

# WMO SDS-WAS

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**Barcelona  
Supercomputing  
Center**  
*Centro Nacional de Supercomputación*



**World  
Meteorological  
Organization**  
Weather • Climate • Water

**7th ICAP Working Group Meeting: Recent Progress on Data Assimilation,  
Barcelona, 16-19 Jun 2015**

# Outline

- WMO Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS)
- Model products exchange and inter-comparison
- Multi-model products
- Forecast evaluation
- Operational services



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

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## Mission:

Improve the capacity of countries to produce and distribute to end users accurate forecasts of the mineral dust content in the atmosphere

## Structure:

- Regional Center for Northern Africa, Middle East and Europe. Barcelona, Spain
- Regional Center for Asia, Beijing, China
- Regional Center for Pan America, Tucson, Az, U.S.A.

# WMO SDS-WAS – Regional Center NA-ME-E



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

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**Northern Africa-Middle East-Europe (NA-ME-E) Regional Center**

Subscribe to the Public Newsletter!

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

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Your email  
Subscribe

**Outstanding**

- Activity Report 2010-2012 of the SDS-WAS Regional Center published by the WMO
- Barcelona Dust Forecast Center starts operations
- Establishing a WMO SDS-WAS Regional Node for West Asia: Current Capabilities and Needs - Full version
- Files Download
- Compared dust forecasts

**Latest News**

- Severe sandstorm hits Northern China  
Jan 24, 2014
- Service down for maintenance 27-28 April  
Jan 23, 2014
- Saharan dust over the U. K.  
Jan 09, 2014

**Upcoming Events**

- Chemistry-Climate Model Initiative Workshop  
Jan 18, 2014
- DUST 2014, International Conference on Atmospheric Dust  
Jan 08, 2014
- 2014 Meeting of the SDS-WAS Regional Steering Group

**Compared Dust Forecasts**

**Forecast Evaluation**

**Dust observations**

[sds-was.aemet.es](http://sds-was.aemet.es)



GOBIERNO DE ESPAÑA

MINISTERIO DE MEDIO AMBIENTE Y MEDIO RURAL Y MARINO

**AEMet**  
Agencia Estatal de Meteorología



**Barcelona Supercomputing Center**

Centro Nacional de Supercomputación

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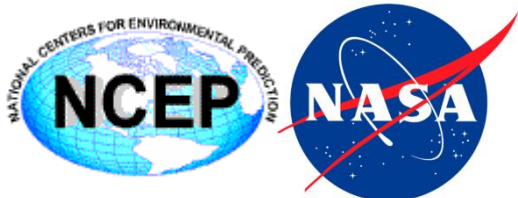


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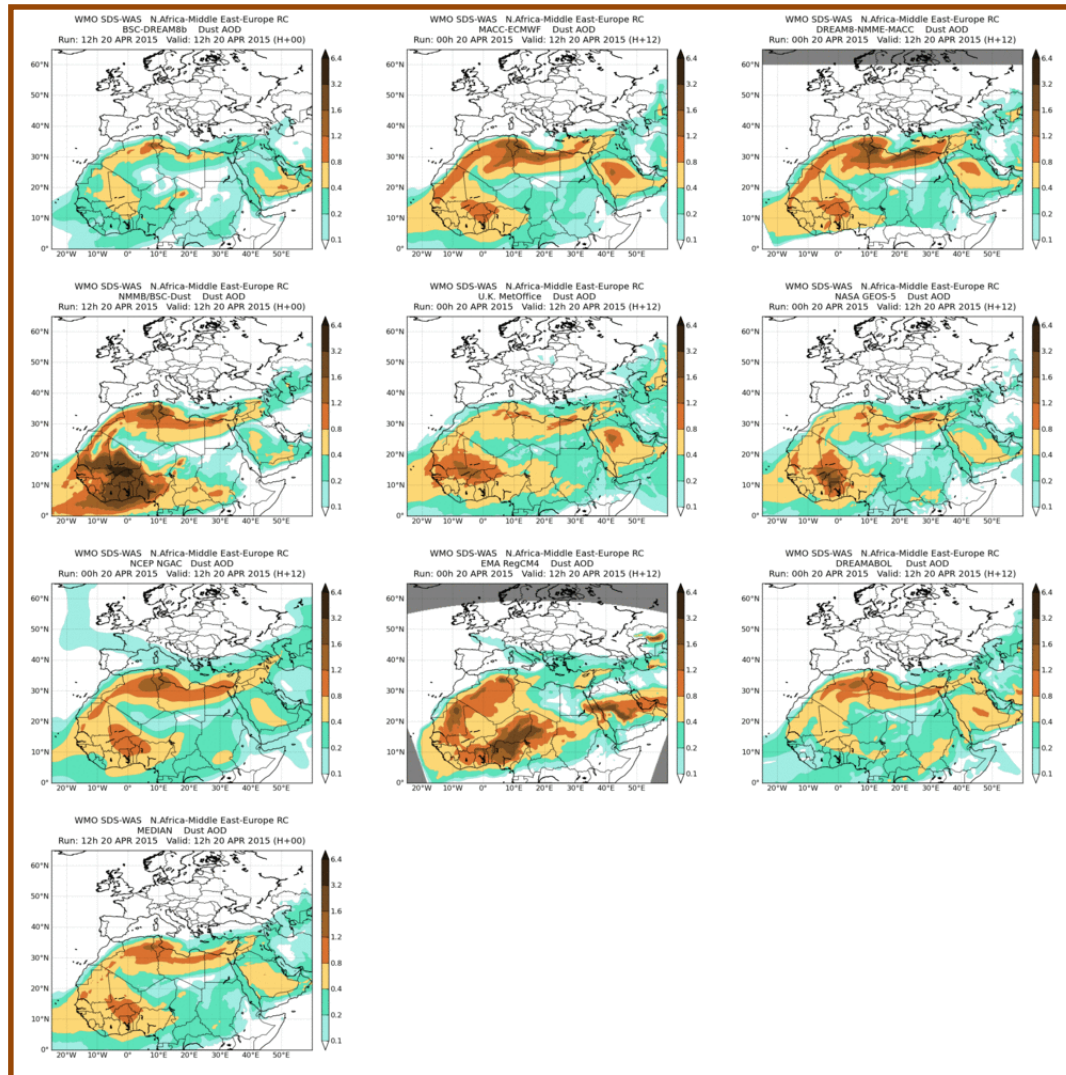
# Exchange of model products



