

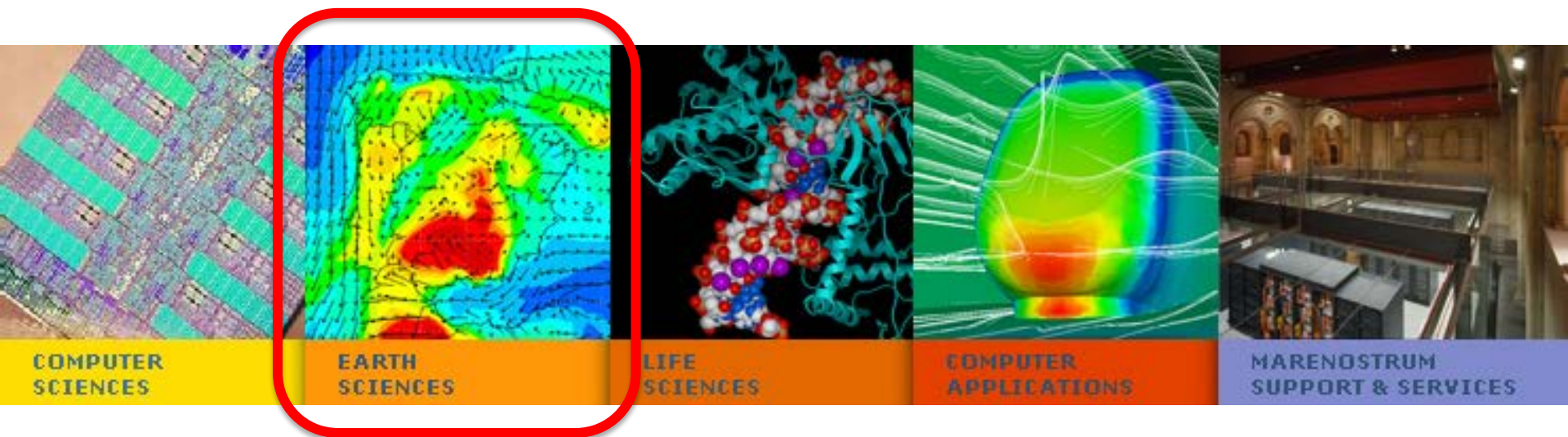


**Barcelona  
Supercomputing  
Center**

*Centro Nacional de Supercomputación*

# Desert dust modelling and forecasting in the BSC: Activities and developments

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Earth Sciences Department  
Barcelona Supercomputing Center



The Earth Sciences Department is devoted to the development and implementation of regional and global state-of-the-art models for air quality, meteorology and climate applications

# Earth Science research lines

⌘ High resolution air quality forecast: [www.bsc.es/caliope](http://www.bsc.es/caliope)

⌘ Transfer technology (EIA and AQ studies)

⌘ Climate Change modelling

⌘ New on-line CTM model: **NMMB/BSC-CTM**

⌘ Dust daily forecast:

– **BSC-DREAM8b**

*<http://www.bsc.es/projects/earthscience/BSC-DREAM/>*

– **NMMB/BSC-Dust:**

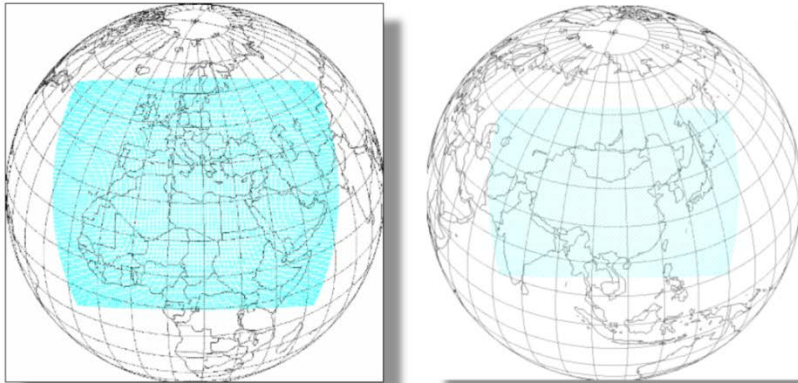
*<http://www.bsc.es/projects/earthscience/NMMB-BSC-DUST/>*

– **Mineral dust database:** Files download

*<http://www.bsc.es/earth-sciences/mineral-dust/catalogo-datos-dust/>*

# The BSC-DREAM8b model

- Daily forecasts in 2 domains:
  - North Africa-Middle East-Europe ( $1/3^\circ \times 1/3^\circ$ )
  - East Asia ( $0.5^\circ \times 0.5^\circ$ )



- Main features
  - USGS 1km and FAO 4km soil texture data
  - 8 particle size bin distribution (0.1 -10  $\mu\text{m}$ )
  - Dust radiative feedbacks (Pérez et al., 2006)
  - *Updated dry and wet deposition*
  - *Inclusion of a preferential source mask*

## Dust forecast evaluation studies:

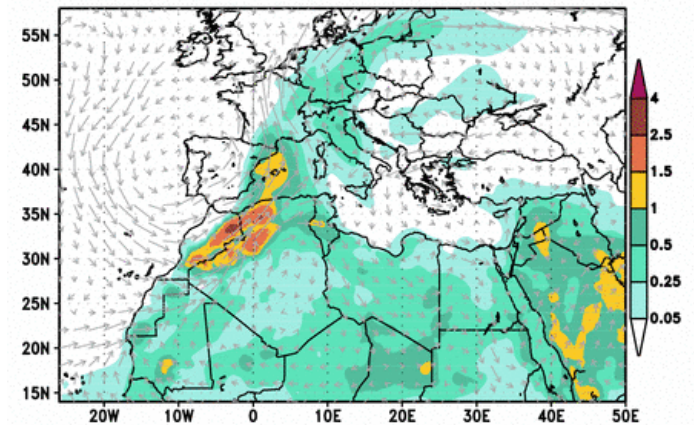
- Single events in the ***Mediterranean*** (e.g., Papayannis et al., 2005; Pérez et al., 2006)
- Experimental campaigns in ***source regions***
  - BoDEX 2005 (Todd et al., 2008)
  - SAMUM 2006 (Haustein et al., 2009)
- Annual evaluation over North Africa, Mediterranean and Middle East (Pay et al., 2011; Basart et al., 2012)
  - ***New model developments***

Near-real time evaluation

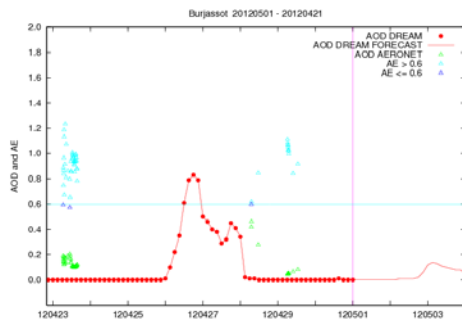
# The BSC-DREAM8b model: Near-real time daily evaluation

## MSG/RGB

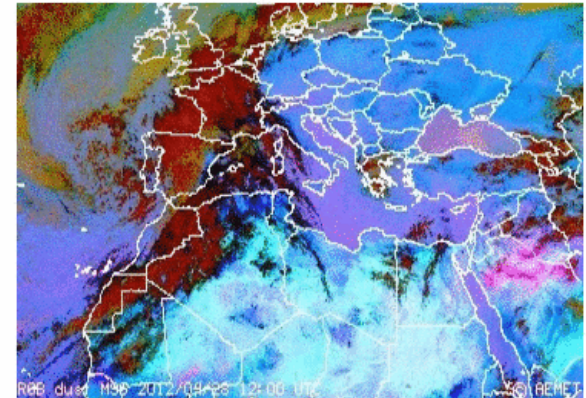
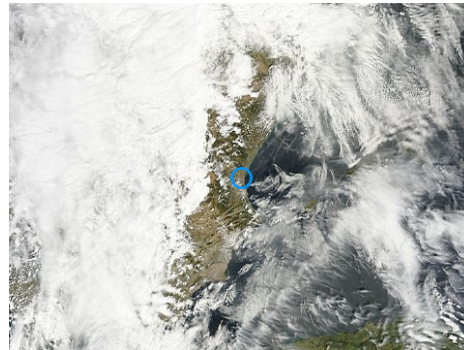
BSC-DREAM8b Dust Loading ( $\text{g}/\text{m}^2$ ) and 3000m Wind  
0h forecast for 12UTC 28 APR 12



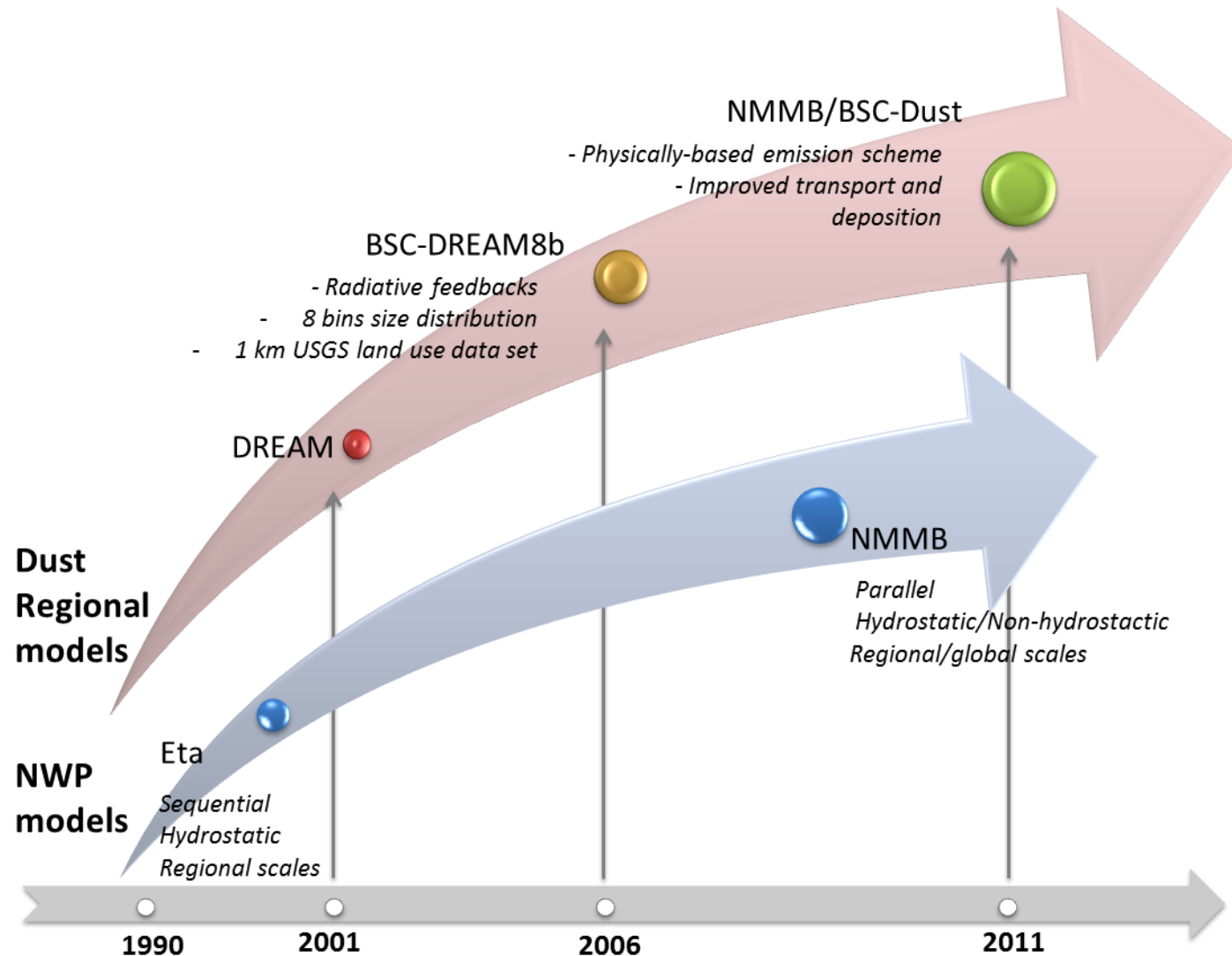
## AERONET



## MODIS



# BSC dust forecasting models

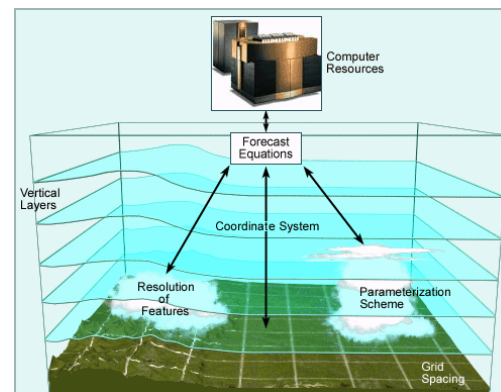
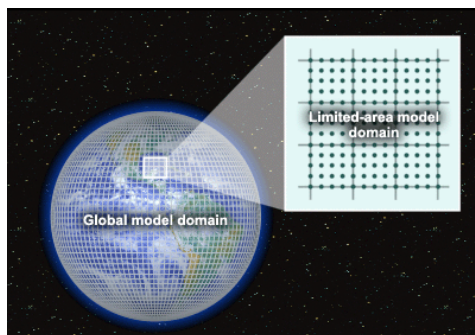


# The NMMB/BSC-CTM Project

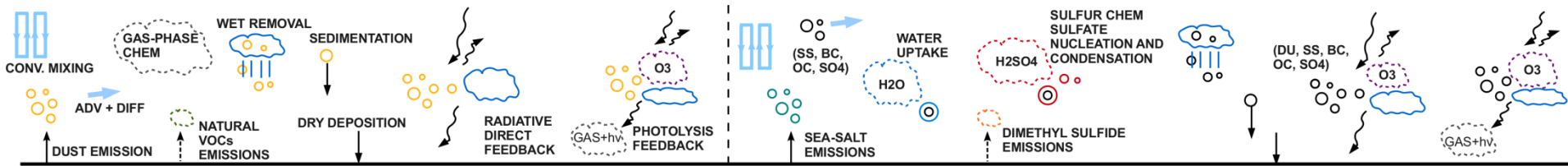
The **Non-hydrostatic Multiscale Model (NMMB)** :

