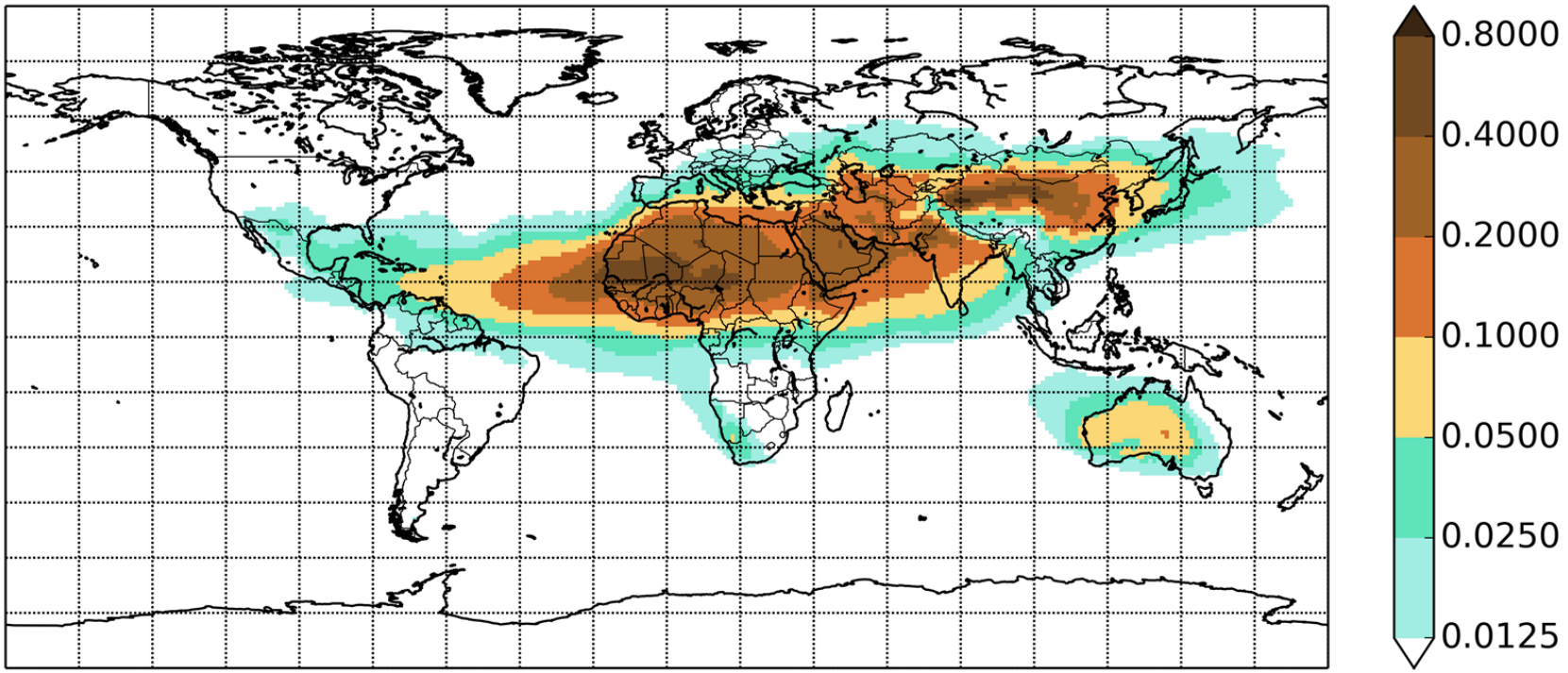
Geographical Aerosol Distribution



GEOS-5 : Earth System Modeling and Data Assimilation

Orange: Mineral dust
Blue: Seasalt
Green: Carbon from biomass burning
White: Sulfates

Geographical Mineral Dust Distribution



CAMS reanalysis AOD 550 nm (Average value: 2003-2015)

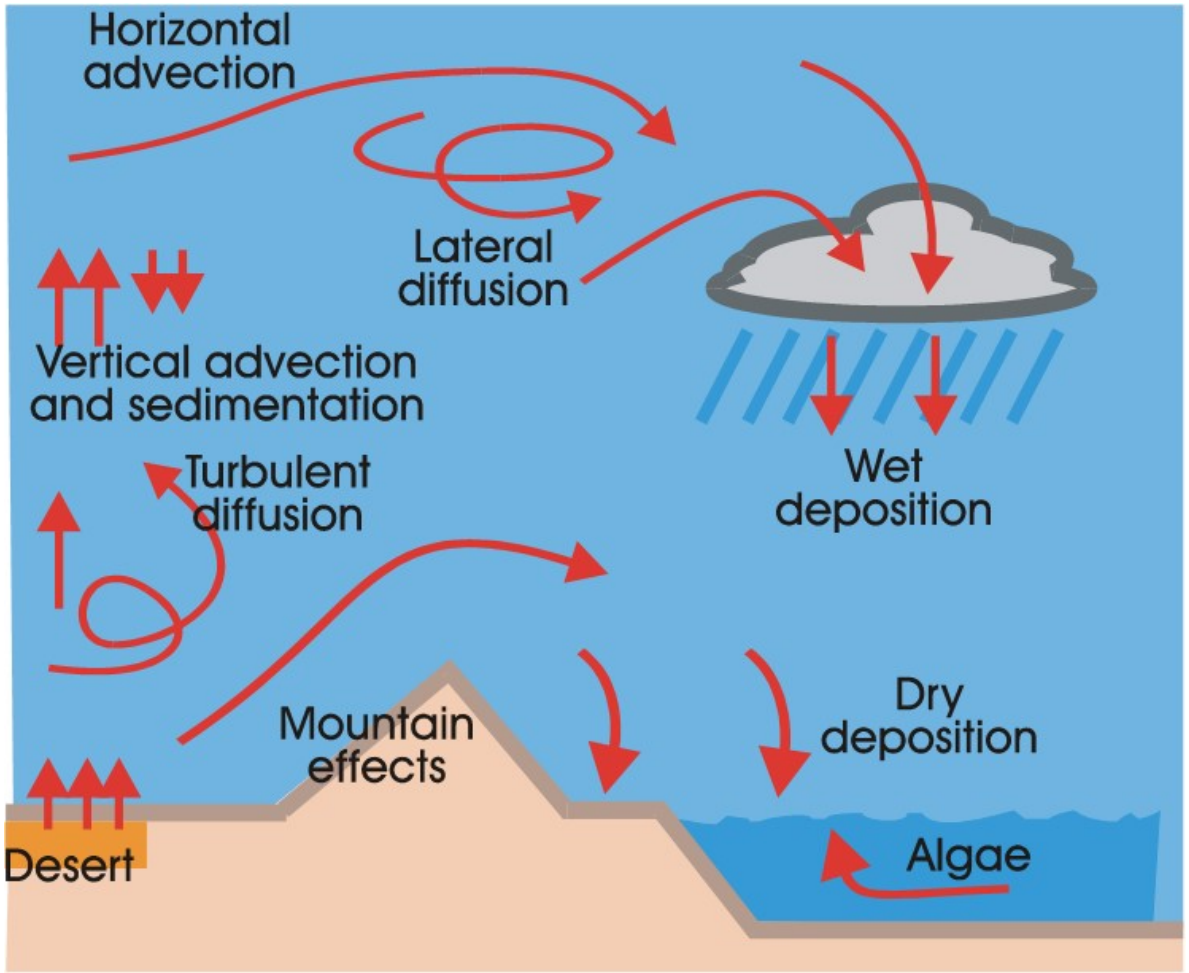
Copernicus Europe's eyes on Earth

Atmosphere Monitoring Service

WMO AIRBORNE DUST BULLETIN Sand and Dust Storm Warning Advisory and Assessment System