MODEL	INSTITUTION	RUN TIME	DOMAIN	DATA ASSIMILATION
BSC-DREAM8b	BSC-CNS	12	Regional	No
MACC	ECMWF	00	Global	MODIS AOD
DREAM-NMME-MACC	SEEVCCC	00	Regional	MACC analysis
NMMB/BSC-Dust	BSC-CNS	12	Regional	No
MetUM	U. K. Met Office	00	Global	MODIS AOD
GEOS-5	NASA	00	Global	MODIS reflectances
NGAC	NCEP	00	Global	No
RegCM4	EMA	12	Regional	No
DREAMABOL	CNR	00	Regional	No

- Dust surface concentration and dust optical depth @ 550 nm
- Lead times: 0-72 h every 3 h

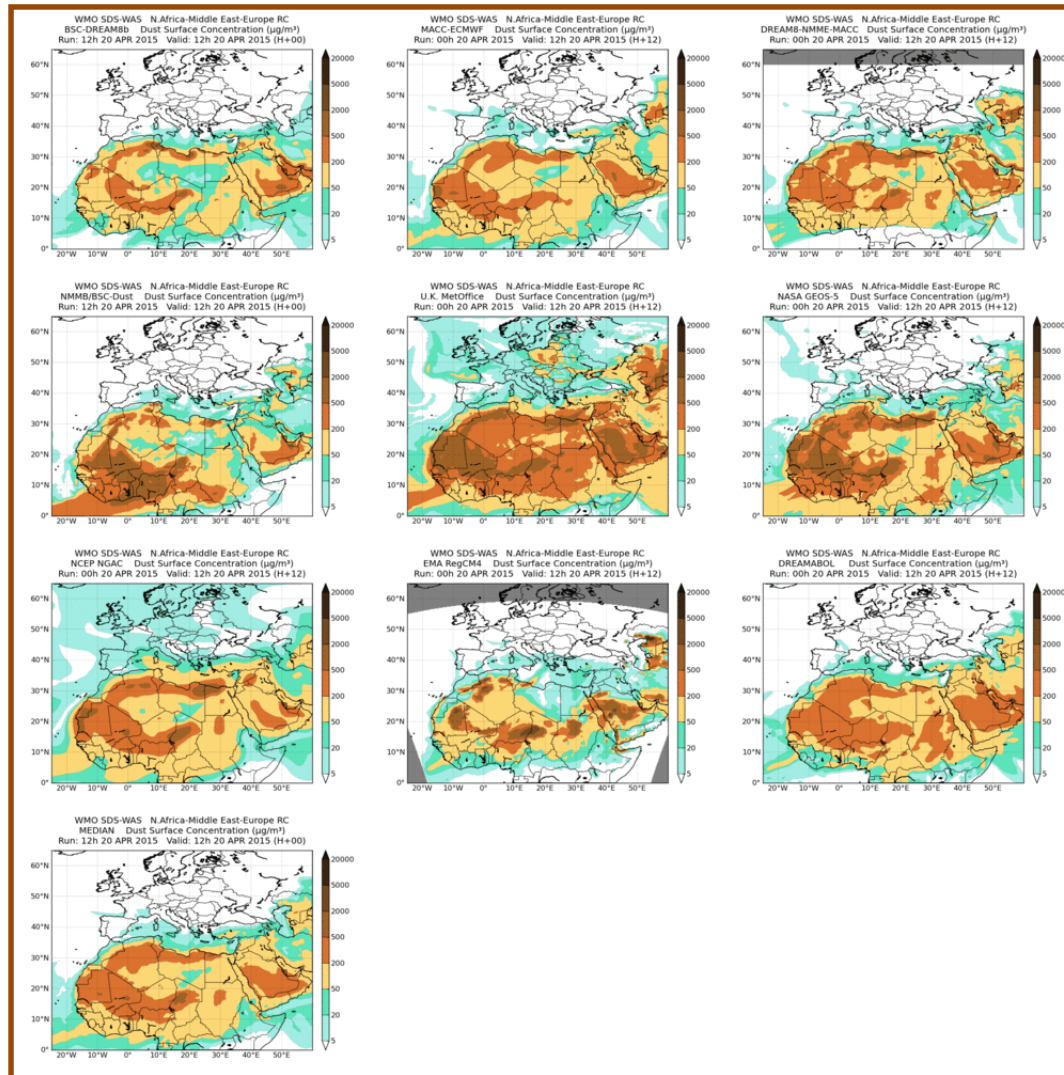
# Models inter-comparison (dust optical depth)