- Under development at NCEP (Janjic, 2005; Janjic and Black, 2007) as evolution of the WRF-NMM model
- Developed within the Earth System Modeling Framework (ESMF)
- Arakawa B grid and regular (global) or rotated (regional) lat/lon coordinate
- NMMB is the regional operational meteorological model in NCEP since October 2011.
- Unified model for a broad range of spatial and temporal scales

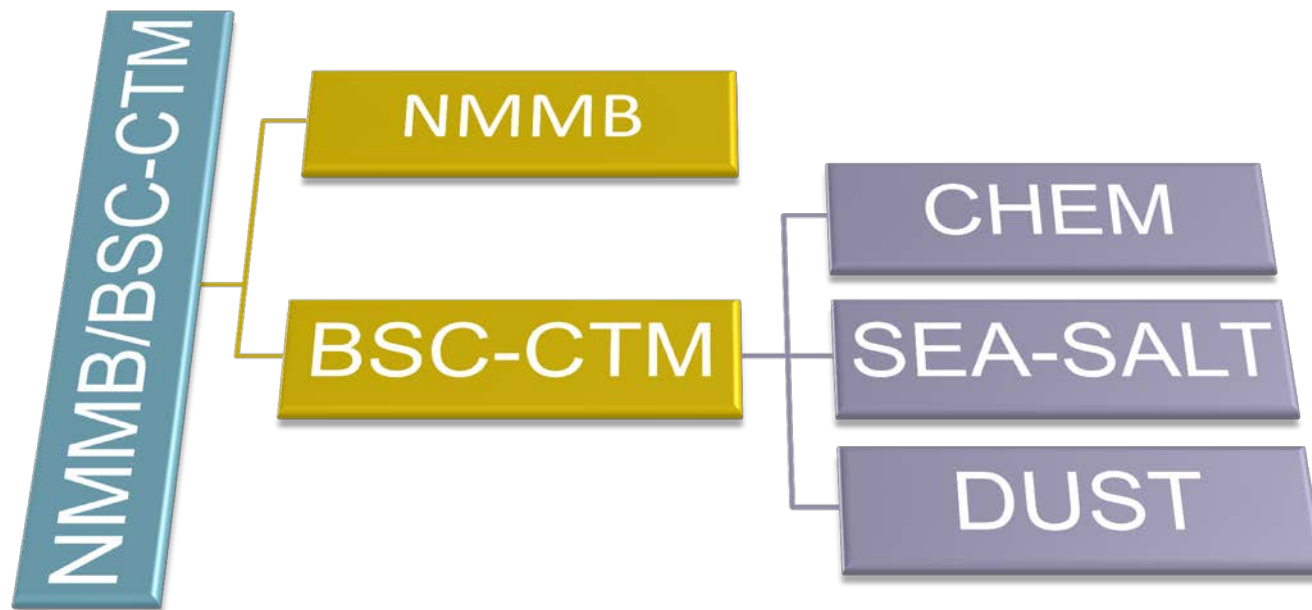
**Multiscale** (global to regional) and **Nonhydrostatic** (up to  $1\text{km}^2$  lat-lon resolution)



# NMMB/BSC-Chemical Transport Model



- Fully **on-line** access coupling: feedback processes allowed
- **Multiscale**: global to regional scales allowed



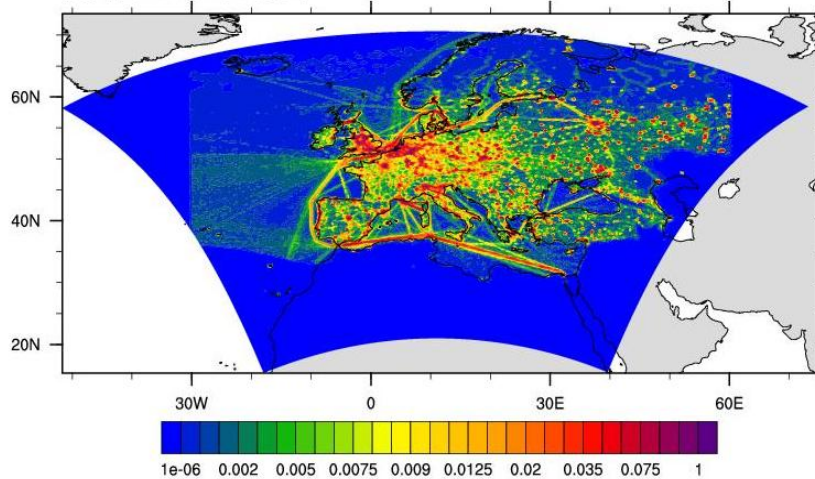


# NMMB/BSC-Gas Phase (Jorba et al. 2012)

## Regional run: 2010

NMMB/BSC-CTM 20100701 12 UTC - AQMEII2 domain

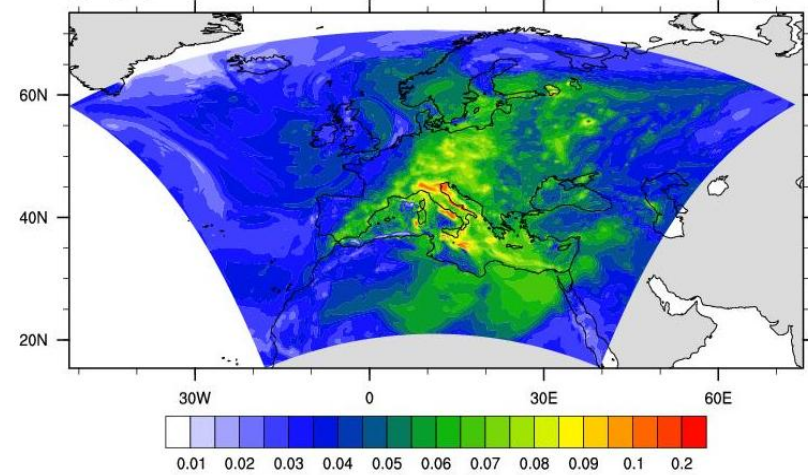
total column NO<sub>2</sub> emissions



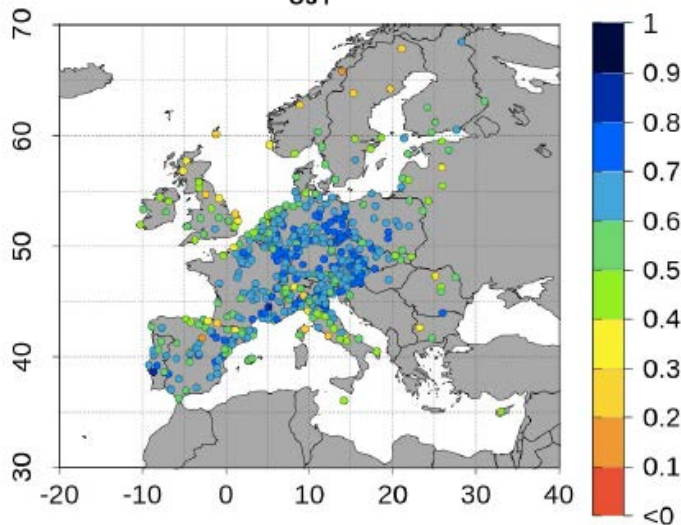
NMMB/BSC-CTM 20100715 12 UTC - AQMEII2 domain

O<sub>3</sub> -UMO

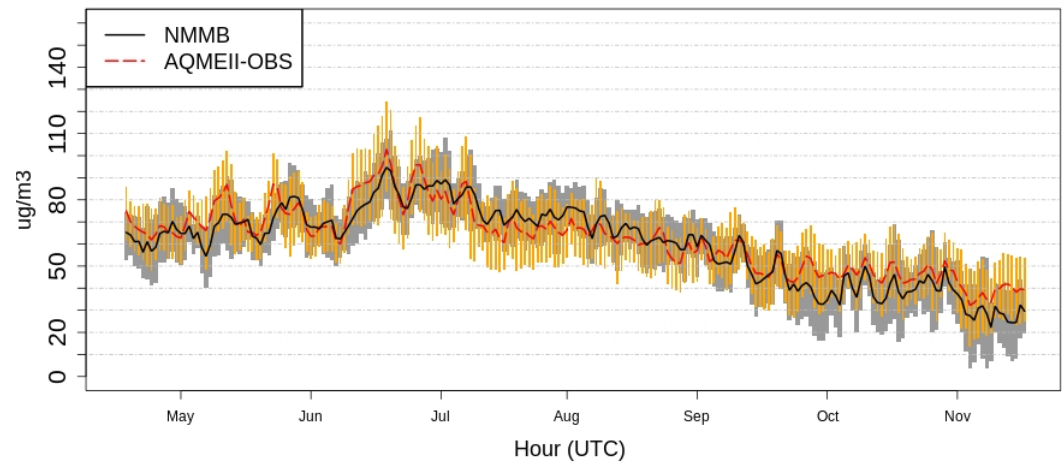
ppmv



O<sub>3</sub> r

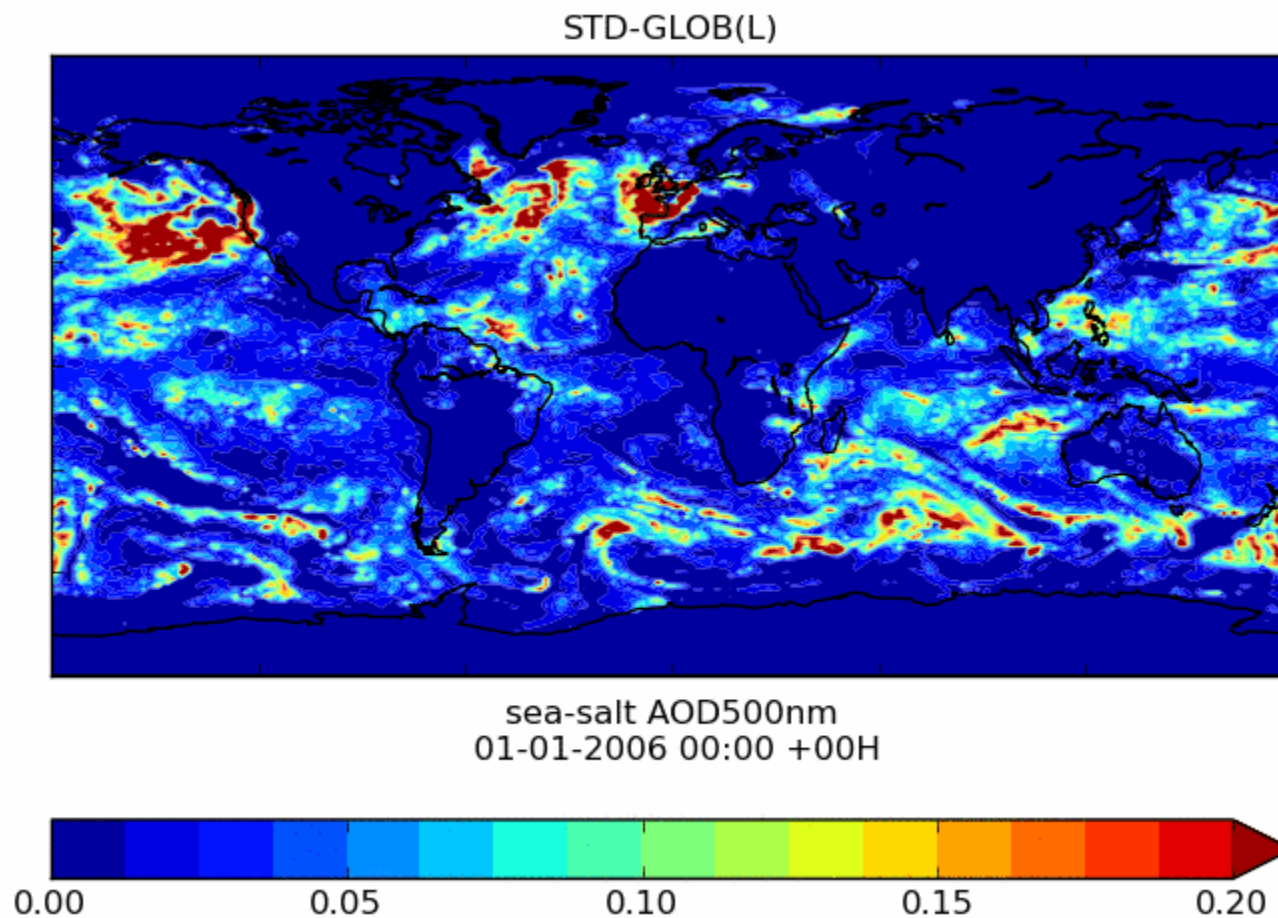


O<sub>3</sub> -Daily mean concentration (ug/m<sup>3</sup>)- R=0.68 RMSE=20.2 MB=-2.2



# NMMB/BSC-SSA (Spada et al. 2013)

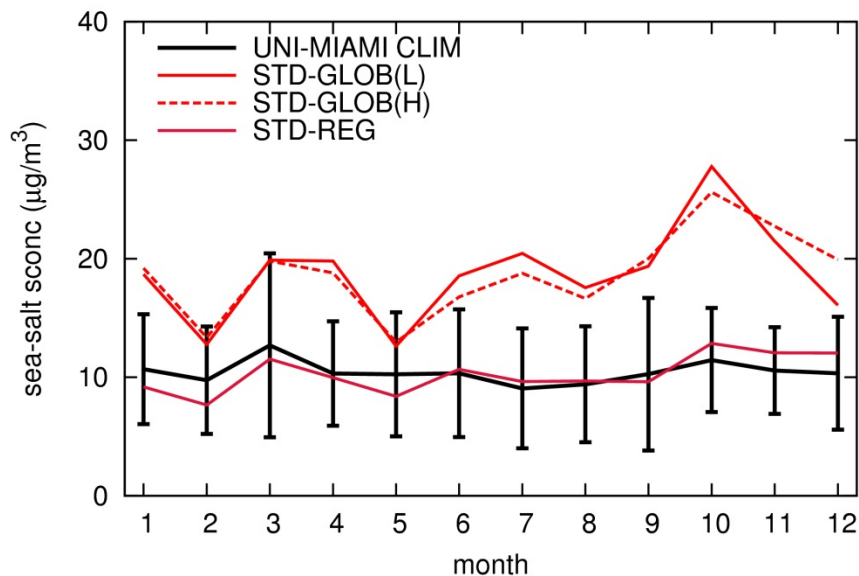
Global run: AOD at 550nm 2006



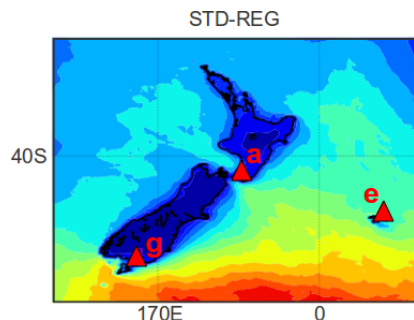
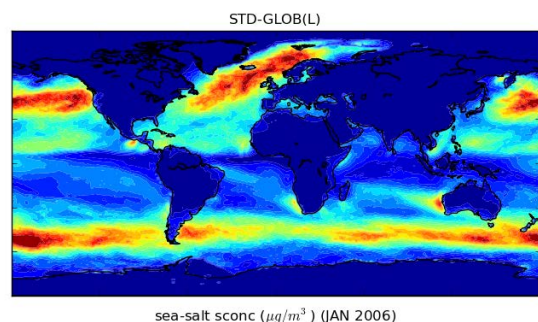
# NMMB/BSC-SSA (Spada et al. 2013)