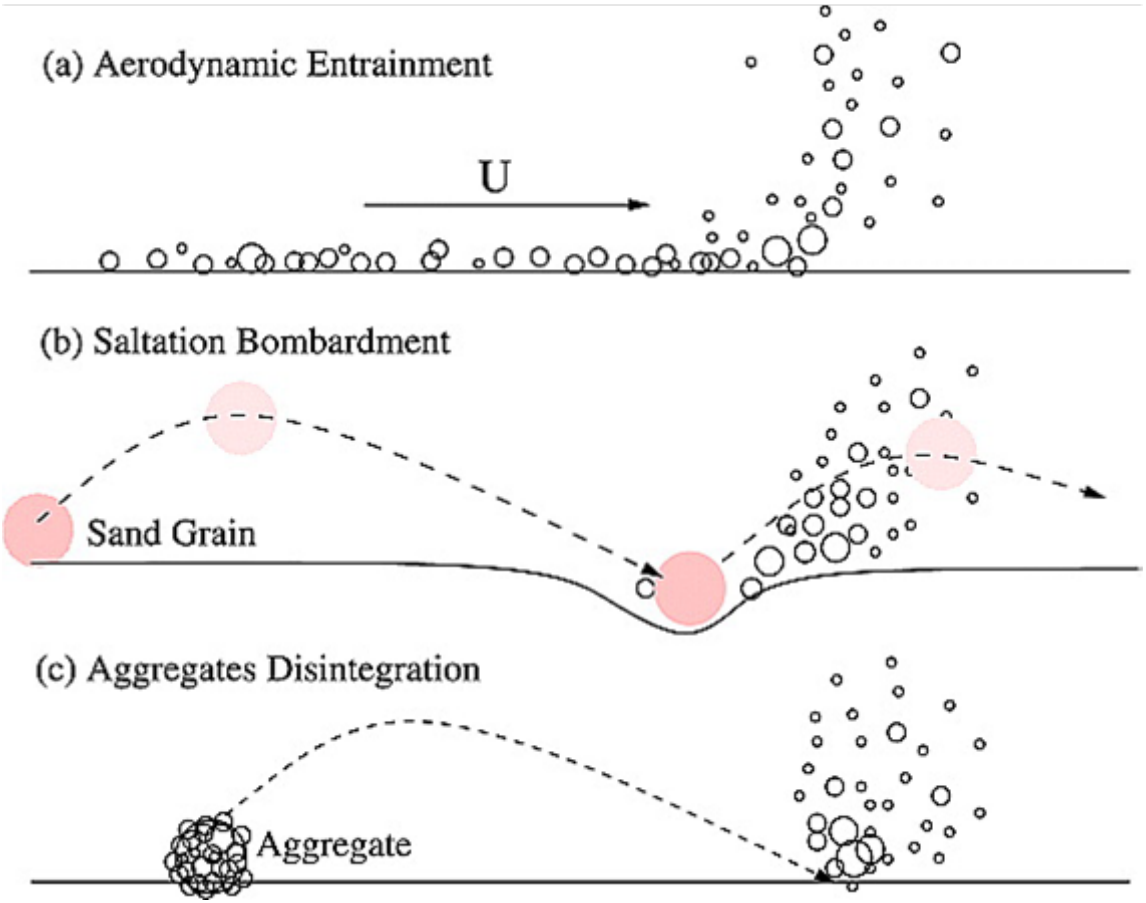
Outline

Dust Cycle



- Emission
- Turbulent Difussion
- Transport
- Wet & Dry Deposition

Emission: Saltation & Sandblasting



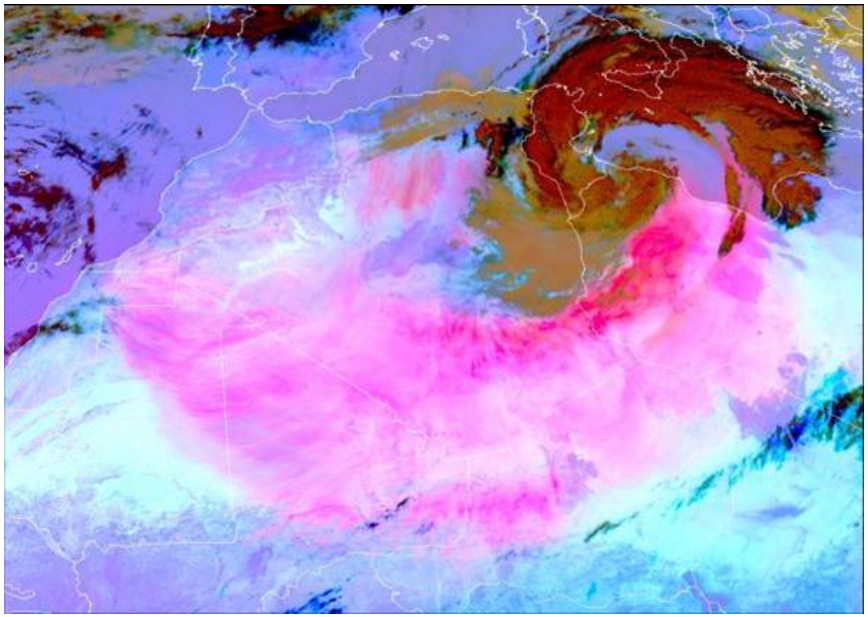
- The most efficient way of dust-emission is the result of the combination of two different physical processes: saltation (horizontal flux) and sandblasting (vertical flux).