Dust Optical Depth 550 nm. Models runtime: 20 Apr 2015



# Models inter-comparison (dust sfc concentration)



Dust Surface Concentration. Models runtime: 20 Apr 2015

# Dissemination of numerical products

Eric Terradellas

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

WMO SDS WAS | Asia Regional Center

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Dust forecasts

DUST FORECASTS

DUST OBSERVATIONS

GUIDANCE FOR FORECASTERS

TIME-AVERAGED VALUES








FORECAST EVALUATION

REANALYSIS

DATA POLICY

Sfc. Concentración  
Dust AOD 550  $\mu\text{m}$

netCDF format

BSC-DREAM8b v2.0	<a href="#">DOWNLOAD FILES</a>	<a href="#">Model website</a>	 <b>Barcelona Supercomputing Center</b> Centro Nacional de Supercomputación
MACC-ECMWF	<a href="#">DOWNLOAD FILES</a>	<a href="#">Model website</a>	 <b>mac</b> Monitoring atmospheric composition & climate
DREAM-NMME-MACC	<a href="#">DOWNLOAD FILES</a>	<a href="#">Model website</a>	 <b>SEEVCCC</b>
NMMB/BSC-Dust	<a href="#">DOWNLOAD FILES</a>	<a href="#">Model website</a>	 <b>Barcelona Supercomputing Center</b> Centro Nacional de Supercomputación
NASA-GEOS-5	<a href="#">DOWNLOAD FILES</a>	<a href="#">Model website</a>	 <b>NASA</b>
NCEP-NGAC	<a href="#">DOWNLOAD FILES</a>	<a href="#">Model website</a>	 <b>NCEP</b> NATIONAL CENTERS FOR ENVIRONMENTAL PREDICTION
Multimodel MEDIAN	<a href="#">DOWNLOAD FILES</a>	<a href="#">Model website</a>	 <b>World Meteorological Organization</b>



Title	Size	Modified
<b>latest</b> - <i>(download all)</i>	4.0 kB	May 08, 2014 10:30 PM
<b>2014</b> - <i>(download all)</i>	4.0 kB	May 01, 2014 10:30 PM
<b>2013</b> - <i>(download all)</i>	4.0 kB	Dec 01, 2013 10:30 PM
<b>2012</b> - <i>(download all)</i>	4.0 kB	Apr 24, 2013 11:57 AM

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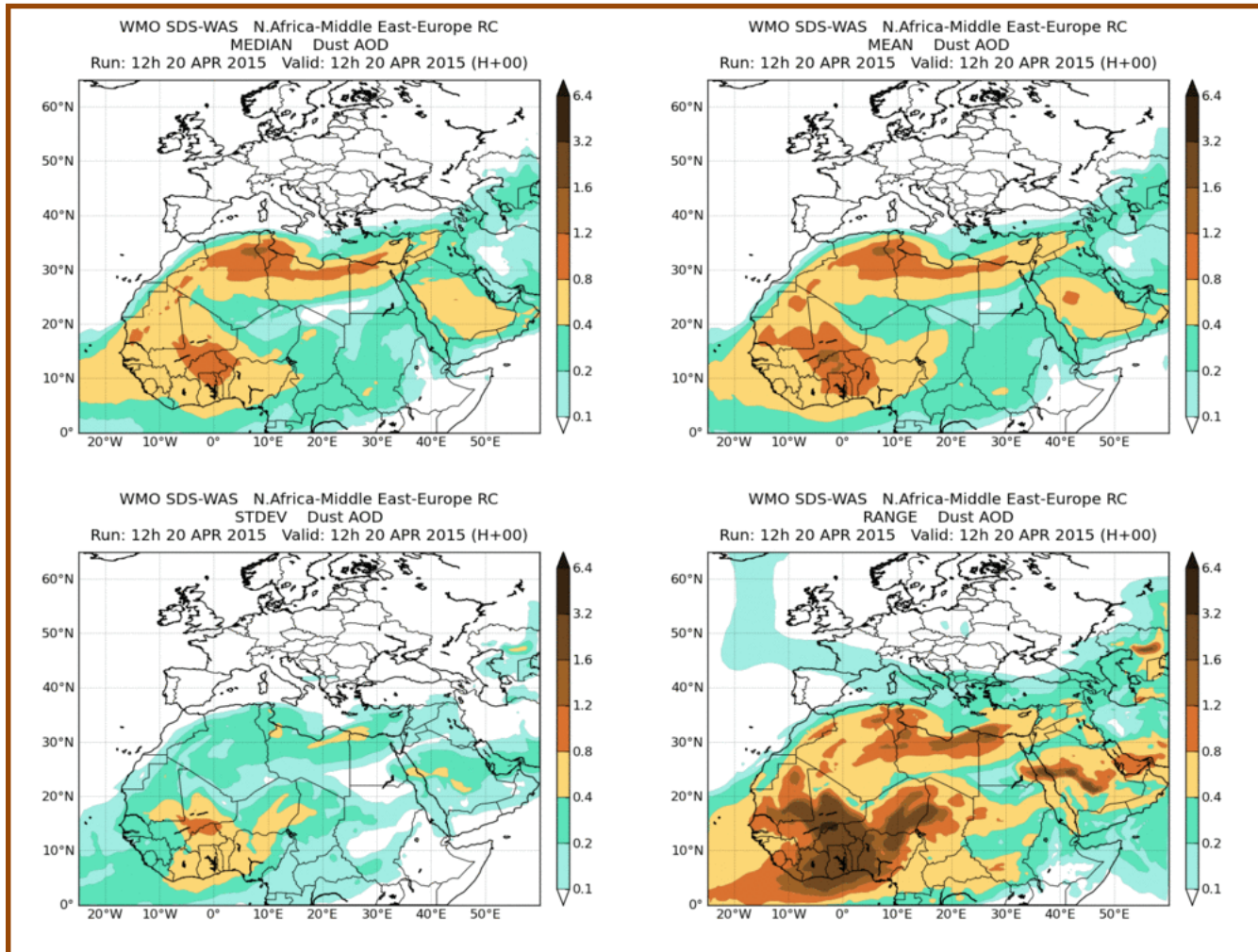