- GLOB(L) and GLOB(H) resolutions seem to give quite similar results, although...

a. BARING HEAD (41.28S, 174.87E)



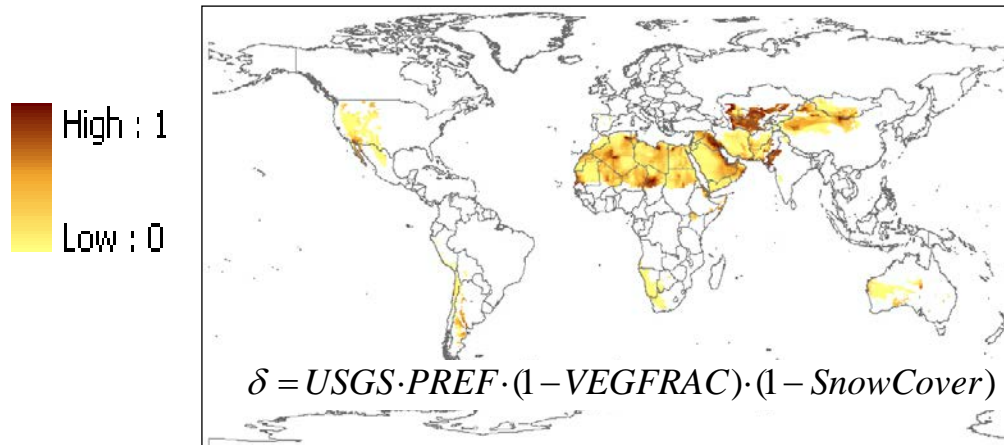
- at smaller scales (REG = 0.1 x 0.1) the model becomes able to resolve steep topographies
- in these cases (such as for the New Zealand domain), the observed SCONC climatologies are reproduced



- obvious but not trivial: smaller scales ( $\approx 0.1$ deg) effects may affect larger scales ( $> 1$ deg)

# NMMB/BSC-Dust (Pérez et al. 2011)

- Source function: update databases



- Physically-based emission scheme: Saltation and sandblasting

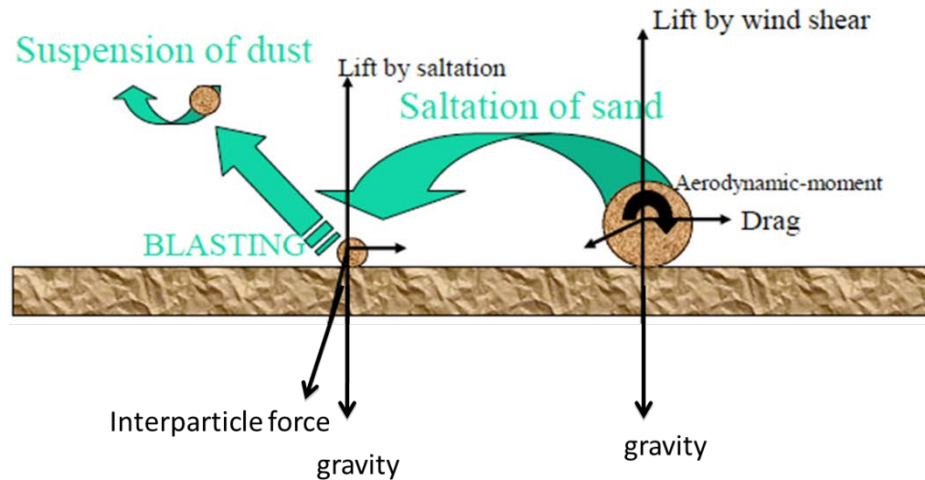
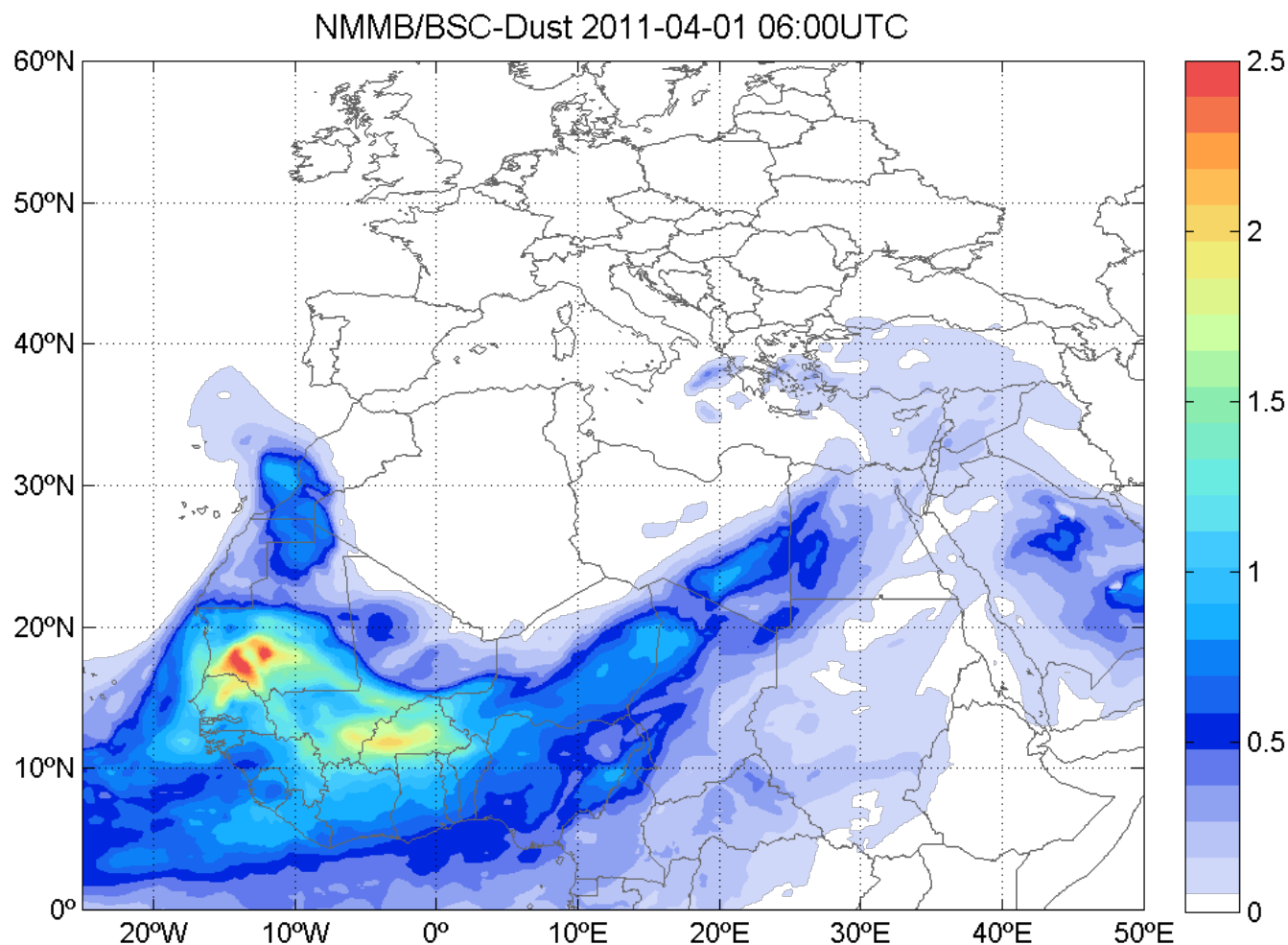


Image from Carlos Pérez

# NMMB/BSC-Dust (Pérez et al. 2011)

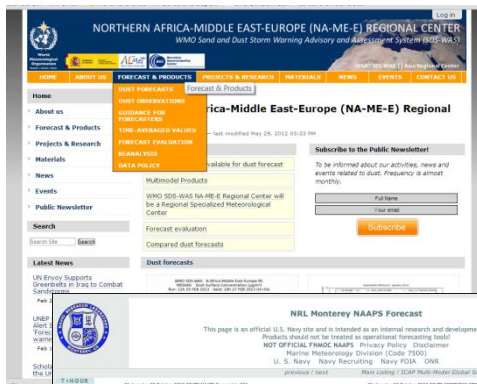
## Regional run: AOD at 550nm April 2011



# NMMB/BSC-CTM: Future Developments

- ⌘ Coupling of chemistry gas-phase with a secondary aerosol scheme for LAM applications at high-resolutions.
- ⌘ Implementation of the other global relevant aerosol species, i.e. black (BC) and organic carbon (OC), and sulfate (SO<sub>4</sub>), in addition to dust (DU) and sea salt (SSA).
- ⌘ Implementation of a volcanic ash module (Fall3D model, Folch et al., 2008)
- ⌘ Implement effects of aerosols on meteorology
- ⌘ Coupling the model with an ocean model for climate applications
- ⌘ Explore methodologies for aerosol data assimilation

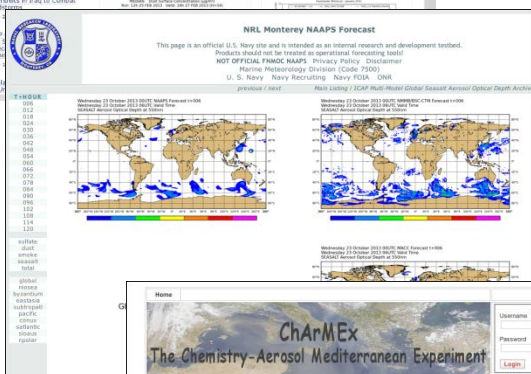
# BSC dust forecasting collaborations



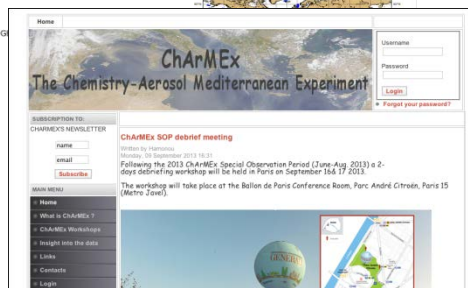
- Mineral dust forecasts for SDS-WAS North Africa, Middle East and Europe portal

<http://sds-was.aemet.es/>

- Participate in the ICAP global-model intercomparison project



- Participate in the Charmex Chemistry-Aerosol Mediterranean experiment



- Participate in the AQMEII on-line Air Quality model intercomparison project





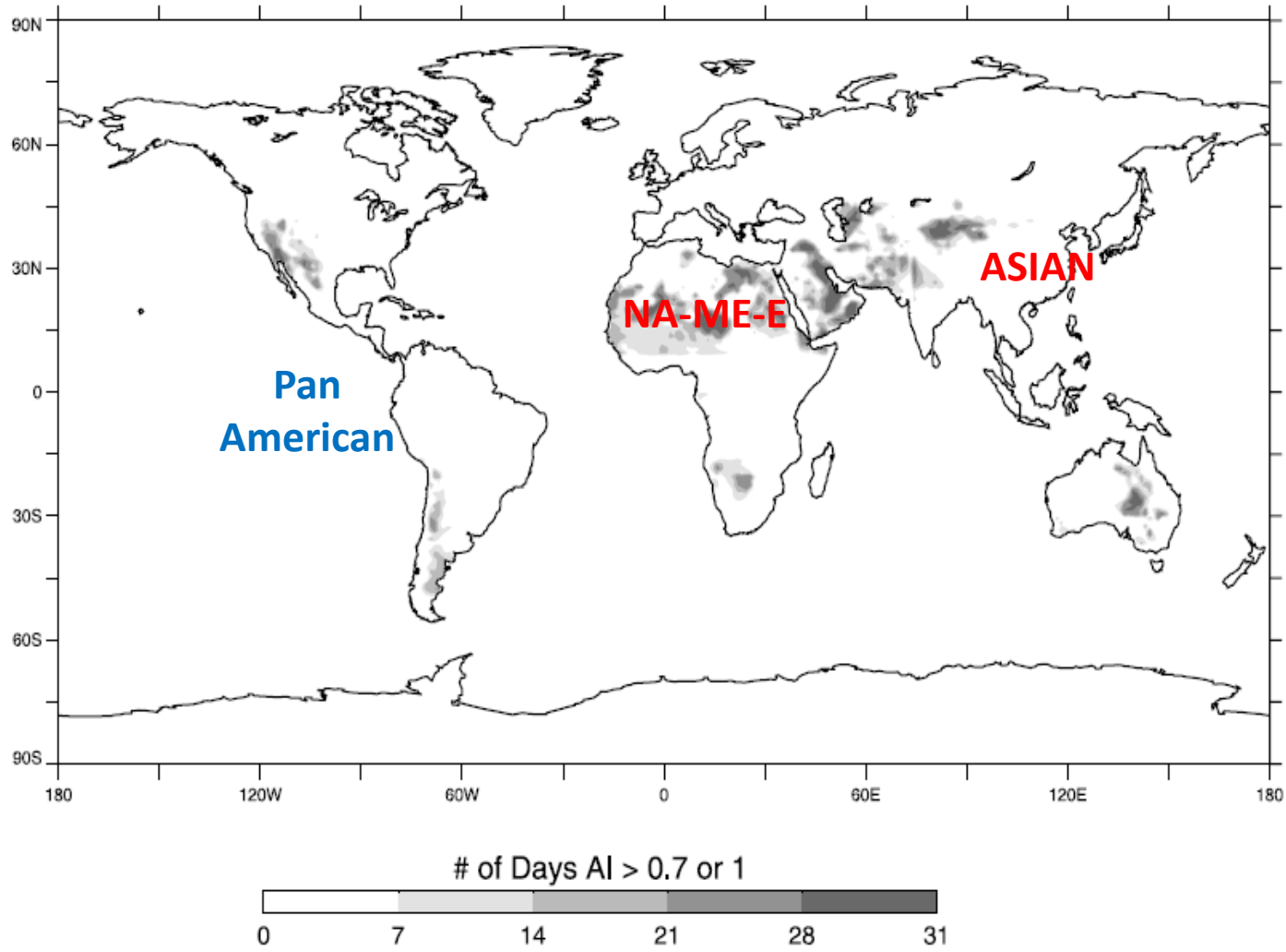
The screenshot shows the WMO website interface. At the top, there is a navigation bar with links for 'Print', 'Save as PDF', 'Text-only version', 'Send by e-mail', and 'Bookmark'. Below this is the WMO logo and the text 'World Meteorological Organization Weather • Climate • Water'. The main content area features a sidebar with a navigation menu including 'About us', 'Governance', 'Members', 'Media centre', 'Programmes', 'GFCS', 'Meetings', 'Publications', 'Library', 'Learning', 'Meteoterm', 'Partnership', 'Themes', 'Vacancies', 'Visitors' info', and 'Youth corner'. The main content area is titled 'World Weather' and includes a breadcrumb trail 'WWRP > SDS >'. The main heading is 'WMO Sand and Dust and Assessment (SDS-WAS)'. Below this, there is a section titled 'The SDS-WAS programme at WMO' which contains the following text: 'SDS-WAS was established in 2007 in response to improve capabilities for more reliable sand products from atmospheric dust models may areas of societal benefit. It will rely on real-time observations and model output. More than 15 organizations currently provide data from various regions. The SDS-WAS integrates research and operational users (e.g. agricultural users). SDS-WAS is established through regional nodes. At the moment two nodes exist: the Europe Node (hosted by Spain) and the Asia Node. The goal is to achieve comprehensive, coordinated capabilities of sand and dust storms in order to increase the understanding of the capabilities. Scientific background and modeling of sand and dust storms'. At the bottom of the main content area, there is a yellow box with the text 'SDS-WAS Science and Information Systems'.