Emission: Erosion treshold depens on soil nature and state

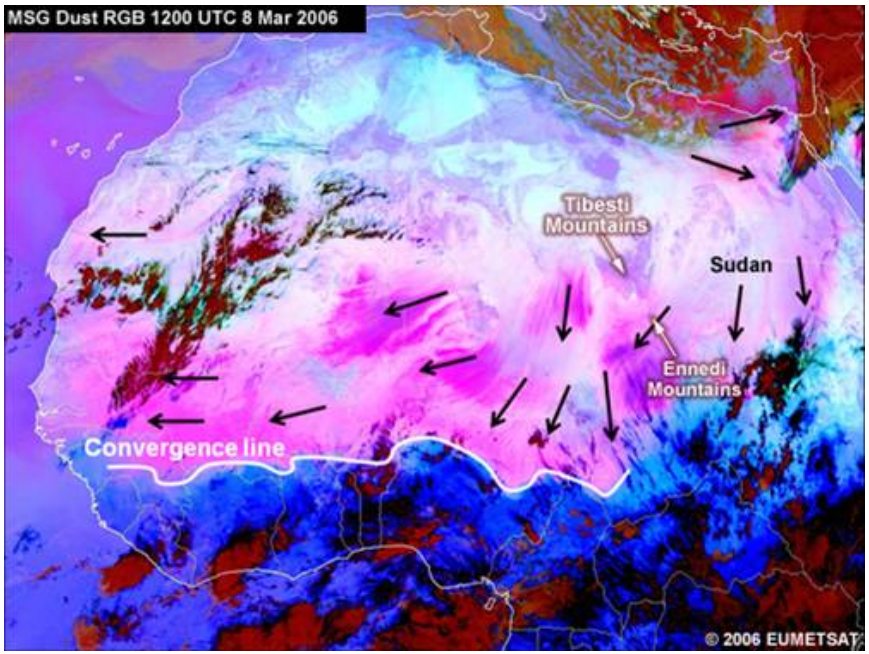
Meteorological factors

Synoptic and meso-alfa phenomena

- Frontal system winds
- Trade winds



RGB images: Magenta → Dust



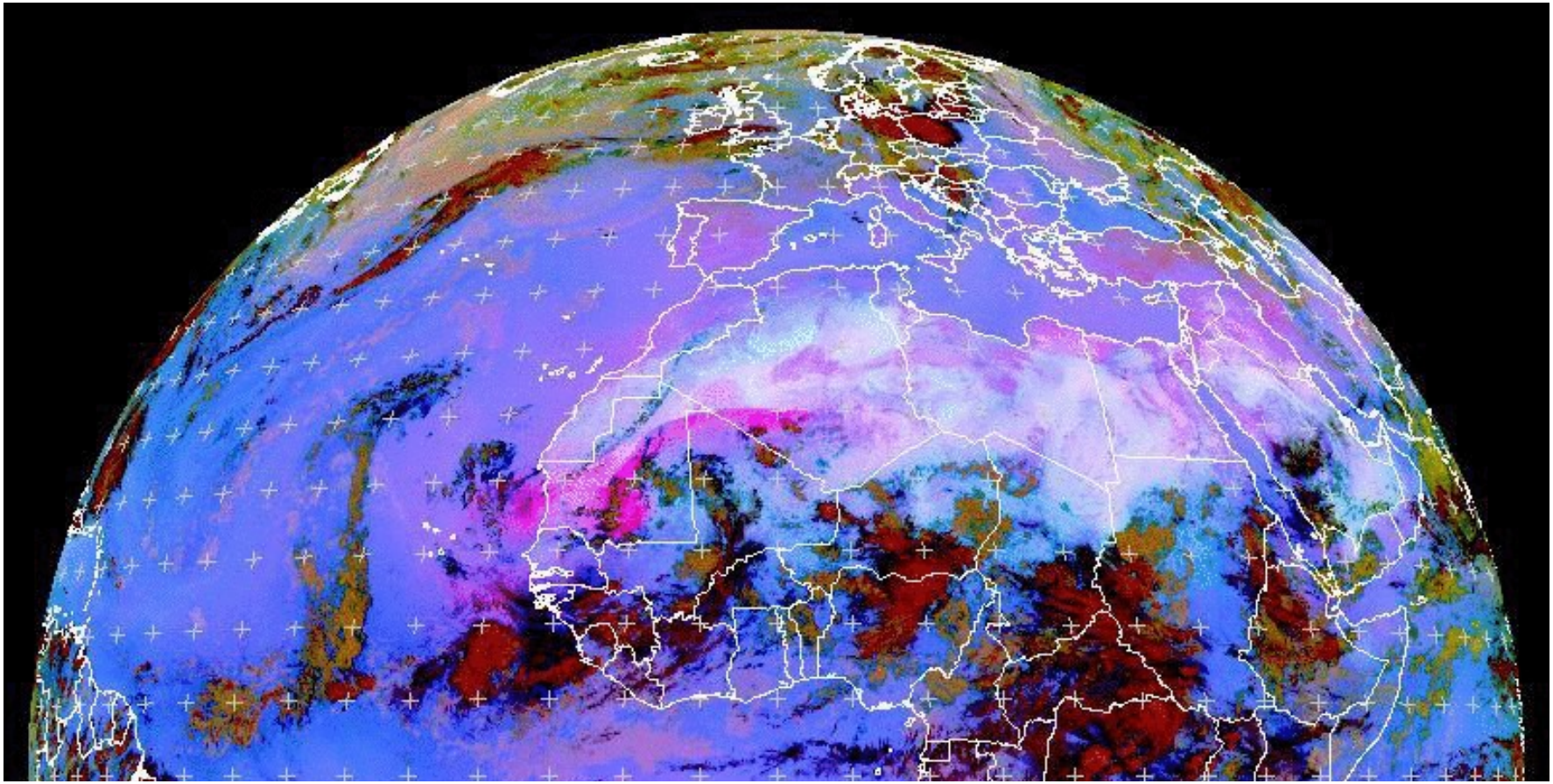
EUMETSAT

Meteorological factors

Meso-gamma and microscale phenomena

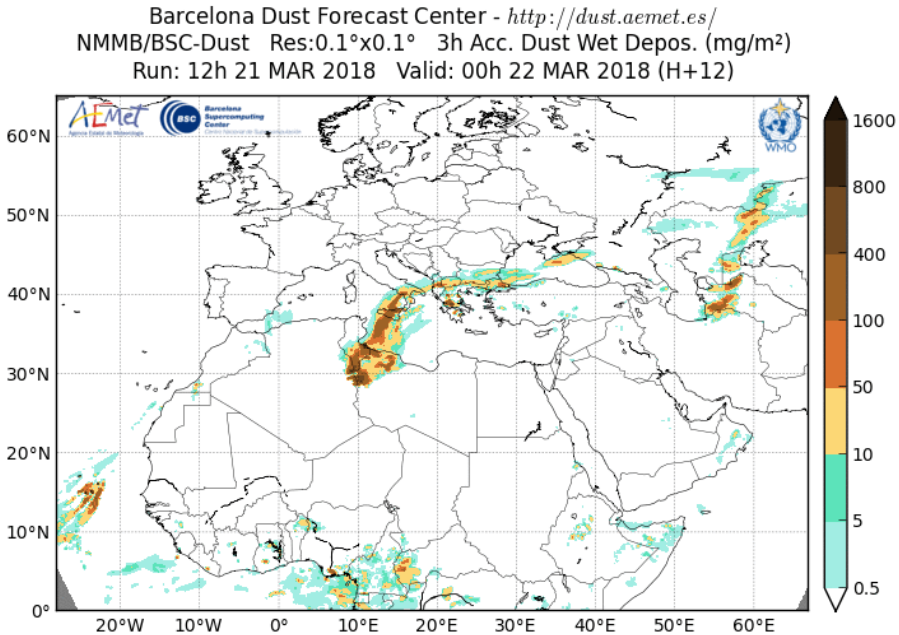
- Orographic Winds
- Convection: Haboob and Dust devils