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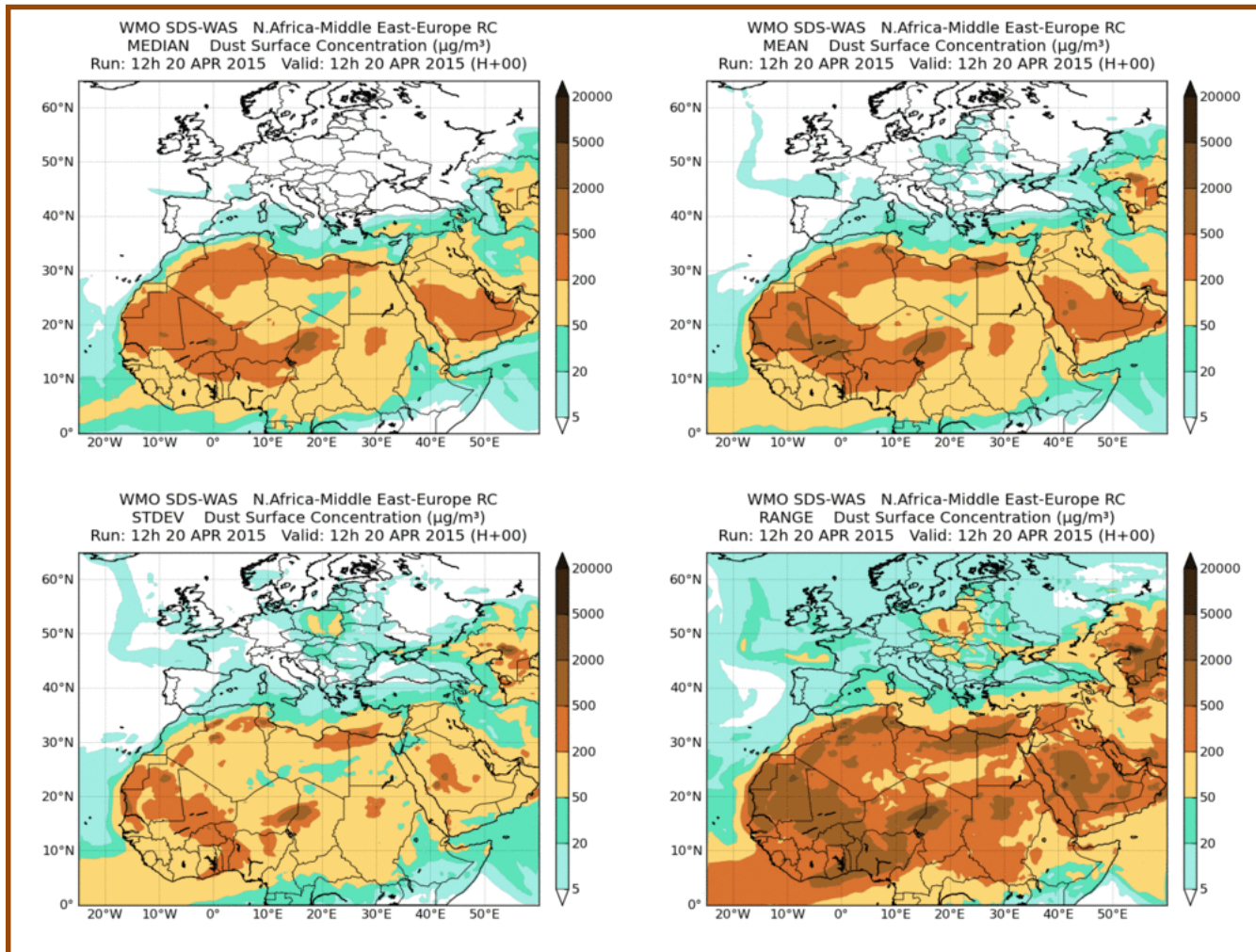
[eterradellasj@aemet.es](mailto:eterradellasj@aemet.es)

# Multi-Model products (dust optical depth)



Dust Optical Depth 550 nm. Models runtime: 20 Apr 2015

# Multi-Model products (dust sfc concentration)



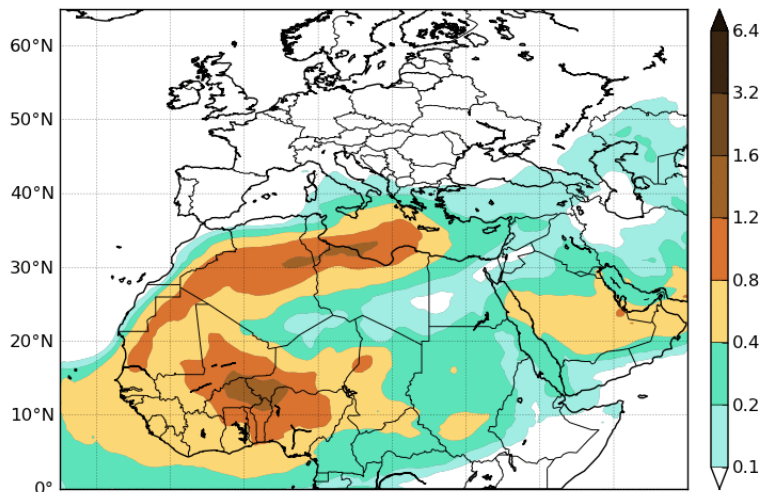
Dust Optical Depth 550 nm. Models runtime: 20 Apr 2015