## OBJECTIVES:

- Identify and improve products to monitor and predict atmospheric dust by working with research and operational organizations, as well as with users
- Facilitate user access to information
- Strengthen the capacity of countries to use the observations, analysis and predictions provided by the WMO SDS-WAS programme



# SDS-WAS Regional Centers



*The global distribution of TOMS dust sources.  
Extracted from Prospero et al. (2002, Rev. Geophys.)*

# SDS-WAS: Asian RC (<http://www.sds.cma.gov.cn>)

**WMO Sand and Dust Storm Warning Advisory and Assessment System(WMO SDS-WAS)**  
**ASIA/CENTRAL PACIFIC REGIONAL CENTRE**

Home | Forecast | Observation | Model InterComparison | News & Event | Publications | About us

### FORECAST

**Concentration**  
Movies of surface dust concentration distribution over Asia in 3 hours interval for 3 days forecast from the model CUACE/Dust.

**CUACE/DUST OF CMA** [see more>>](#) [MORE](#)

**MASINGAR OF JMA** [see more>>](#) [MORE](#)

**ADAM OF KMA** [see more>>](#) [MORE](#)

### NEWS & EVENT

- Severe Solar Blast Affects China's Communication
- Science Steering Committee
- Workshop on the Implementation of the WMO SDS-WAS Asia Node (28-30 October 2009, Seoul, Korea)
- Workshop on the Implementation of the WMO SDS-WAS Asia Node

### MODEL COMPARISON

**Model InterComparison**  
To promote the SDS forecast ability and to evaluate SDS forecast models representation in Asia Regional Center, one of the most important activities is model inter-comparison. At present there are three operational forecast models CUACE/Dust...

### OBSERVATION

**PM10**

CMA | JMA | KMA | Other

**AOD**

CMA | JMA | KMA | Other

**Satellite Observation**

CMA | JMA | KMA | Other

### LOGIN

username  
password  
checking  
  
[Login](#) [Register](#)

### SDS COLOR INDEX

No SDS
Suspended dust
Blowing sand
Sand And Dust Storm
Severe SDS
Extreme Severe SDS

### HOT LINKS

- cma
- wmo sds was
- cp was
- cans
- name regional center

### FORECAST DATA SHARING

Download Forecast Data from

[Download](#)

The Center is managed by a consortium of AEMET and the Barcelona Supercomputing Center (BSC-CNS)



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**Nexus II Building. Barcelona**



**MareNostrum supercomputer**



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*Centro Nacional de Supercomputación*

The screenshot shows the website for the Northern Africa-Middle East-Europe (NA-ME-E) Regional Center of the WMO Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS). The page features a header with the WMO logo and the center's name. A navigation menu includes 'HOME', 'ABOUT US', and 'FORECAST & PRODUCTS'. The 'FORECAST & PRODUCTS' menu is expanded, listing 'DUST FORECASTS', 'DUST OBSERVATIONS', 'GUIDANCE FOR FORECASTERS', 'TIME-AVERAGED VALUES', 'FORECAST EVALUATION', 'REANALYSIS', and 'DATA POLICY'. Below the menu, there are sections for 'Multimodel', 'WMO SDS-WAS to be a Regional Center', 'Forecast evaluation', and 'Compared to'. A 'Dust forecast' section displays a map of the region with a color-coded dust forecast overlay and a corresponding time-series plot of dust concentration over time.

## FORECAST AND PRODUCTS

- Data exchange
- Joint visualization
- Common forecast evaluation
- Generation of multimodel products
- Calculation of monthly evaluation metrics
- New sources of data for model evaluation
- Sharing model output data files
- Time-averaged products

# SDS-WAS: Dust models



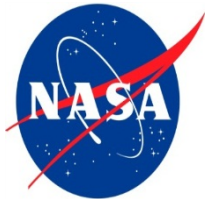
LMD



LSCE



Met Office



**Barcelona  
Supercomputing  
Center**  
Centro Nacional de Supercomp



Monitoring atmospheric  
composition & climate



NATIONAL CENTERS FOR ENVIRONMENTAL PREDICTION  
**NCEP**

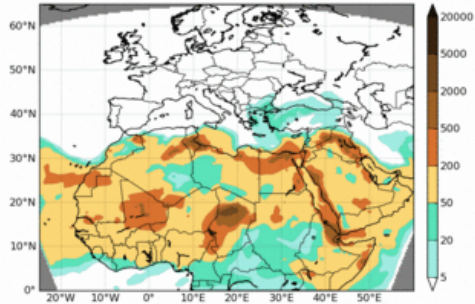


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Center**  
Centro Nacional de Supercomputación

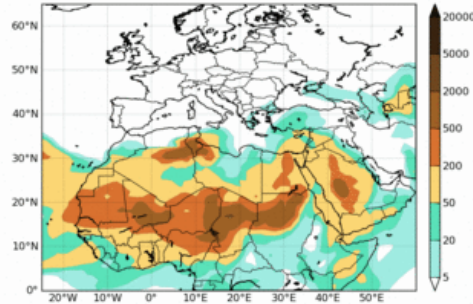
MODEL	RUN TIME	DOMAIN	DATA ASSIMILATION
BSC-DREAM8b	12	Regional	No
<b>CHIMERE</b>	<b>00</b>	<b>Regional</b>	<b>No</b>
<b>LMDzT-INCA</b>	<b>00</b>	<b>Global</b>	<b>No</b>
MACC	00	Global	MODIS AOD
DREAM-NMME- MACC	12	Regional	MACC analysis
NMMB/BSC-Dust	12	Regional	No
MetUM	00	Global	MODIS AOD
GEOS-5	00	Global	MODIS reflectances
NGAC	00	Global	No

# SDS-WAS: Surface concentration joint visualization

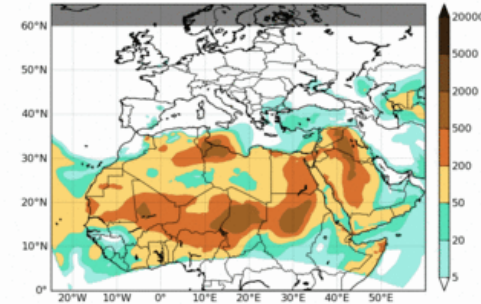
WMO SDS-WAS N.Africa-Middle East-Europe RC  
BSC-DREAMb Dust Surface Concentration ( $\mu\text{g}/\text{m}^3$ )  
Run: 12h 06 FEB 2013 Valid: 12h 06 FEB 2013 (H+00)



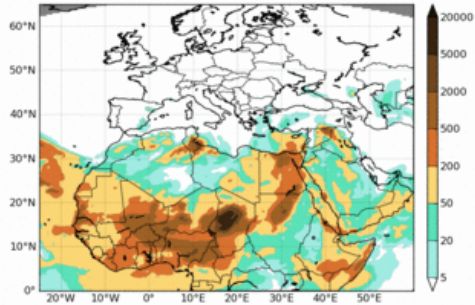
WMO SDS-WAS N.Africa-Middle East-Europe RC  
MACC-ECMWF Dust Surface Concentration ( $\mu\text{g}/\text{m}^3$ )  
Run: 00h 06 FEB 2013 Valid: 12h 06 FEB 2013 (H+12)



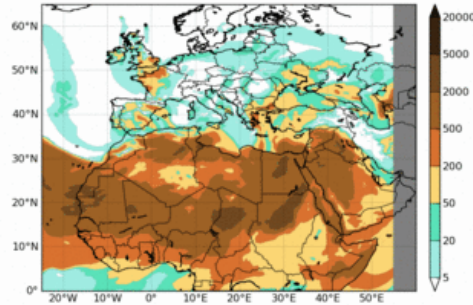
WMO SDS-WAS N.Africa-Middle East-Europe RC  
DREAM8-NMME-MACC Dust Surface Concentration ( $\mu\text{g}/\text{m}^3$ )  
Run: 12h 06 FEB 2013 Valid: 12h 06 FEB 2013 (H+00)



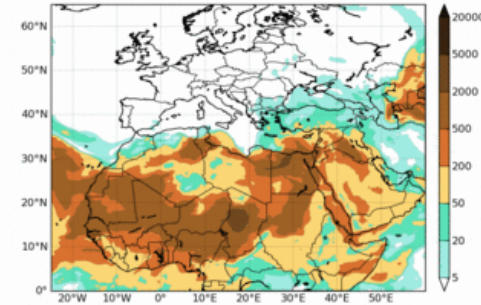
WMO SDS-WAS N.Africa-Middle East-Europe RC  
NMMB/BSC-Dust Dust Surface Concentration ( $\mu\text{g}/\text{m}^3$ )  
Run: 12h 06 FEB 2013 Valid: 12h 06 FEB 2013 (H+00)



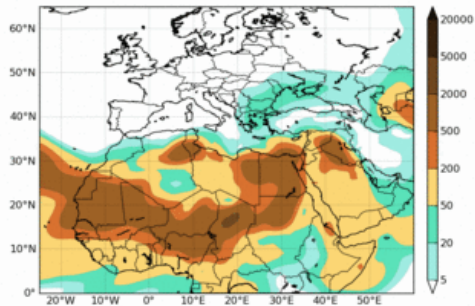
WMO SDS-WAS N.Africa-Middle East-Europe RC  
U.K. MetOffice Dust Surface Concentration ( $\mu\text{g}/\text{m}^3$ )  
Run: 00h 06 FEB 2013 Valid: 12h 06 FEB 2013 (H+12)



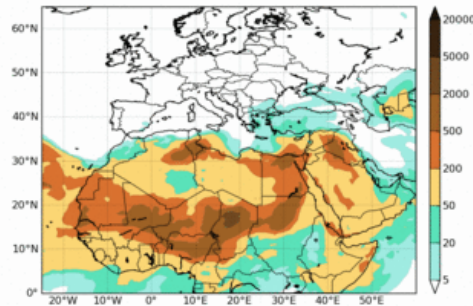
WMO SDS-WAS N.Africa-Middle East-Europe RC  
NASA GEOS-5 Dust Surface Concentration ( $\mu\text{g}/\text{m}^3$ )  
Run: 00h 06 FEB 2013 Valid: 12h 06 FEB 2013 (H+12)



WMO SDS-WAS N.Africa-Middle East-Europe RC  
NCEP NGAC Dust Surface Concentration ( $\mu\text{g}/\text{m}^3$ )  
Run: 00h 06 FEB 2013 Valid: 12h 06 FEB 2013 (H+12)