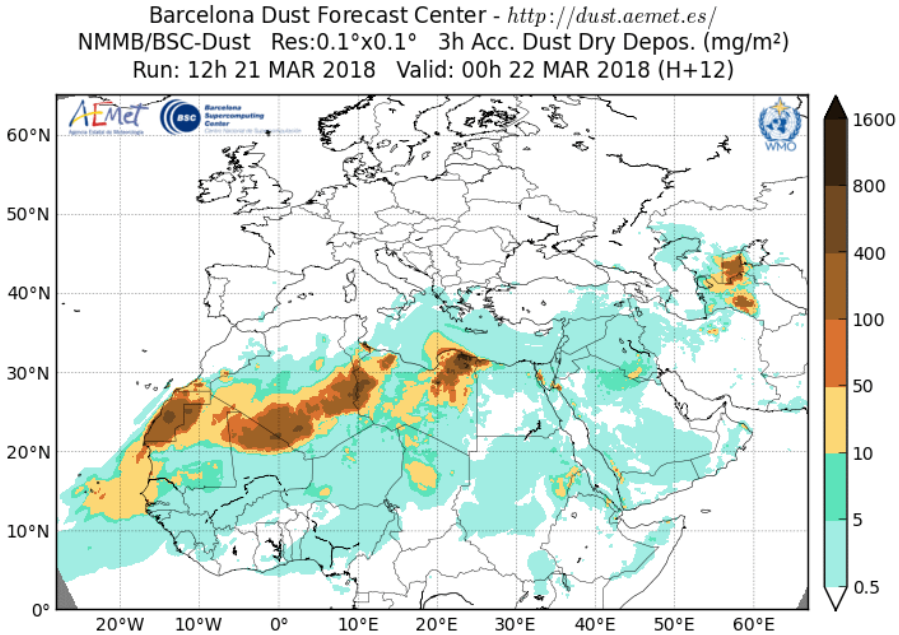
Transport



EUMETSAT

Wet & Dry Deposition





Outline

SDS-WAS

SDS-WAS History and Objectives

- Sand and Dust Storm Warning Advisory and Assessment System
- WMO mission (2004-2007)
- Enhance the capacity of countries to generate and distribute to end-users dust observations, forecasts, information and knowledge
- Impacts: health, transport, industry, climatology, meteorology, ...
- Regional Centers: Beijin (Asia 2008), Barcelona (NAMEE 2010), Barbados (America 2016-2017)

WORLD METEOROLOGICAL ORGANIZATION

GAW

SDS-WAS & Barcelona Dust Forecast Center

SDS-WAS Regional Center NAMEE in Barcelona

- AEMET and BSC (Barcelona Supercomputing Center)
- Barcelona Dust Forescast Center (Operational Center 2014)

Supercomputer MareNostrum 4 - BSC

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AEMet
Agencia Estatal de Meteorología

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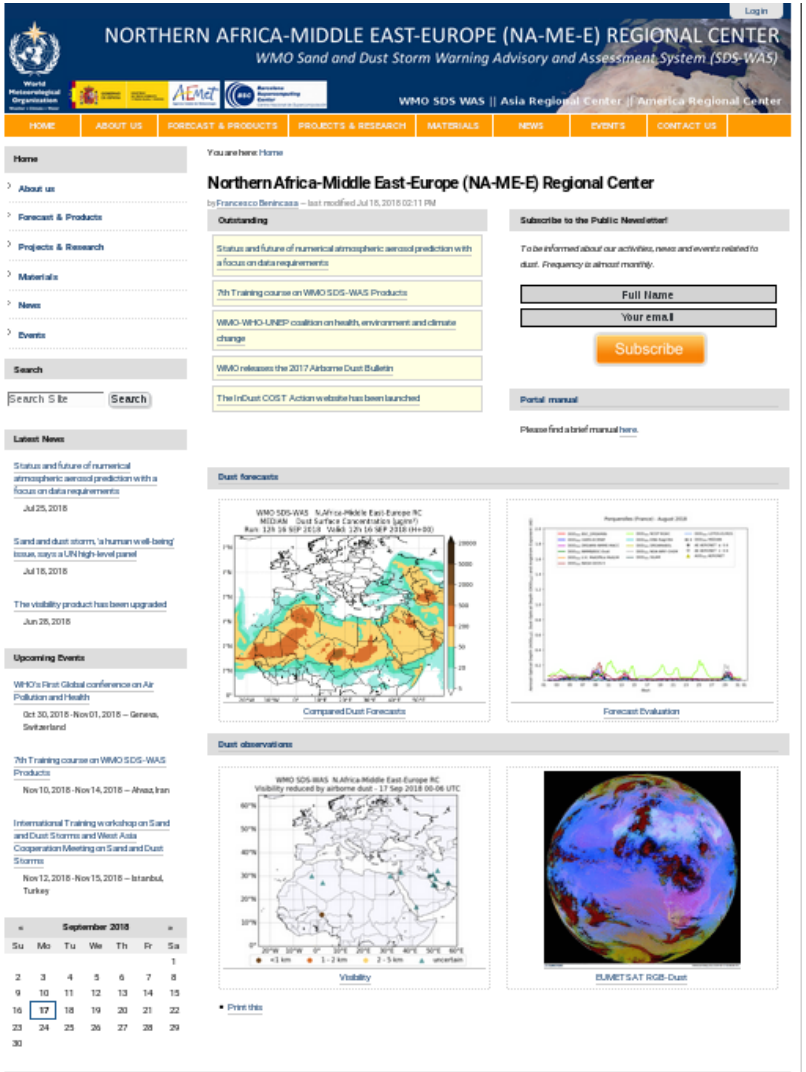
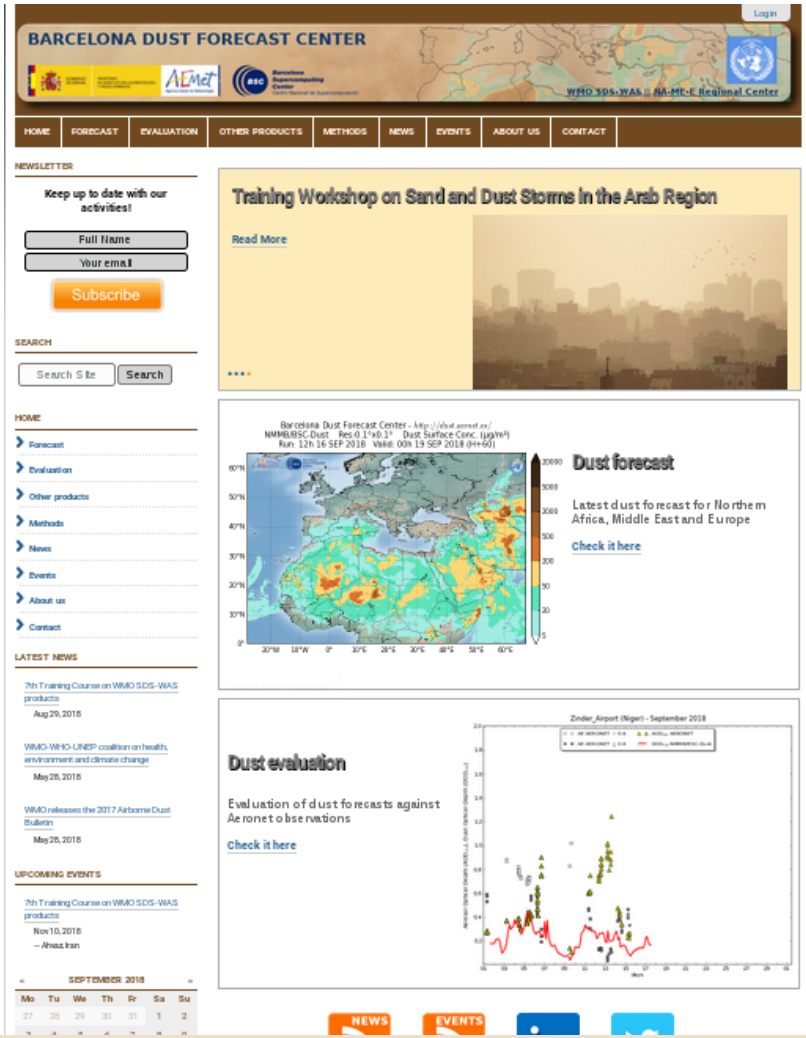
Outline