# SDS-WAS / ICAP Comparison of MM products

WMO SDS-WAS N.Africa-Middle East-Europe RC

MEAN Dust AOD

Run: 12h 19 APR 2015 Valid: 12h 19 APR 2015 (H+00)

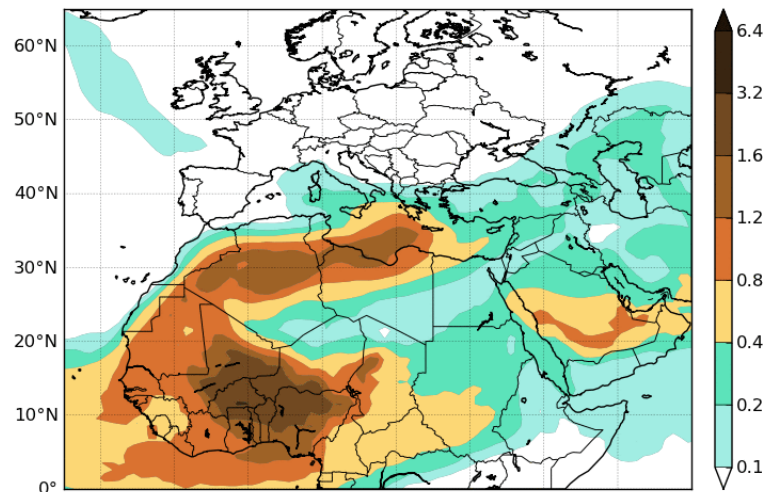


**SDS-WAS** <http://sds-was.aemet.es>

ICAP Multi Model Ensemble

MEAN Dust AOD

Run: 00h 19 APR 2015 Valid: 12h 19 APR 2015 (H+12)

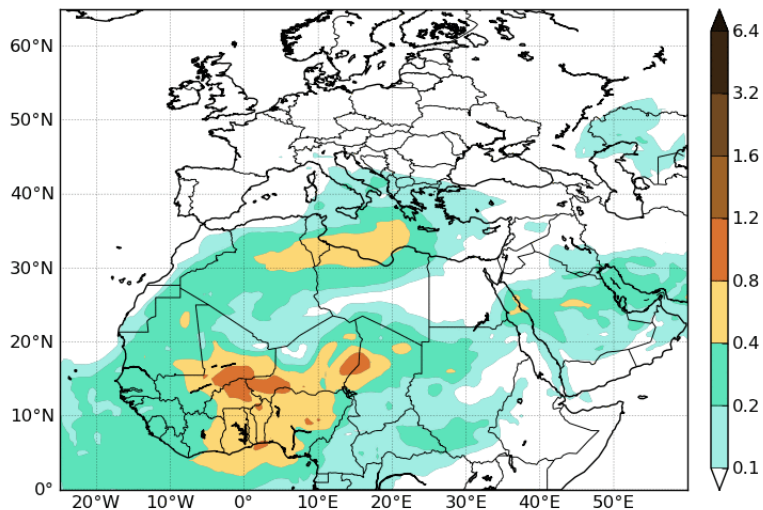


**ICAP** <http://icap.atmos.und.edu>

WMO SDS-WAS N.Africa-Middle East-Europe RC

STDEV Dust AOD

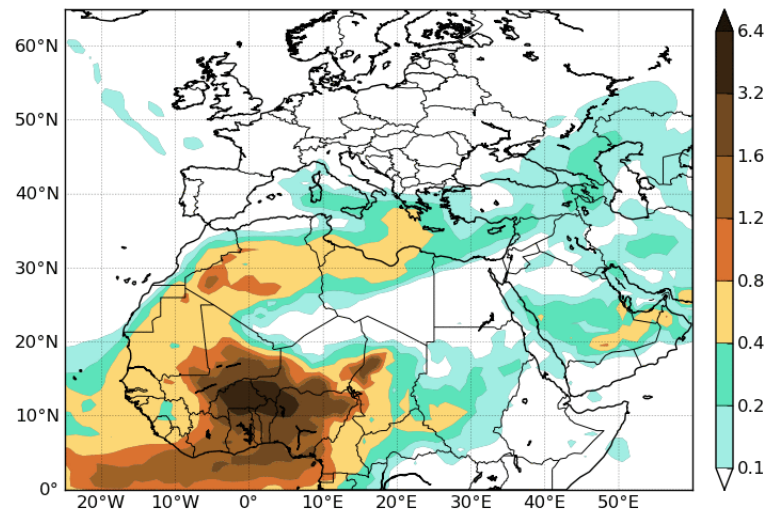
Run: 12h 19 APR 2015 Valid: 12h 19 APR 2015 (H+00)



ICAP Multi Model Ensemble

STDEV Dust AOD

Run: 00h 19 APR 2015 Valid: 12h 19 APR 2015 (H+12)