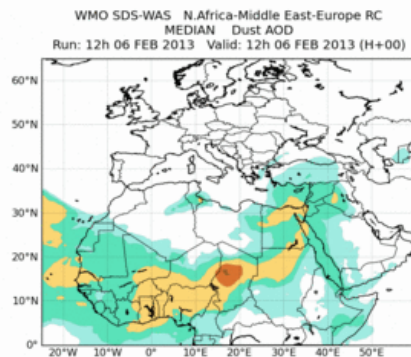
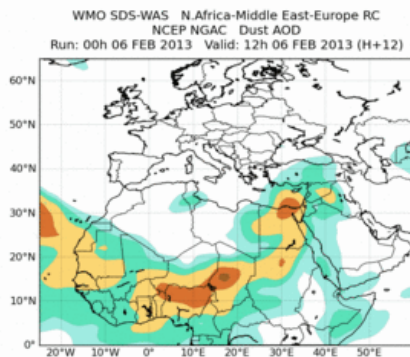
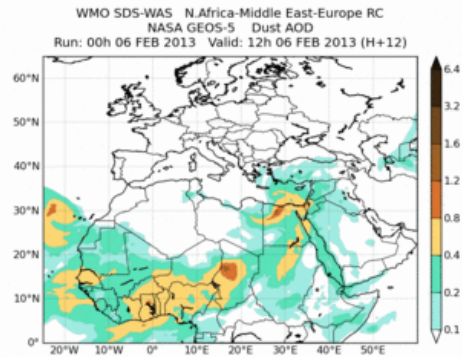
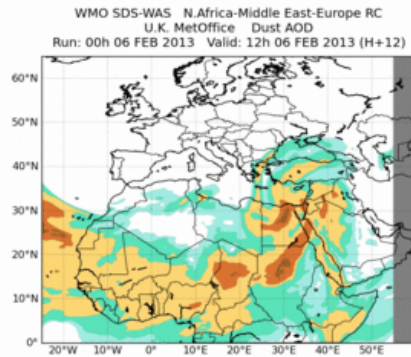
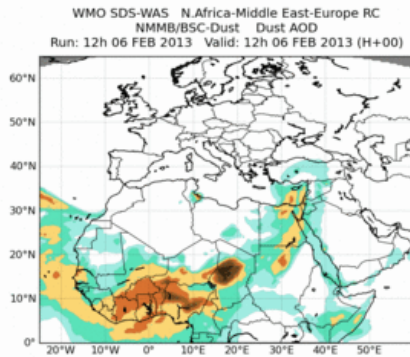
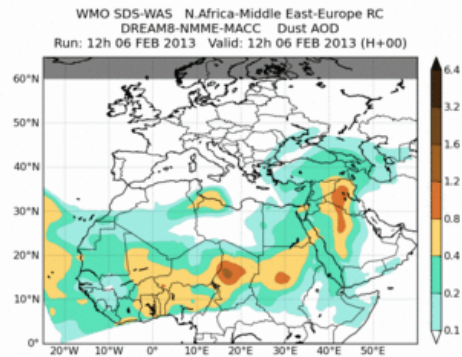
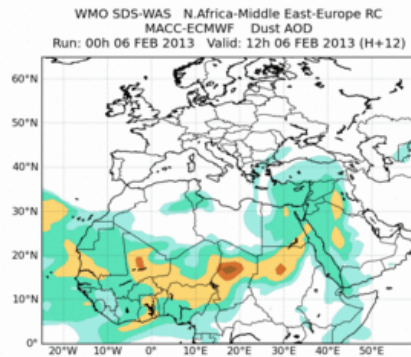
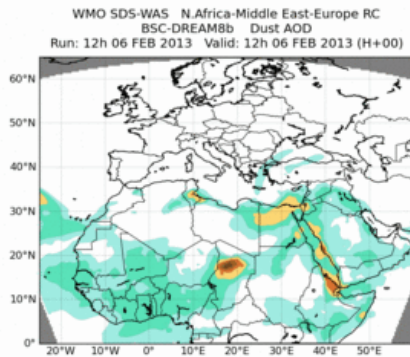


WMO SDS-WAS N.Africa-Middle East-Europe RC  
MEDIAN Dust Surface Concentration ( $\mu\text{g}/\text{m}^3$ )  
Run: 12h 06 FEB 2013 Valid: 12h 06 FEB 2013 (H+00)



Surface concentration  
from 6-Feb-2013 12:00 to  
9-Feb-2013 00:00

# SDS-WAS: AOD joint visualization

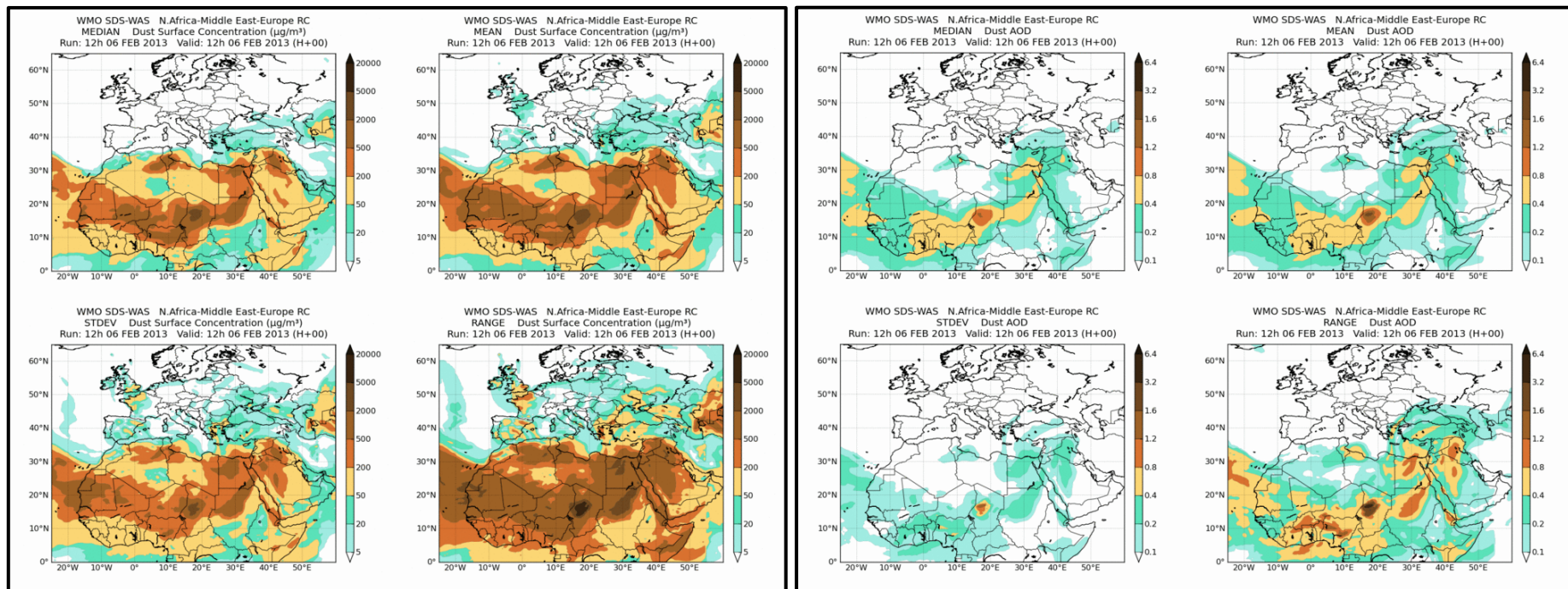


**AOD at 550nm**  
from 6-Feb-2013 12:00 to  
9-Feb-2013 00:00

# SDS-WAS: Generation of multi-model products

## Surface concentration

## AOD at 550nm



from 6-Feb-2013 12:00 to 9-Feb-2013 00:00

Model outputs are bi-linearly interpolated to a common  $0.5^\circ \times 0.5^\circ$  grid mesh. Then, different multi-model products are generated:

**CENTRALITY:** median - mean

**SPREAD:** standard deviation – range of variation



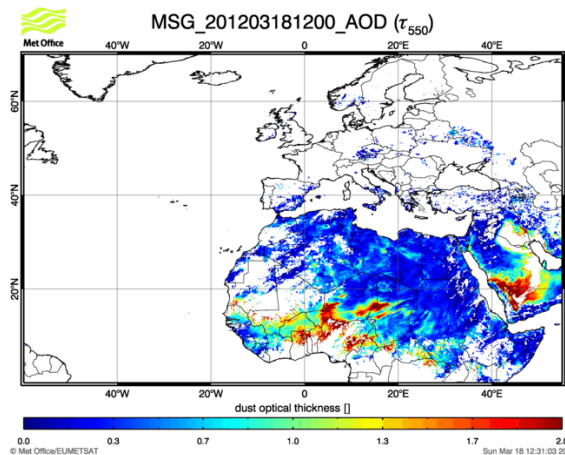
## New sources of data for model evaluation

- Visibility
- MSG
- MODIS
- OMI
- CALIPSO
- PARASOL
- MPLNET
- $PM_{10}$



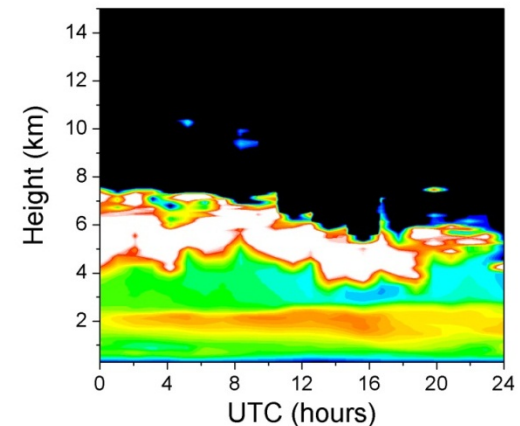
Last Update:  
2012-03-27 12:40:40

CLICK ON A STATION FOR TIME OF  
OBSERVATION



Micro Pulse LIDAR - Sta. Cruz de Tenerife

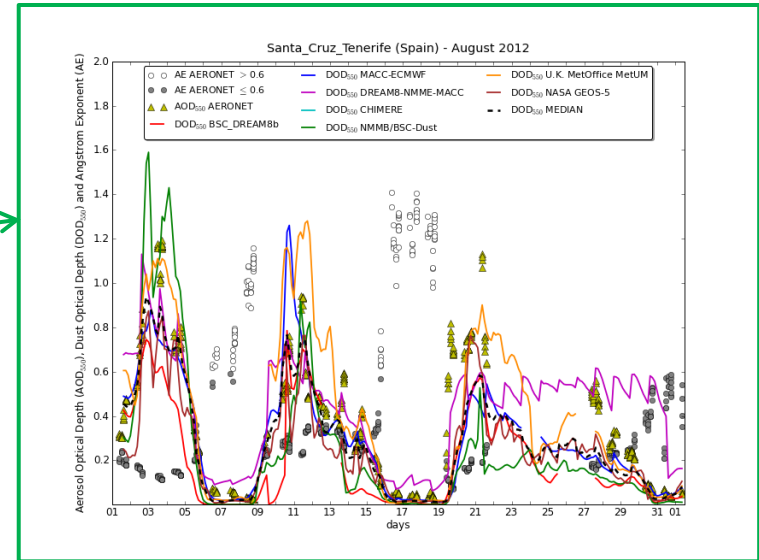
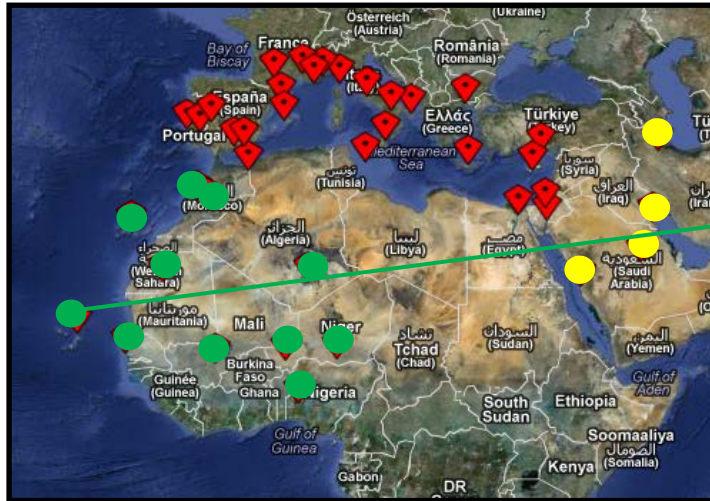
08 Dec  
2011



# SDS-WAS: Model intercomparison

The screenshot shows the website for the Northern Africa-Middle East-Europe (NA-ME-E) Regional Center of the WMO Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS). The page features a navigation menu with options like HOME, ABOUT US, FORECAST & PRODUCTS, PROJECTS & RESEARCH, MATERIALS, NEWS, EVENTS, and CONTACT US. A sidebar on the left contains a search bar, a 'Latest News' section with links to dust forecasts and lectures, and an 'Upcoming Events' section. The main content area displays an article titled 'Northern Africa-Middle East-Europe (NA-ME-E) Regional Center Model Intercomparison' by Francesco Benincasa, dated May 29, 2012. Below the article title are several highlighted links: 'Outstanding' (lectures on atmospheric mineral dust), 'Dust forecasts' (guidance, evaluation, and comparison), and 'Dust observations'. A red circle highlights the 'Forecast Evaluation' section, which contains a line graph comparing dust concentration forecasts from various models against observations. The graph shows dust concentration in  $\mu\text{g}/\text{m}^3$  over time for different models and observations.

# SDS-WAS: NRT Evaluation using AERONET



Model evaluation metrics (bias, correlation, RMSE and FGE) are calculated:

- By regions: NA-ME-E, Sahel/Sahara, Middle East and Mediterranean
- By time periods: monthly, seasonal and annual

# SDS-WAS: NRT Evaluation using AERONET

## Calculation of monthly evaluation metrics

Mar 2012. Dust Optical Depth.  
Threshold Angstrom Exponent = 0.600

BIAS [show stations](#)

	BSC_ DREAM8b	MACC- ECMWF	DREAM8-NMME- MACC	CHIMERE	NMMB/BSC- Dust	MEDIAN
<b>TOTAL</b>	<b>-0.36</b>	<b>-0.39</b>	<b>-0.20</b>	<b>-0.41</b>	<b>-0.15</b>	<b>-0.35</b>

ROOT MEAN SQUARE ERROR [show stations](#)

	BSC_ DREAM8b	MACC- ECMWF	DREAM8-NMME- MACC	CHIMERE	NMMB/BSC- Dust	MEDIAN
<b>TOTAL</b>	<b>0.62</b>	<b>0.57</b>	<b>0.45</b>	<b>0.59</b>	<b>0.50</b>	<b>0.53</b>

NUMBER OF CASES [show stations](#)

	BSC_ DREAM8b	MACC- ECMWF	DREAM8-NMME- MACC	CHIMERE	NMMB/BSC- Dust	MEDIAN
<b>TOTAL</b>	<b>1033</b>	<b>846</b>	<b>977</b>	<b>1007</b>	<b>1007</b>	<b>1007</b>