SDS-WAS & Dust Barcelona Forecast Center websites

SDS-WAS: Multimodel & Observations



Dust Barcelona Forecast Center: Operational forecasts



Operational forecasts (NMMB/MONARCH)

Surface

- Dust Surface Concentration [ug/m3]
- Extinction [M/m]

Columnar

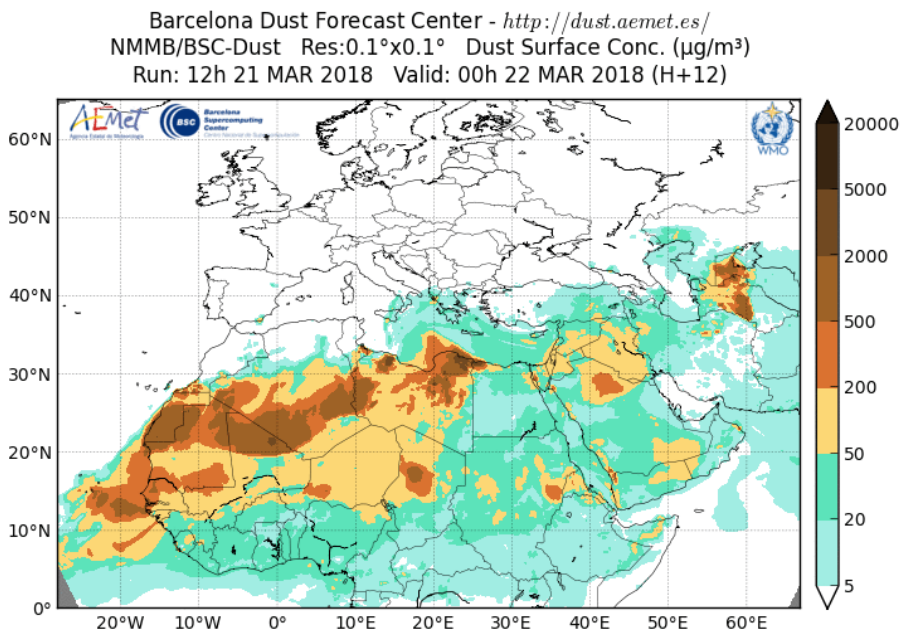
- Dust Load [g/m2]
- Dust Optical Depht (Dust AOD) [–]

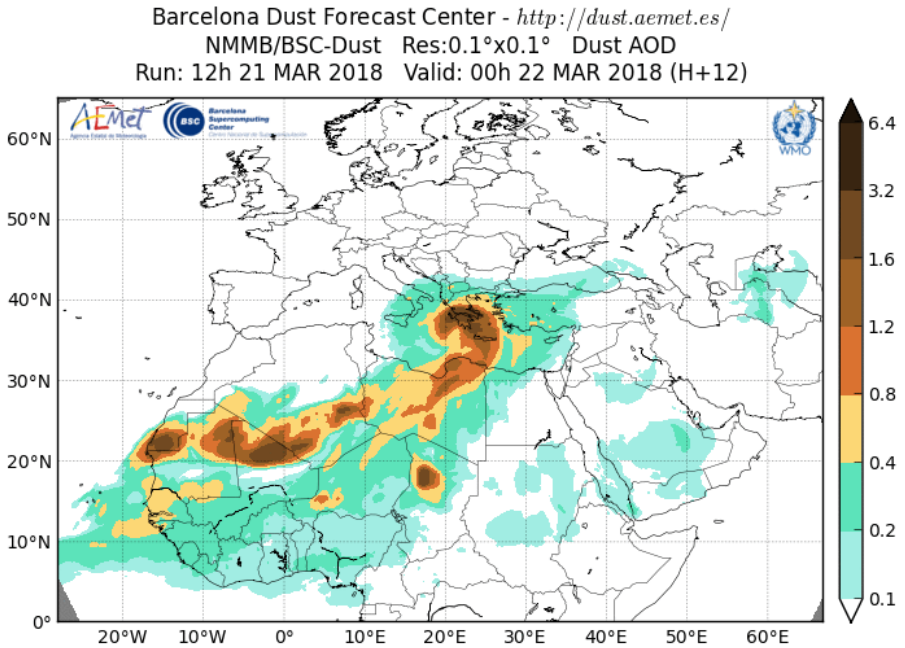
Dust Deposition

- Dry Deposition [mg/m2]
- Wet Deposition [mg/m2]