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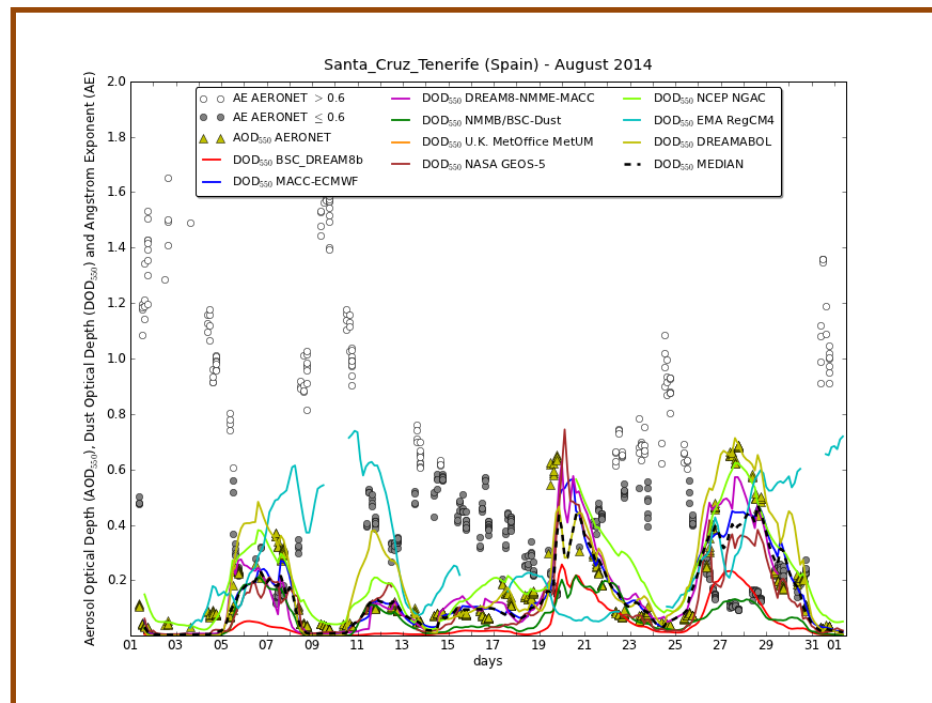


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# Evaluation with AERONET data



## CORRELATION COEFFICIENT

	BSC_ DREAM8b	MACC- ECMWF	DREAM8- NMME-MACC	NMMB/ BSC-Dust	U.K. Met Office	NASA GEOS-5	NCEP NGAC	EMA RegCM4	DREAM ABOL	MEDIAN
<b>Sahel/Sahara</b> show stations	0.53	0.56	0.47	0.53	0.57	0.58	0.60	0.25	0.30	0.62
<b>Middle East</b> show stations	0.36	0.36	0.44	0.42	0.36	0.37	0.32	0.29	0.20	0.35
<b>Mediterranean</b> show stations	0.38	0.51	0.40	0.48	0.47	0.49	0.46	0.20	0.34	0.51
<b>TOTAL</b>	0.51	0.56	0.47	0.54	0.56	0.58	0.58	0.28	0.35	0.61

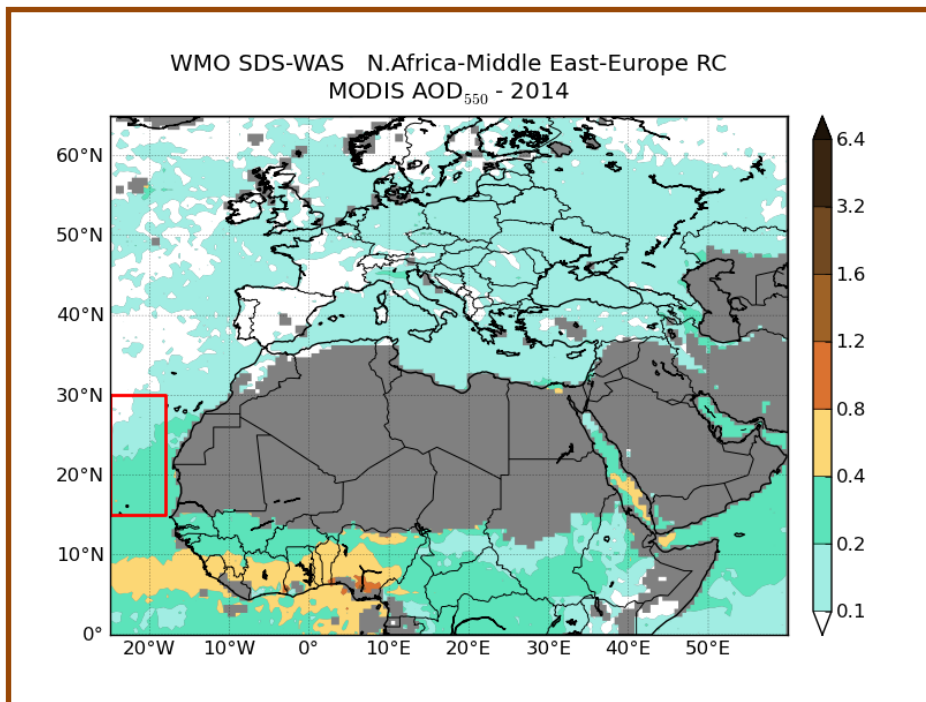
- Bias
- RMSE
- Correlation coefficient
- FGE