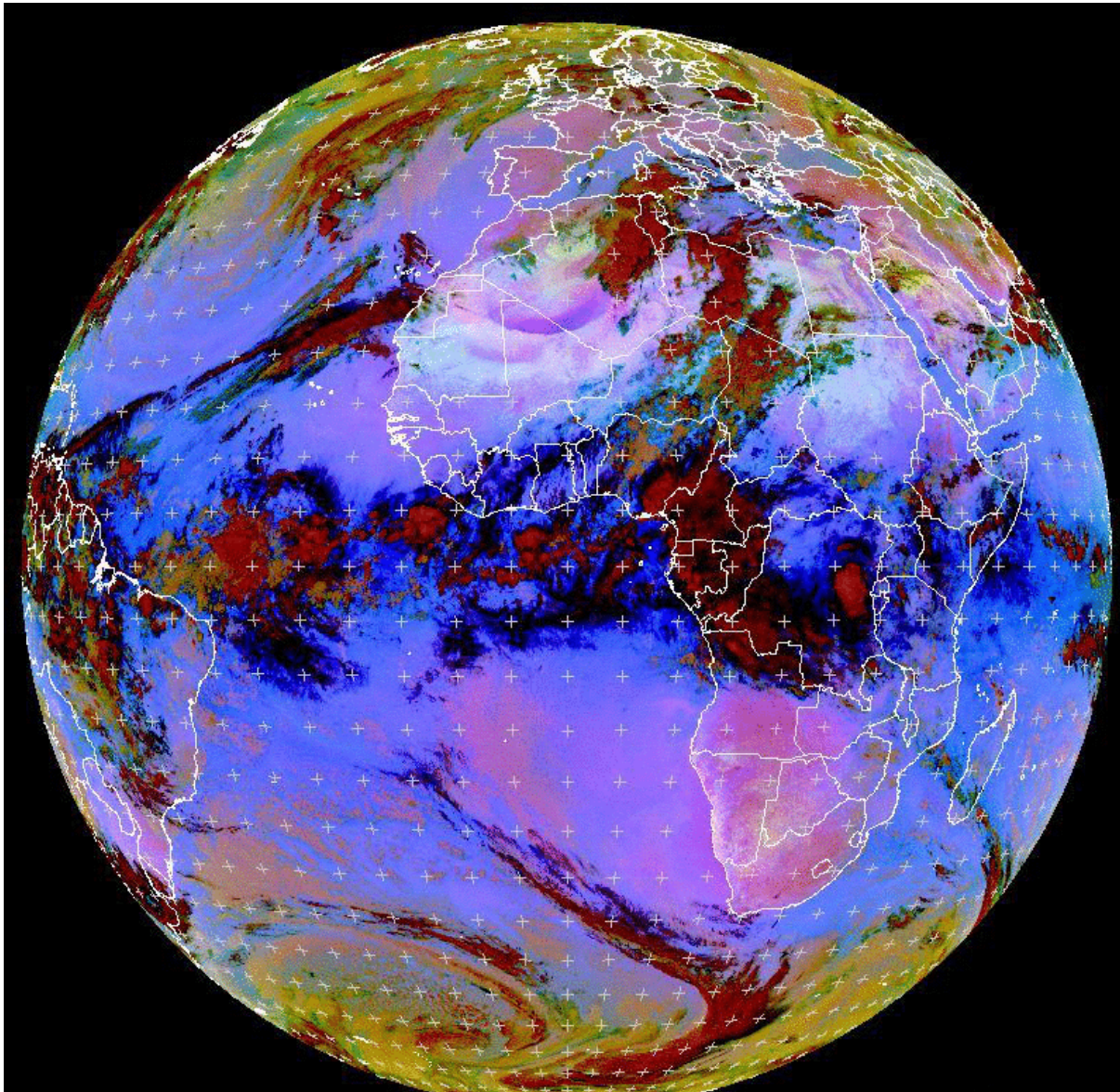
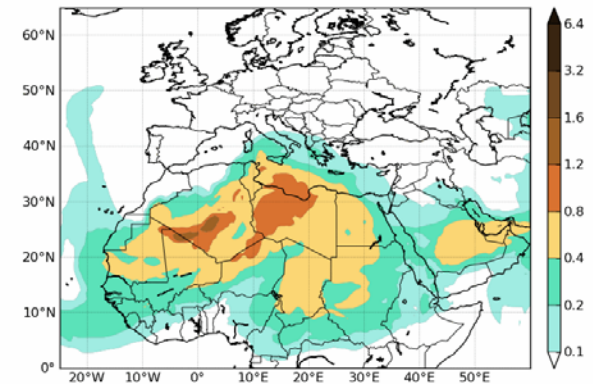
- Besides dust, there might be other aerosol types (anthropogenic, biomass burning, etc.). Then, a small BE could be expected.
- Scores for individual sites can be little significant for being calculated from a small number of data.
- The RMSE is strongly dominated by the largest values. Especially in cases where prominent outliers occur, the usefulness of the RMSE is questionable and the interpretation becomes more difficult.

# SDS-WAS: NRT Evaluation using satellite aerosol products



**24 April 2013**

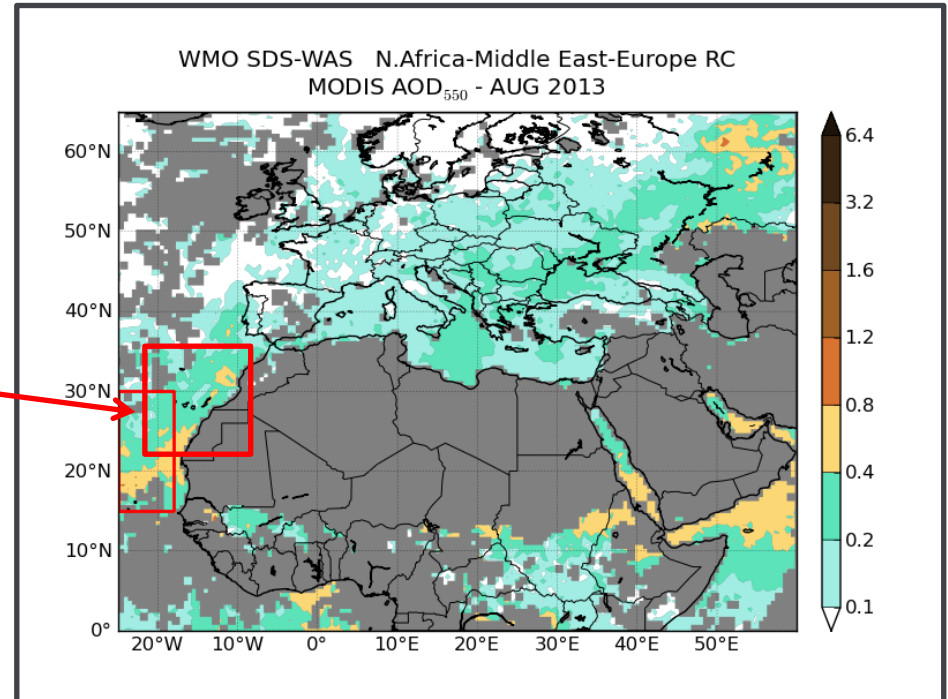
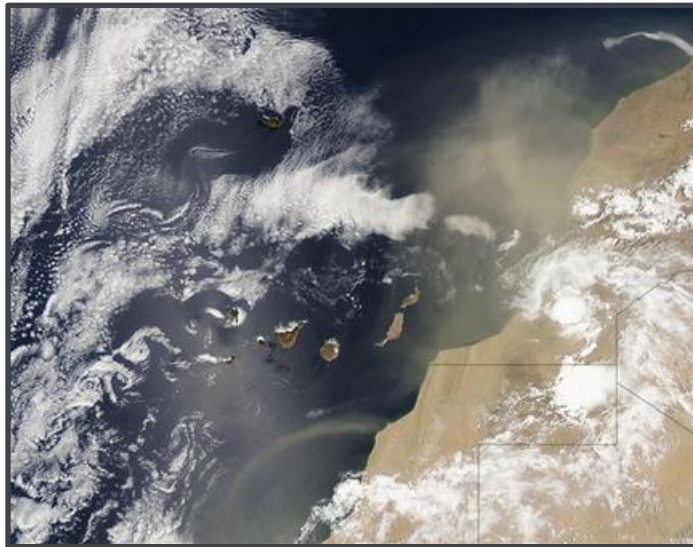
WMO SDS-WAS N.Africa-Middle East-Europe RC  
MEDIAN Dust AOD  
Run: 12h 23 APR 2013 Valid: 00h 24 APR 2013 (H+12)



MET10 RGB-Dust 2013-04-24 00:00 UTC

# SDS-WAS: NRT Evaluation using MODIS

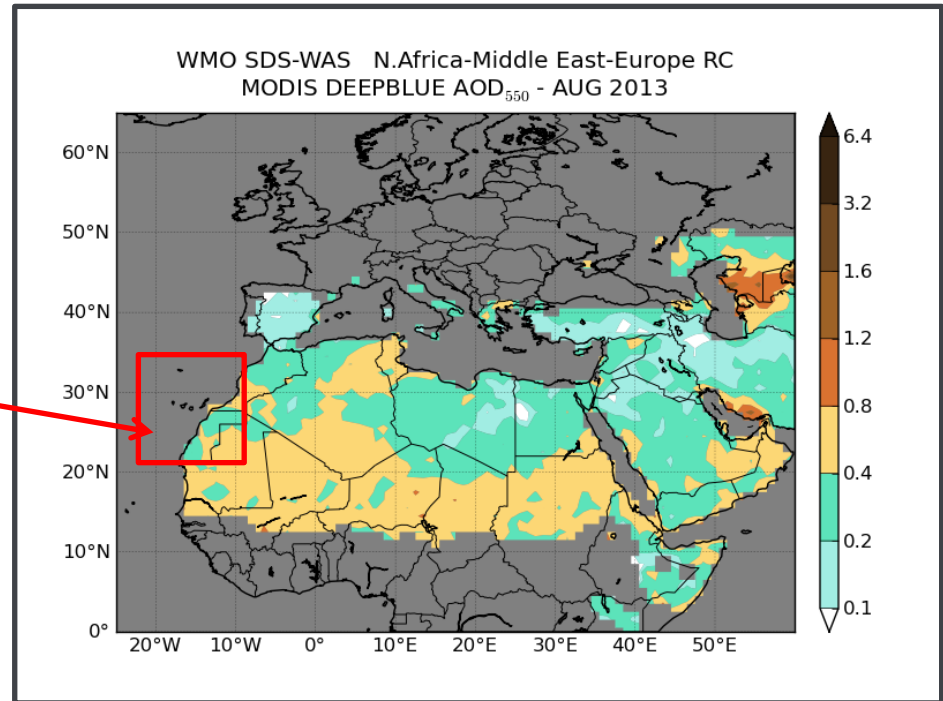
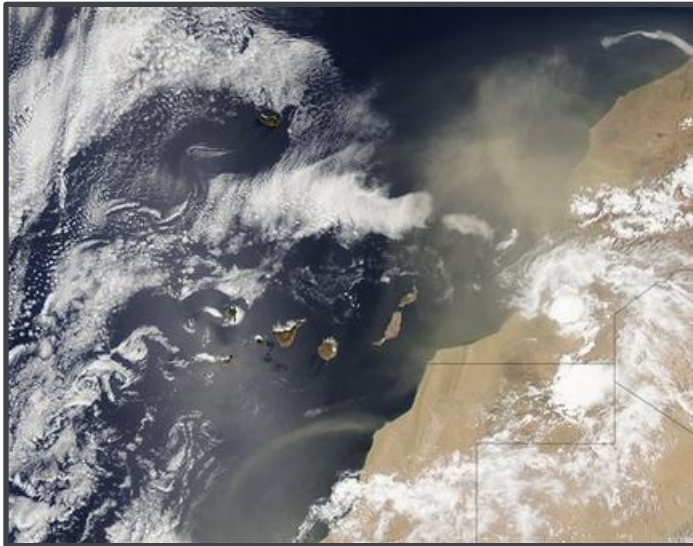
19th August 2013



	BIAS	ROOT MEAN SQUARE ERROR	CORRELATION COEFFICIENT	FRACTIONAL GROSS ERROR	NUMBER OF CASES
<b>BSC_ DREAM8b</b>	<b>-0.16</b>	<b>0.21</b>	<b>0.70</b>	<b>0.87</b>	<b>1220</b>
<b>NMMB/BSC- Dust</b>	<b>-0.13</b>	<b>0.20</b>	<b>0.68</b>	<b>0.81</b>	<b>1038</b>
<b>NCEP NGAC</b>	<b>0.14</b>	<b>0.21</b>	<b>0.78</b>	<b>0.41</b>	<b>1228</b>

# SDS-WAS: NRT Evaluation using MODIS Deep Blue

19th August 2013

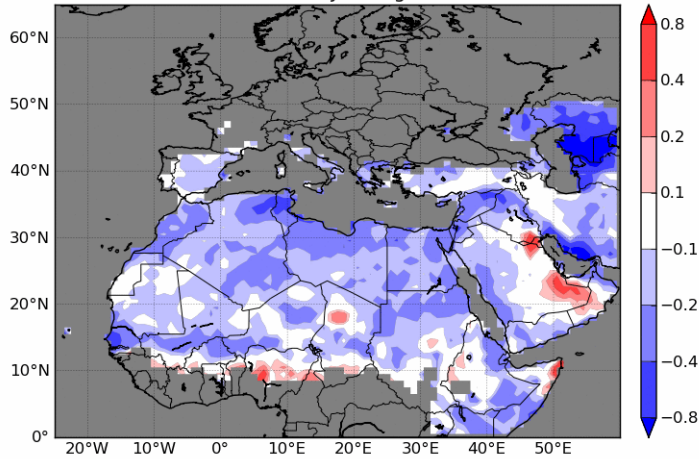


	BIAS	ROOT MEAN SQUARE ERROR	CORRELATION COEFFICIENT	FRACTIONAL GROSS ERROR	NUMBER OF CASES
<b>BSC_ DREAM8b</b>	<b>-0.17</b>	<b>0.31</b>	<b>0.28</b>	<b>0.96</b>	<b>42618</b>
<b>NMMB/BSC- Dust</b>	<b>-0.20</b>	<b>0.33</b>	<b>0.29</b>	<b>1.05</b>	<b>41049</b>
<b>NCEP NGAC</b>	<b>-0.06</b>	<b>0.29</b>	<b>0.32</b>	<b>0.64</b>	<b>42664</b>