NMMB/MONARCH: Operational Forecasts

- 72 h forecast (3 h step)
- Dust Surface Concentration and Dust AOD



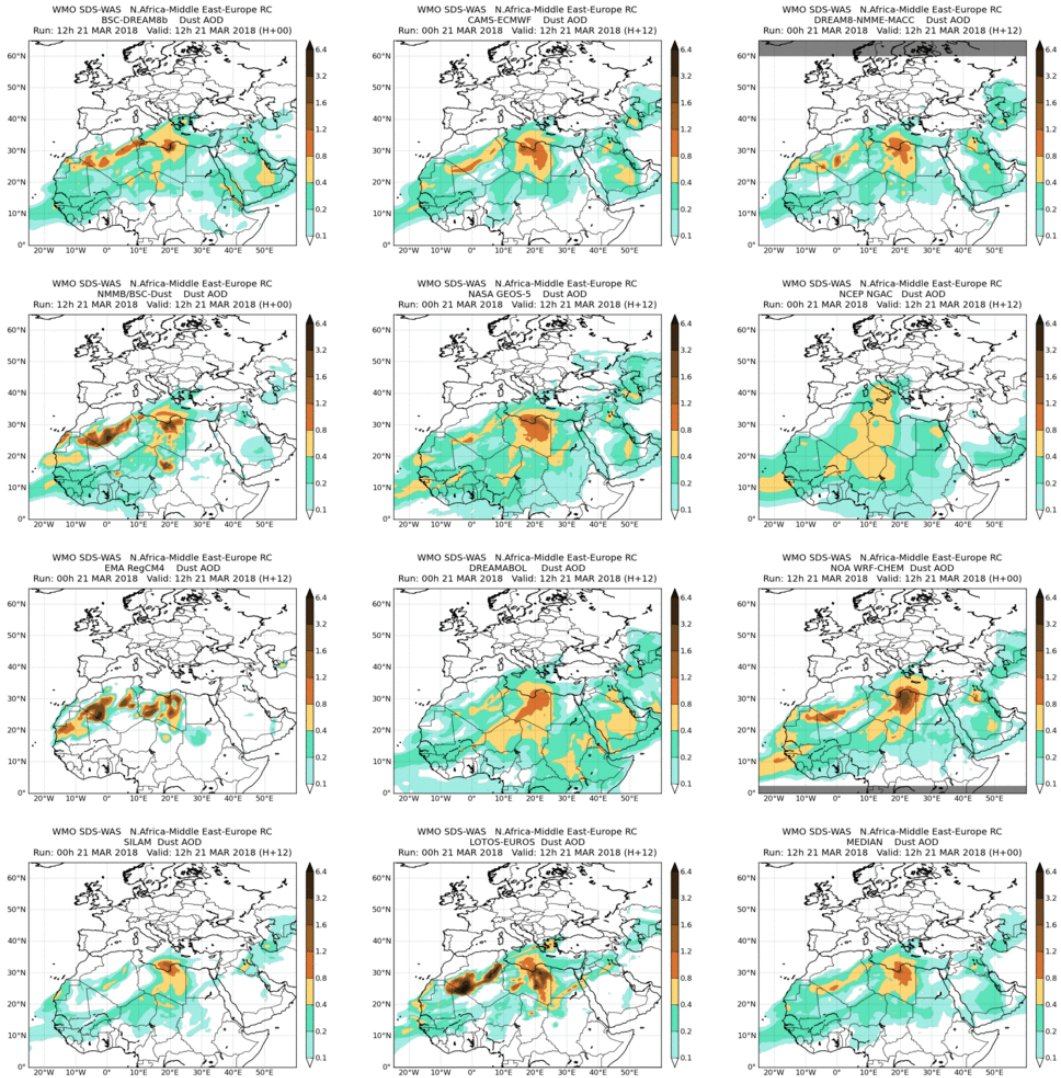


Multimodel: AOD & Dust Surface Concentration

MODEL	RUN TIME	DOMAIN	DATA ASIMILATION
CAMS-ECMWF	00	GLOBAL	MODIS-AOD
BSC-DREAM8BV2.0	12	REGIONAL	NO
DREAM8-NMME	00	REGIONAL	CAMS analysis
NMMB/BSC-DUST	12	REGIONAL	NO
MetUM	00	GLOBAL	MODIS-AOD
GEOS-5	00	GLOBAL	MODIS reflectances
NGAC	00	GLOBAL	NO
EMA REG CM4	00	REGIONAL	NO
DREAMABOL	00	REGIONAL	NO
NOA WRF-CHEM	12	REGIONAL	NO
FMI-SILAM	00	GLOBAL	NO
LOTOS-EURO	00	REGIONAL	MODIS-AOD

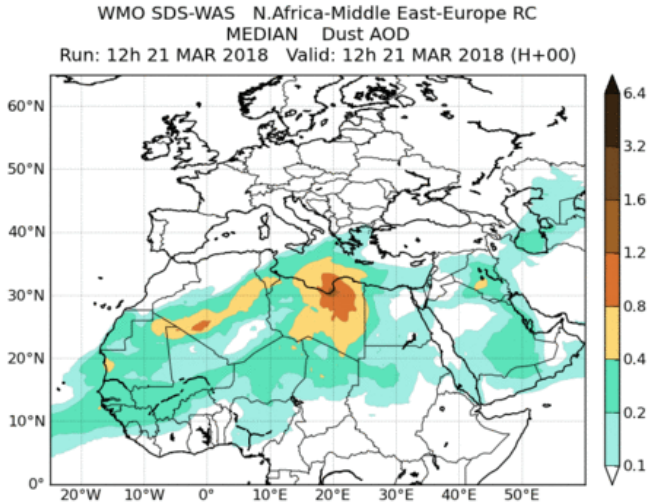
Dust model inter-comparison

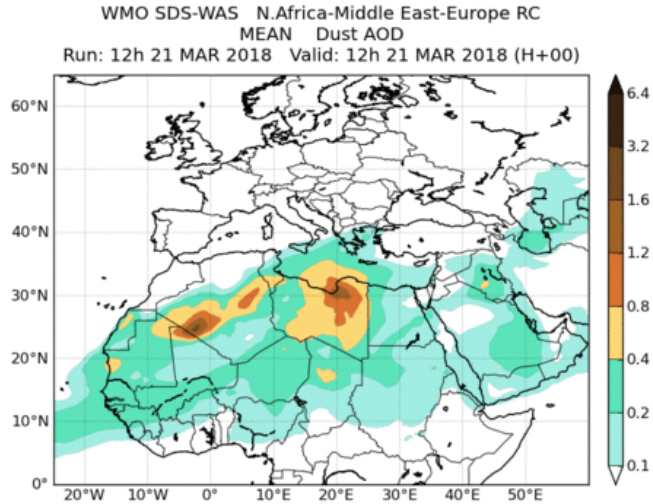
Dust Optical Depth 550 nm. Models runtime: 21 Mar 2018