Monthly  
Seasonal  
Yearly

2014



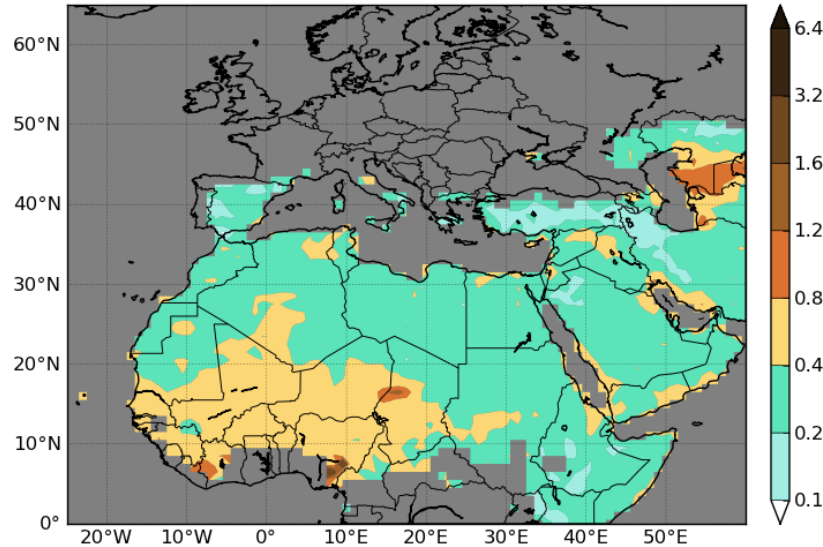
# Evaluation with MODIS data



	BIAS	ROOT MEAN SQUARE ERROR	CORRELATION COEFFICIENT	FRACTIONAL GROSS ERROR	NUMBER OF CASES
<b>BSC_DREAM8b</b>	<b>-0.14</b>	<b>0.20</b>	<b>0.72</b>	<b>1.07</b>	<b>22154</b>
<b>NMMB/BSC-Dust</b>	<b>-0.13</b>	<b>0.18</b>	<b>0.79</b>	<b>1.09</b>	<b>22154</b>
<b>NCEP NGAC</b>	<b>0.04</b>	<b>0.15</b>	<b>0.81</b>	<b>0.59</b>	<b>21608</b>
<b>EMA RegCM4</b>	<b>-0.04</b>	<b>0.37</b>	<b>0.26</b>	<b>1.09</b>	<b>13300</b>
<b>DREAMABOL</b>	<b>-0.04</b>	<b>0.17</b>	<b>0.69</b>	<b>0.92</b>	<b>13611</b>

# Evaluation with MODIS Deep Blue

WMO SDS-WAS N.Africa-Middle East-Europe RC  
MODIS DEEPBLUE AOD<sub>550</sub> - 2014



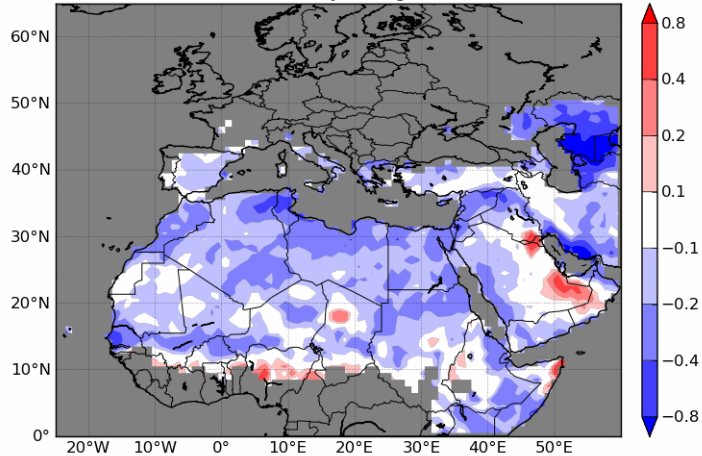
Daily level 3 product  
Collection 5.1 → Col. 6 (1 Dec 2014)  
1 x 1 deg. Resolution  
Angstrom exp. < 1.0

	BIAS	ROOT MEAN SQUARE ERROR	CORRELATION COEFFICIENT	FRACTIONAL GROSS ERROR	NUMBER OF CASES
<b>BSC_DREAM8b</b>	<b>-0.14</b>	<b>0.29</b>	<b>0.36</b>	<b>0.84</b>	<b>336894</b>
<b>NMMB/BSC-Dust</b>	<b>-0.13</b>	<b>0.31</b>	<b>0.44</b>	<b>0.95</b>	<b>336894</b>
<b>NCEP NGAC</b>	<b>-0.03</b>	<b>0.26</b>	<b>0.48</b>	<b>0.64</b>	<b>332566</b>
<b>EMA RegCM4</b>	<b>0.36</b>	<b>0.77</b>	<b>0.26</b>	<b>0.94</b>	<b>213819</b>
<b>DREAMABOL</b>	<b>-0.02</b>	<b>0.30</b>	<b>0.34</b>	<b>0.79</b>	<b>225717</b>

# Evaluation with MODIS Deep Blue

## NMMB-BSC/Dust

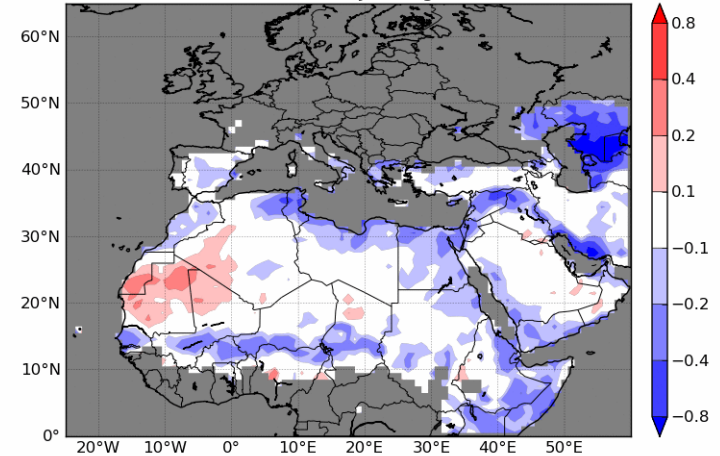
WMO SDS-WAS N.Africa-Middle East-Europe RC  
NMMB-BSC/Dust - Jun/Aug 2013 - bias