# SDS-WAS: NRT Evaluation using MODIS Deep Blue

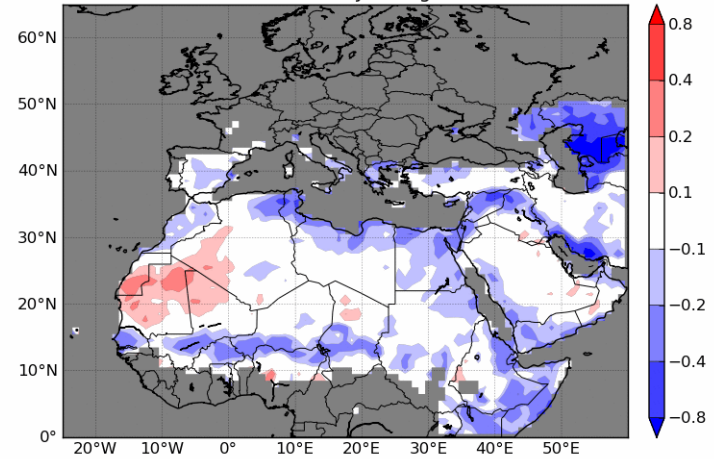
## NMMB-BSC/Dust

WMO SDS-WAS N.Africa-Middle East-Europe RC  
NMMB-BSC/Dust - Jun/Aug 2013 - bias



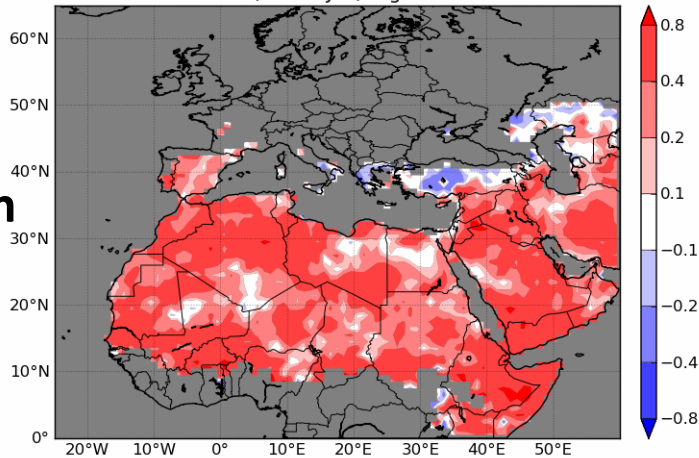
## Multimodel MEDIAN

WMO SDS-WAS N.Africa-Middle East-Europe RC  
multimodel MEDIAN - Jun/Aug 2013 - bias

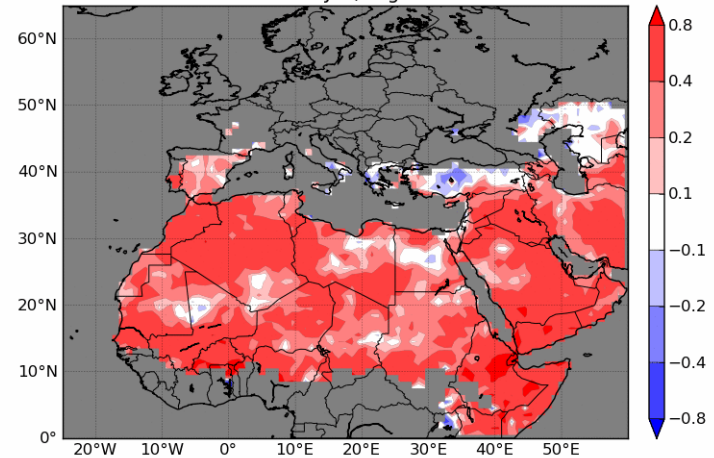


MB

WMO SDS-WAS N.Africa-Middle East-Europe RC  
NMMB-BSC/Dust - Jun/Aug - correlation



WMO SDS-WAS N.Africa-Middle East-Europe RC  
multimodel MEDIAN - Jun/Aug 2013 - correlation



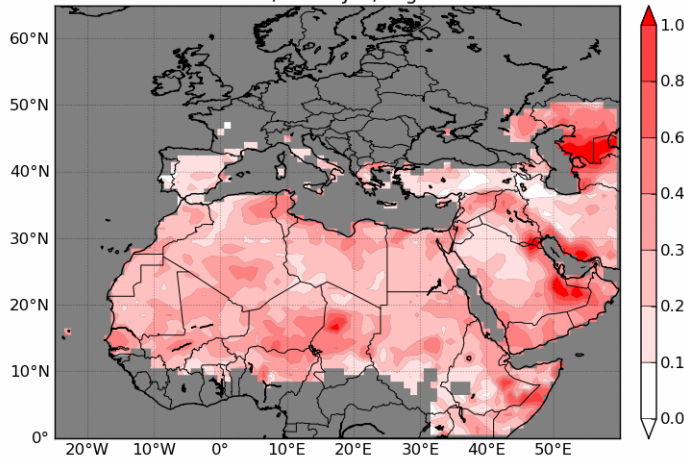
Correlation



# SDS-WAS: NRT Evaluation using MODIS Deep Blue

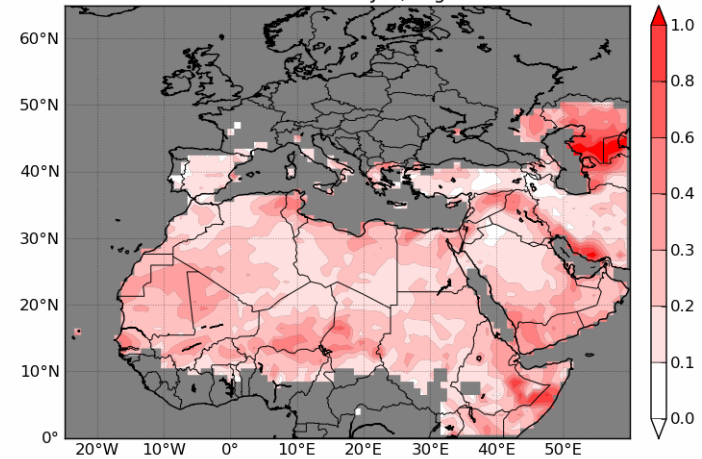
## NMMB-BSC/Dust

WMO SDS-WAS N.Africa-Middle East-Europe RC  
NMMB-BSC/Dust - Jun/Aug - r.m.s.e.



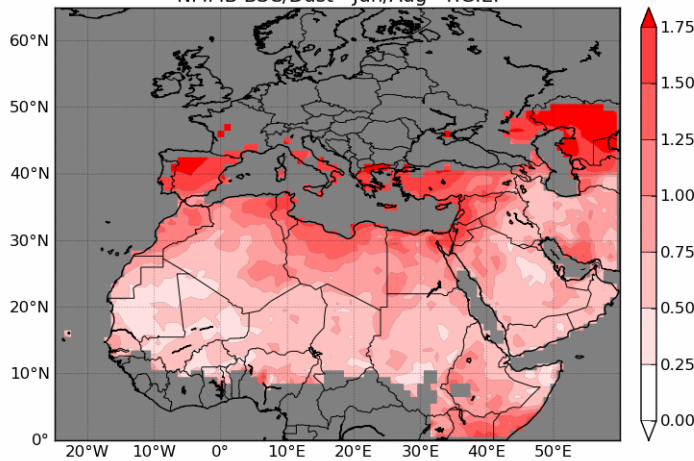
## Multimodel MEDIAN

WMO SDS-WAS N.Africa-Middle East-Europe RC  
multimodel MEDIAN - Jun/Aug - r.m.s.e.

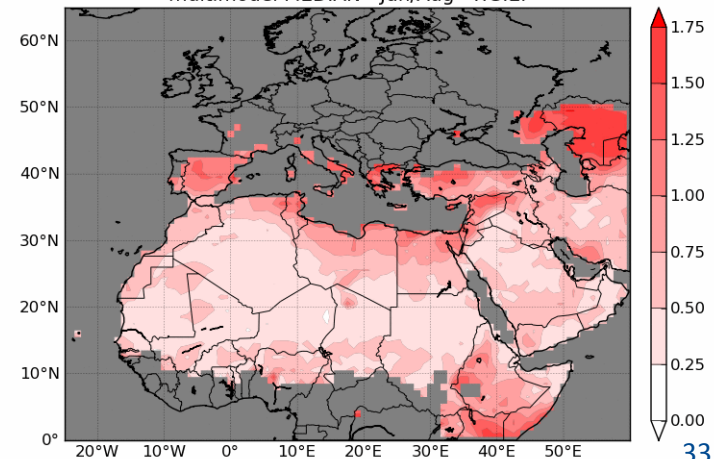


RMSE

WMO SDS-WAS N.Africa-Middle East-Europe RC  
NMMB-BSC/Dust - Jun/Aug - F.G.E.



WMO SDS-WAS N.Africa-Middle East-Europe RC  
multimodel MEDIAN - Jun/Aug - F.G.E.



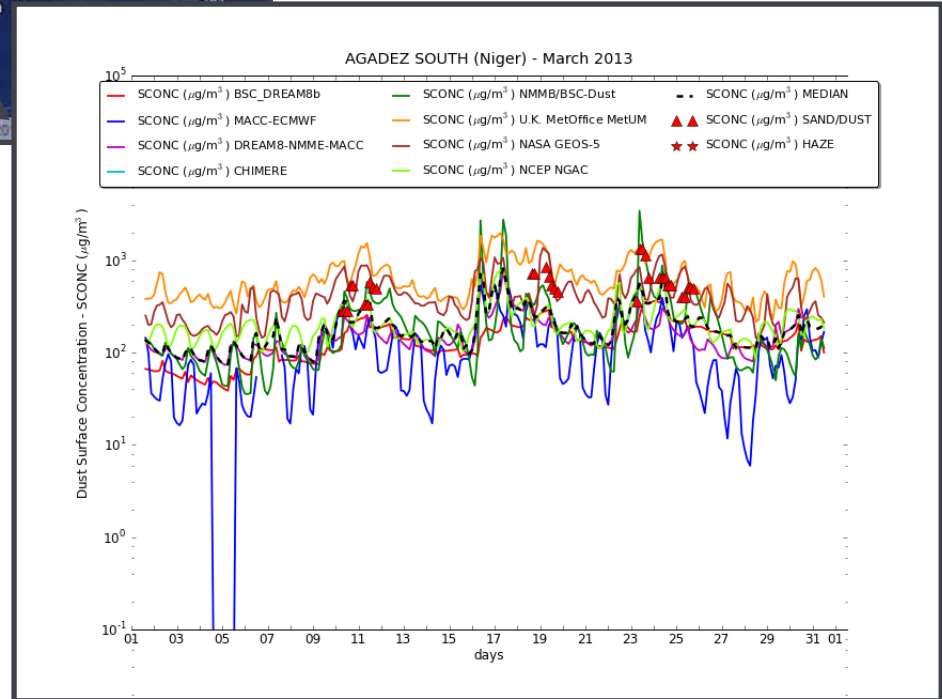
FGE

# SDS-WAS: Evaluation using VISIBILITY data










**$PM_{10} = 1339.84 V^{-0.67}$**   
**Ben Mohamed et al. (1992)**

**AGADEZ SOUTH, Niger**  
**March 2013**



# SDS-WAS: Files download

<b>BSC-DREAM8b v2.0</b>	<a href="#">DOWNLOAD FILES</a>	<a href="#">Model website</a>	
<b>MACC-ECMWF</b>	<a href="#">DOWNLOAD FILES</a>	<a href="#">Model website</a>	
<b>DREAM-NMME-MACC</b>	<a href="#">DOWNLOAD FILES</a>	<a href="#">Model website</a>	
<b>NMMB/BSC-Dust</b>	<a href="#">DOWNLOAD FILES</a>	<a href="#">Model website</a>	
<b>NASA-GEOS-5</b>	<a href="#">DOWNLOAD FILES</a>	<a href="#">Model website</a>	
<b>NCEP-NGAC</b>	<a href="#">DOWNLOAD FILES</a>	<a href="#">Model website</a>	
<b>Multimodel</b>			

Title	Size	Modified
<b>latest</b> - <i>(download all)</i>	4.0 kB	Apr 18, 2013 09:00 PM
<b>2013</b> - <i>(download all)</i>	4.0 kB	Apr 01, 2013 09:00 PM
<b>2012</b> - <i>(download all)</i>	4.0 kB	Apr 08, 2013 04:30 PM

- Daily forecasts of dust surface concentration and dust optical depth will be displayed on a page together with a menu to allow visualization of the archived products and/or download of the numerical files for a selected range of dates.
- Access to the download pages shall be restricted to those groups that authorize the exchange of their own data.



# SDS-WAS: Model intercomparison

Log in

NORTHERN AFRICA-MIDDLE EAST-EUROPE (NA-ME-E) REGIONAL CENTER  
WMO Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS)

World Meteorological Organization  
AEMET  
Barcelona Supercomputing Center

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You are here: **MACC PROJECT** > **MODEL INTERCOMPARISON** > Northern Africa Middle East Europe (NA-ME-E) Regional Center Model Intercomparison

by Francesco Benincà Last modified May 29, 2012 03:33 PM

**Outstanding**

- II Lectures on Atmospheric Mineral Dust. A few seats are still available
- WMO SDS-WAS NA-ME-E Regional Center will be a Regional Specialized Meteorological Center
- Guidance for forecasters
- Forecast evaluation
- Compared dust forecasts

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To be informed about our activities, news and events related to dust. Frequency is almost monthly.