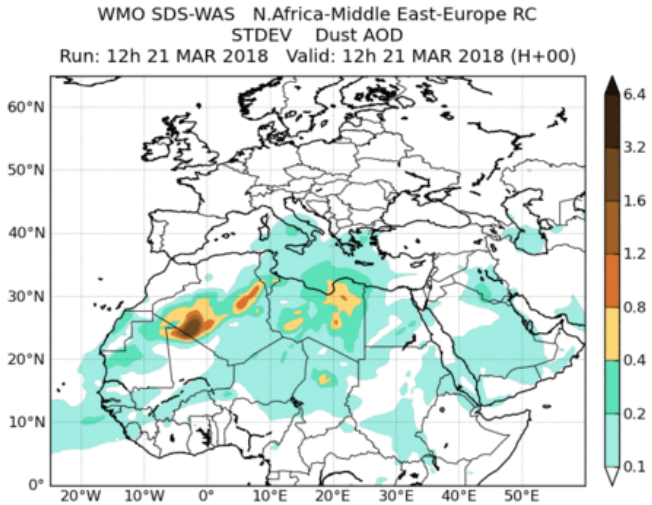


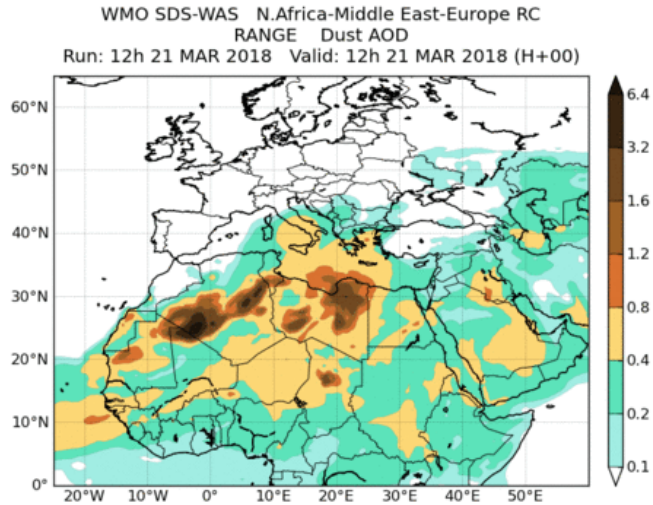
Multimodel Products

Dust Optical Depth 550 nm. Models runtime: 21 Mar 2018

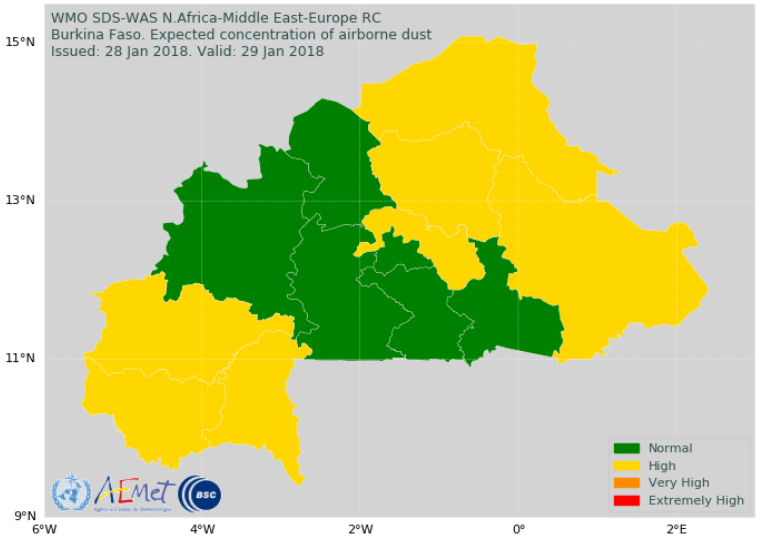


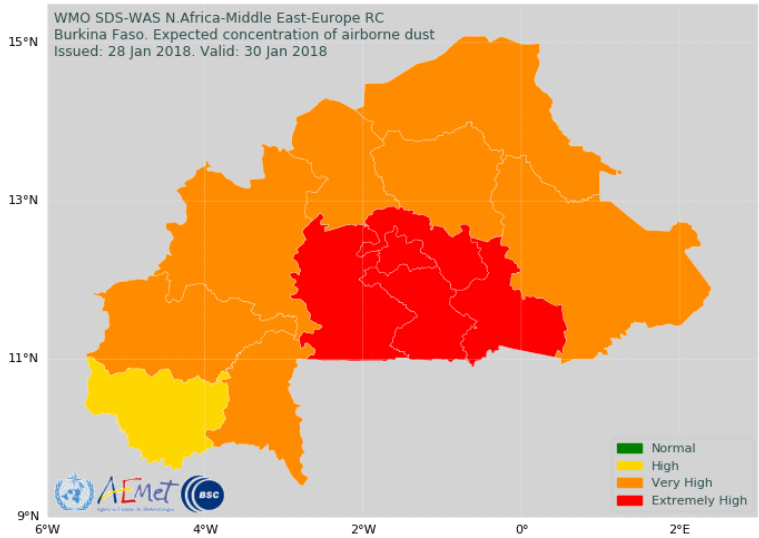






Burkina Faso Warning Advisory System (WAS)

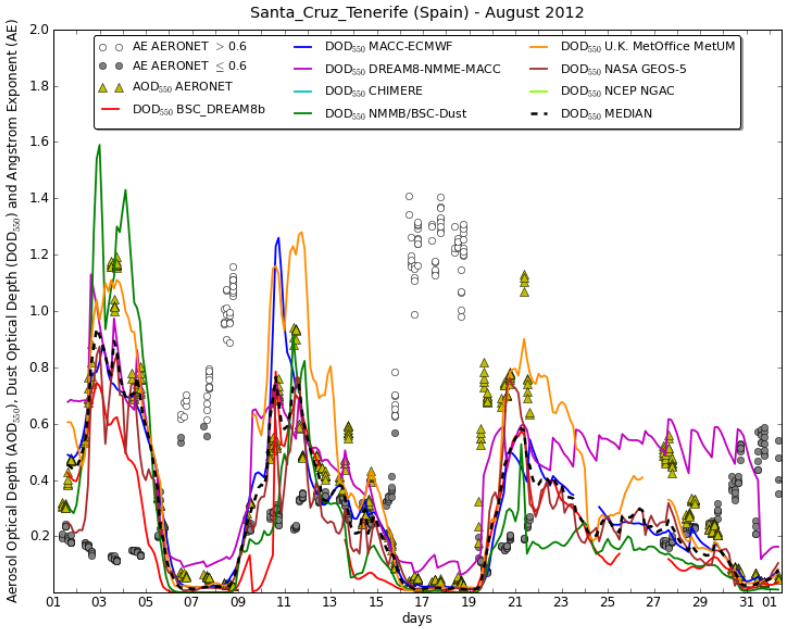




SDS-WAS Regional Center NAMEE

- Daily maximum value of the Dust SFC Concentration multimodel median
- Yellow: Perc 80; Orange: Perc 90; Red: Perc 97.5

Deterministic Evaluation: AERONET



AERONET Evaluation:

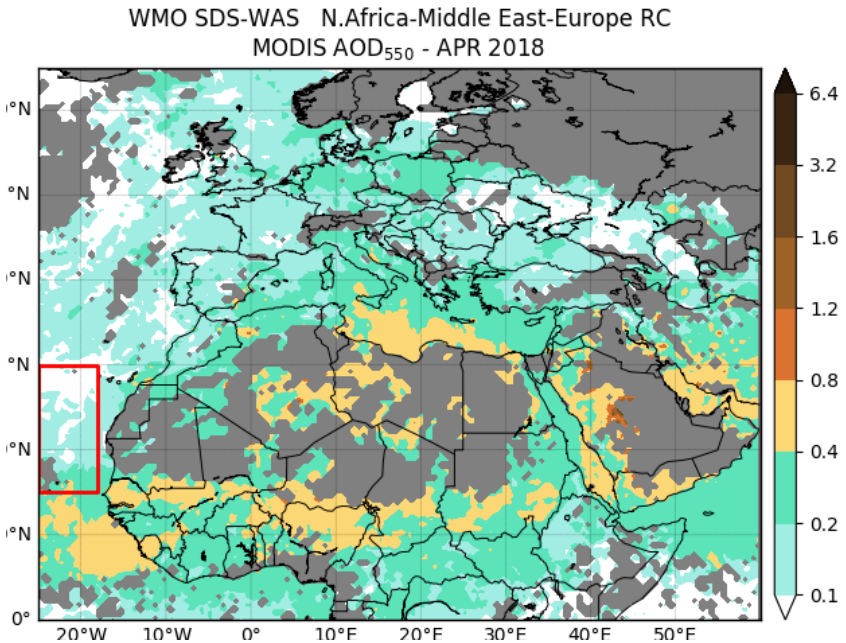
Near-real-time

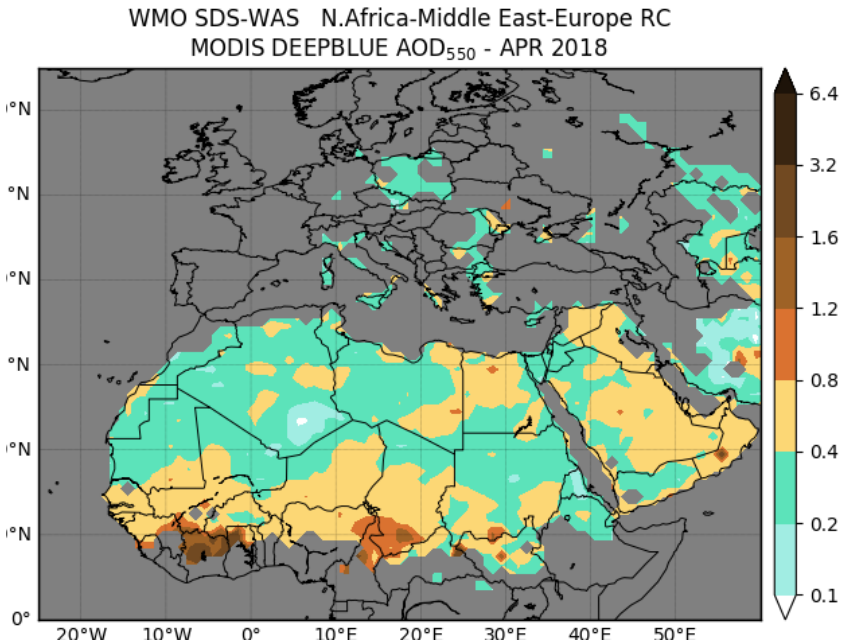
Monthly

Seasonally

Annually

Deterministic Evaluation: MODIS





MODIS Evaluation:

Monthly

Seasonally

Annually

Outline

Future Plans to modernise SDS-WAS Regional Center NAMEE

Objectives

- Replace current web services
- Improve dust operational forecast
- Data Assimilation system
- New Convective parametrizations: Haboobs
- Implement dust reanalysis model

Plan Summary

- Three-year plan: September 2018-September 2021
- Development: 2019-2020
- Testing & Quality Assurance (QA) & Deployment: 2021

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SDS-WAS: PM10/AOD Campaign in Northern Africa 2019-2020

Outline

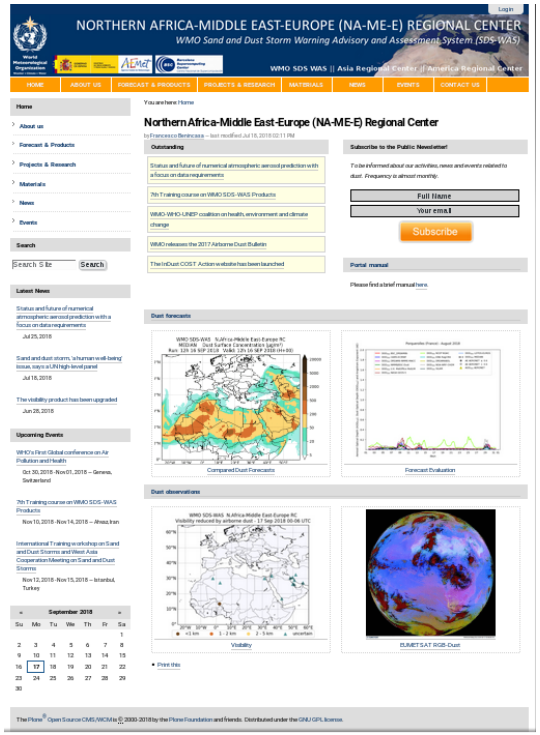
SDS-WAS Training activities 2018/2019

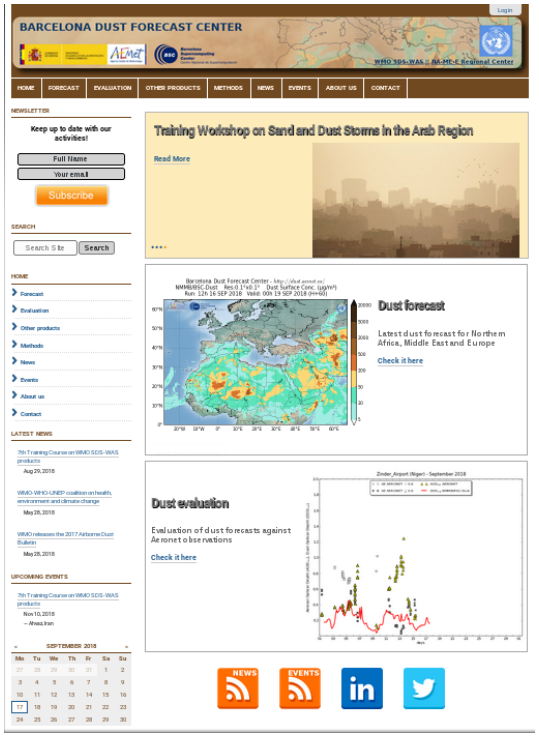
- Workshop on SDS in the Arab Region, (Cairo, Egypt Feb 2018)
- 2nd International Conference on Dust (Ilam, Iran Apr 2018)
- Workshop on the use of low-cost radiometers (Izaña, Spain Apr 2018)
- Workshop on SDS in West Africa (La Laguna, Spain May 2018)
- 9th International Workshop on SDS (La Laguna, Spain May 2018)
- 7th Training course on SDS-WAS products (Ahvaz, Iran Nov 2018)
- Training school on Dust products (Aveiro, Portugal Feb 2019)
- **Workshop on SDS products (Dakar, Senegal Dec 2019)**

SDS-WAS

Thank you for your attention

http://sds-was.aemet.es
https://dust.aemet.es





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