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**Dust forecasts**

WMO SDS-WAS N.Africa-Middle East-Europe RC  
MEDIAN Dust Surface Concentration (µg/m³)  
Run: 14 OCT 2012 - Valid: 12h 14 OCT 2012 (H+00)

Compared Dust Forecasts

Forecast Evaluation

**Dust observations**

Italy - Ciampino - Particulate Matter  
September 2012

# SDS-WAS: Model intercomparison April 2011

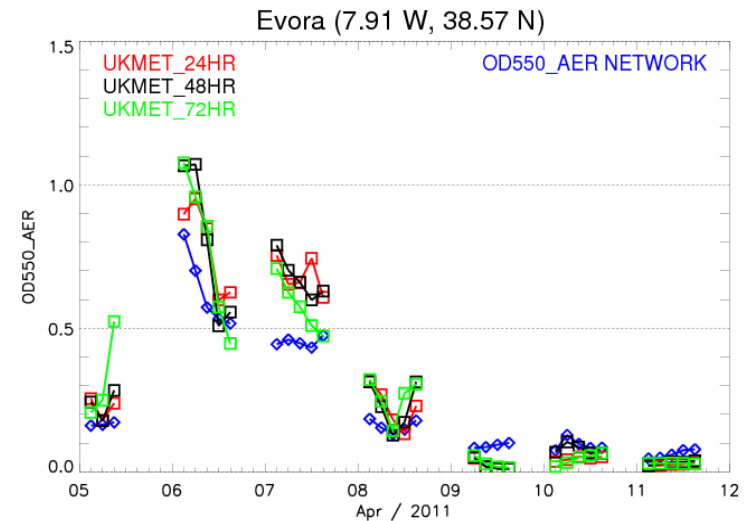
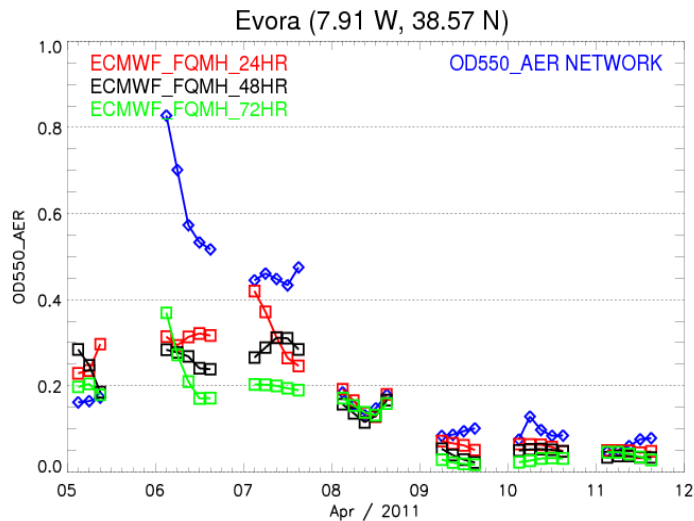
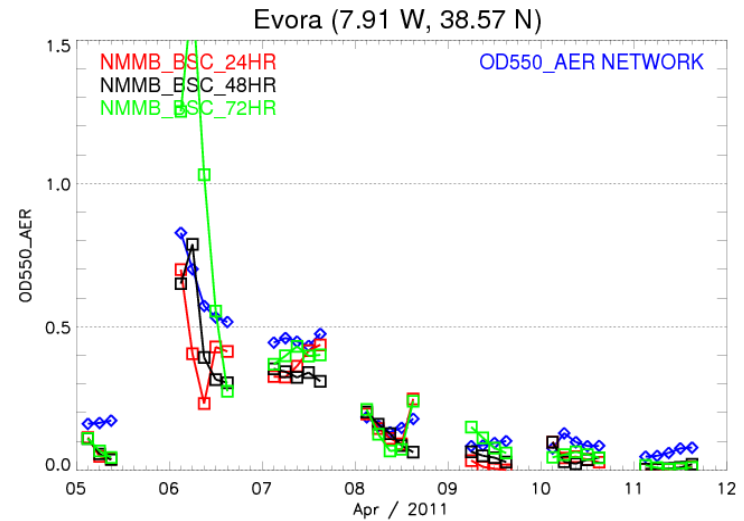
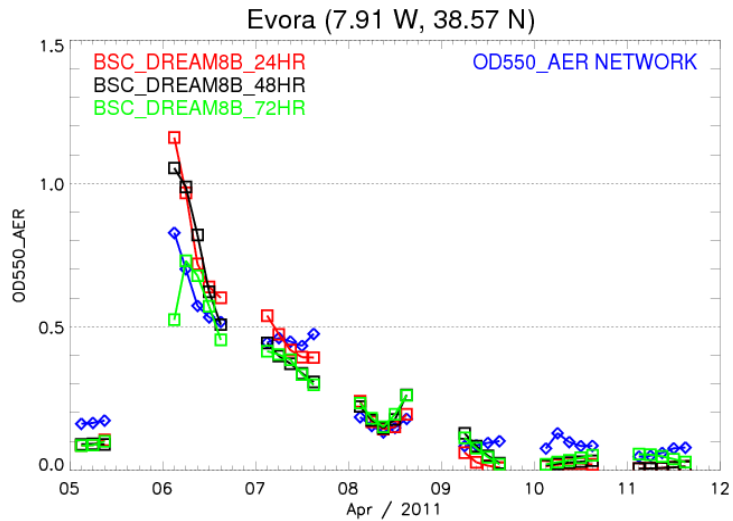


*MODIS True color 7 April 18:00*

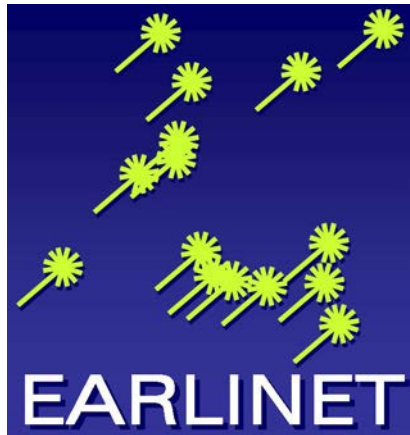
- The selected dust event corresponds to the one which occurred between the 5<sup>th</sup> and 11<sup>th</sup> of April of 2011.
- Participating models: BSC-DREAM8b, NMMB/BSC-Dust, ECMWF-MACC and UKMetOffice-UM
- Comparison of each forecast (at 24, 48 and 72h) output to in-situ measurements of AOD (from AERONET), surface concentration (PM) and satellite retrieved AOD (MODIS, CALIPSO).

(Huneeus et al., in preparation)

# SDS-WAS: AERONET Model intercomparison April 2011



# SDS-WAS: Lidar and models intercomparison



**BSC-DREAM8b v2**  
**NMMB-BSC/Dust**



**DREAM8-NMME-MACC**



**BOLCHEM**

**60 – 80 dust cases for the period Jan 2011 – Jun 2013**

# Barcelona Dust Forecast Center

*First Specialized Center for Mineral Dust Prediction of WMO  
NMMB/BSC-CTM selected  provide operational forecasts*



The screenshot shows the website's header with the title "BARCELONA DUST FORECAST CENTER" and logos for the Government of Spain, AEMET, and BSC. A navigation menu includes links for HOME, ABOUT US, FORECAST, FORECAST 10KM, FORECAST EVALUATION, METHODS, NEWS, and EVENTS. A search bar is located on the left. The main content area features a news article titled "28 Jul - 2 Aug 2013. Dust traveled from Western Africa to the Lesser Antilles" with a sub-headline "Large thunderstorms over western Africa lifted large amounts of dust into the air. On 30 July, the elevated dust started to cross the Atlantic Ocean and it arrived in the Lesser Antilles on 2 August." and a "Read More" link. A "You are here: Home" breadcrumb is also visible.

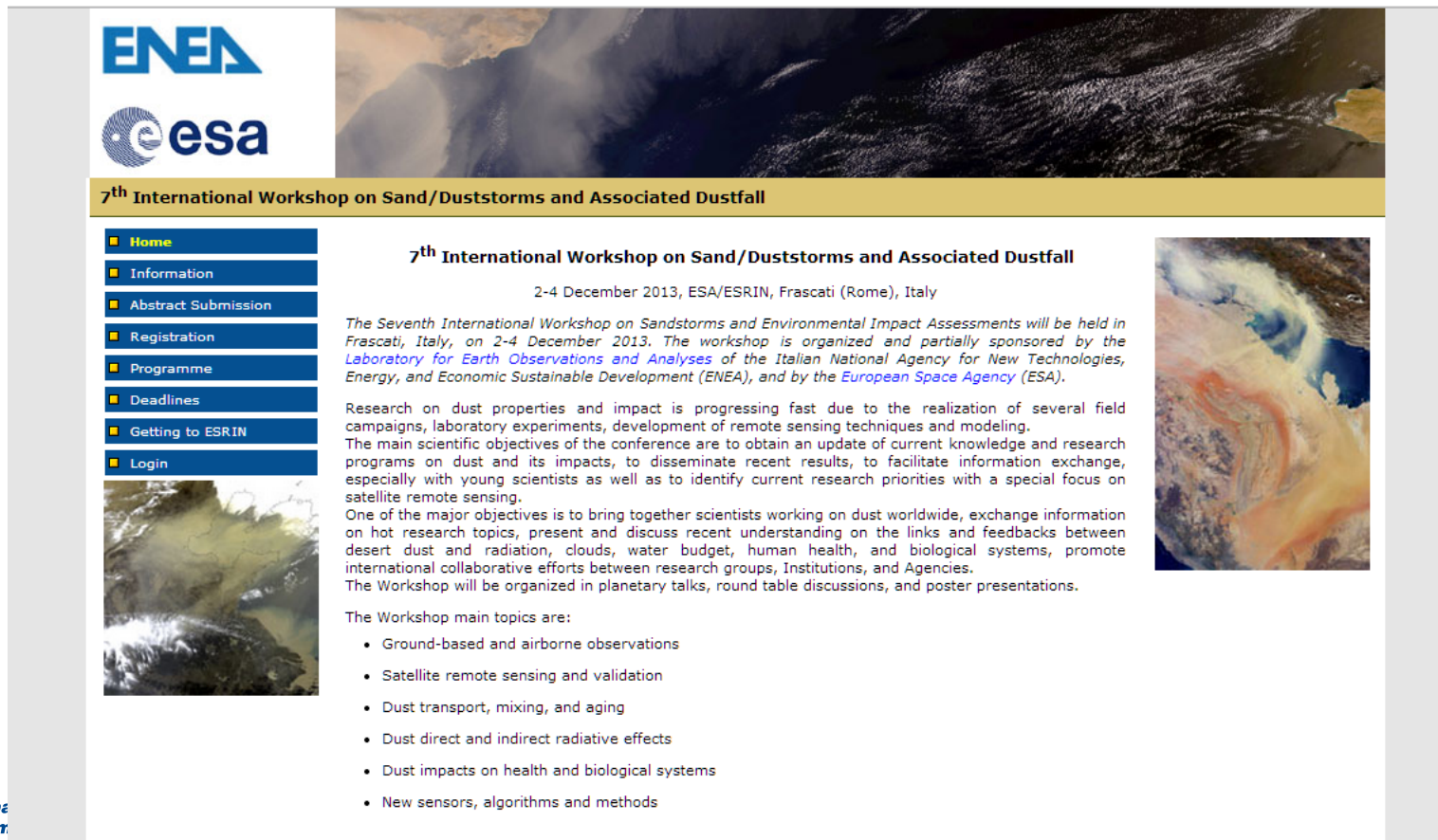


**WEBSITE UNDER CONSTRUCTION**



## 7th International Workshop on Sand/Duststorms and Associated Dustfall

2-4 December 2013, ESA/ESRIN, Frascati (Rome), Italy



The screenshot shows the website for the 7th International Workshop on Sand/Duststorms and Associated Dustfall. At the top left are the logos for ENEA and ESA. Below them is a navigation menu with links for Home, Information, Abstract Submission, Registration, Programme, Deadlines, Getting to ESRIN, and Login. The main content area features a title, dates, location, and a detailed description of the workshop. A list of main topics is provided at the bottom. On the right side, there is a satellite image of a dust storm over the Earth's surface.

**ENEA**  
**esa**

**7<sup>th</sup> International Workshop on Sand/Duststorms and Associated Dustfall**

- Home
- Information
- Abstract Submission
- Registration
- Programme
- Deadlines
- Getting to ESRIN
- Login

**7<sup>th</sup> International Workshop on Sand/Duststorms and Associated Dustfall**

2-4 December 2013, ESA/ESRIN, Frascati (Rome), Italy

*The Seventh International Workshop on Sandstorms and Environmental Impact Assessments will be held in Frascati, Italy, on 2-4 December 2013. The workshop is organized and partially sponsored by the Laboratory for Earth Observations and Analyses of the Italian National Agency for New Technologies, Energy, and Economic Sustainable Development (ENEA), and by the European Space Agency (ESA).*

Research on dust properties and impact is progressing fast due to the realization of several field campaigns, laboratory experiments, development of remote sensing techniques and modeling. The main scientific objectives of the conference are to obtain an update of current knowledge and research programs on dust and its impacts, to disseminate recent results, to facilitate information exchange, especially with young scientists as well as to identify current research priorities with a special focus on satellite remote sensing.

One of the major objectives is to bring together scientists working on dust worldwide, exchange information on hot research topics, present and discuss recent understanding on the links and feedbacks between desert dust and radiation, clouds, water budget, human health, and biological systems, promote international collaborative efforts between research groups, Institutions, and Agencies.

The Workshop will be organized in planetary talks, round table discussions, and poster presentations.

The Workshop main topics are:

- Ground-based and airborne observations
- Satellite remote sensing and validation
- Dust transport, mixing, and aging
- Dust direct and indirect radiative effects
- Dust impacts on health and biological systems
- New sensors, algorithms and methods



International Conference on  
**ATMOSPHERIC DUST**  
Castellaneta Marina (TA), Italy - June 1-6, 2014

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## Waiting for DUST 2014 International Conference on Atmospheric Dust

The Italian Association for the Study of Clays (AISA) and the Institute of Methodologies for Environmental Analysis (IMAA) are pleased to invite you to DUST 2014, the International Conference on Atmospheric Dust. The meeting provides an unique opportunity for mineralogists, physicists, geochemists, engineering, volcanologists, chemists and for many other specialists to share ideas and knowledge on the

:: NEWS ::

September 30

**NEW SESSION  
ME8  
Statistical Modeling of  
Emissions And Air  
Quality**

 **Abstracts**  
The Conference

**Session Modelling and field Studies -  
Atmospheric dust modelling and forecast**  
*Convened by J.M. Baldasano and E. Terradellas*



**Barcelona  
Supercomputing  
Center**

*Centro Nacional de Supercomputación*

**Thank you!**

Acknowledgments:

C. Pérez, K. Haustein, N. Huneus, M Shculz, Z. Janjic, A. Badia, M. Spada, T. Black, D. Dabdub, K. Haustein, M. Carreras, K. Serradell and all the SDS-WAS NAMEE participants.

We thank the AERONET, EARLINET and MODIS community for their valuable data.

This work is funded by the projects CGL2006-11879, CGL2008-02818, CGL2010-19652 of the Spanish Ministry of Science and Innovation.

Simulations have been performed in the Marenostrum supercomputer.