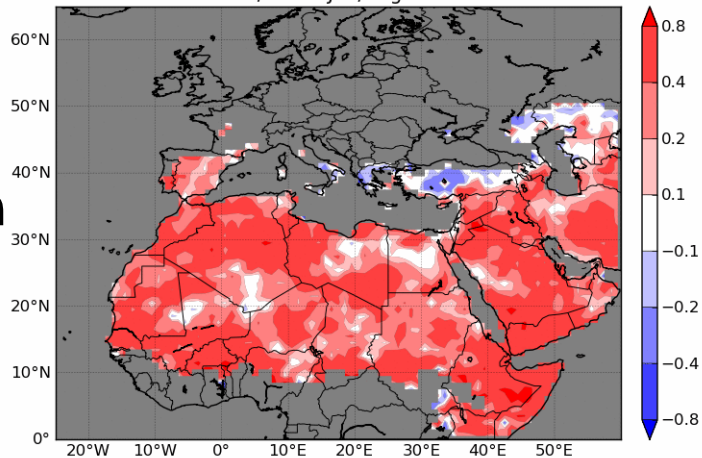
bias

## Multimodel MEDIAN

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

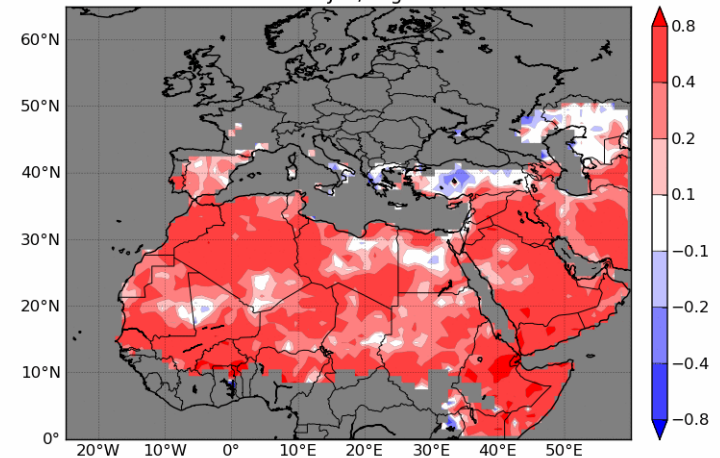


WMO SDS-WAS N.Africa-Middle East-Europe RC  
NMMB-BSC/Dust - Jun/Aug - correlation



correlation

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

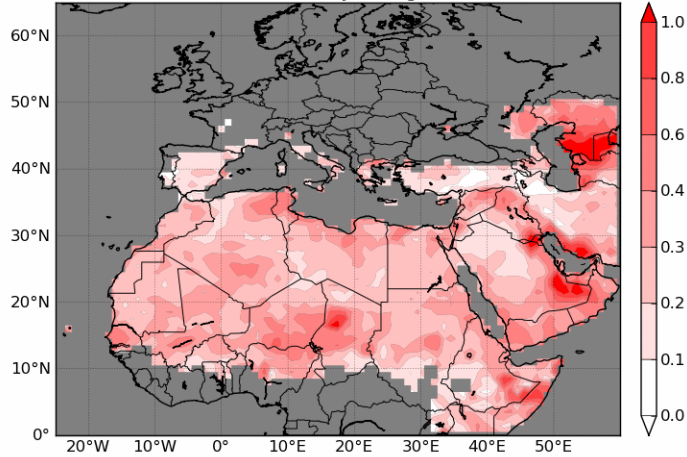


# Evaluation with MODIS DB

rmse

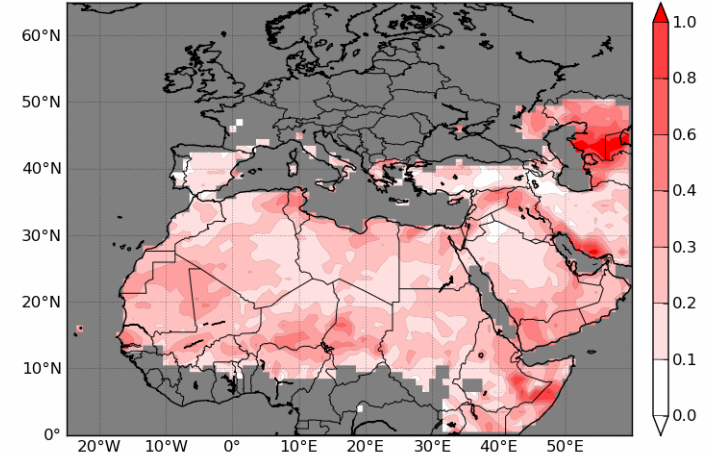
## NMMB-BSC/Dust

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



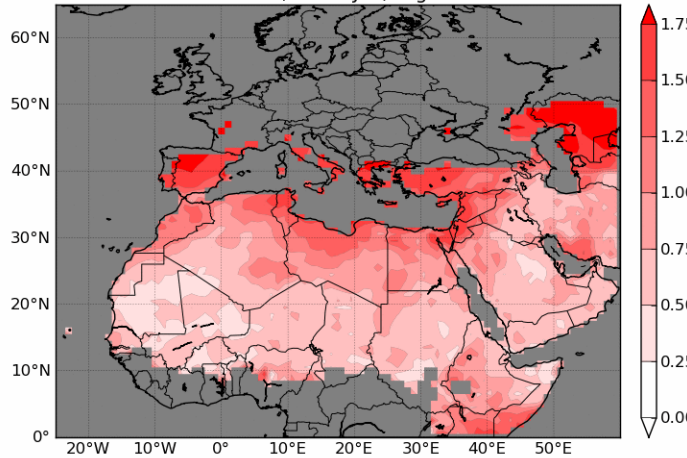
## Multimodel MEDIAN

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

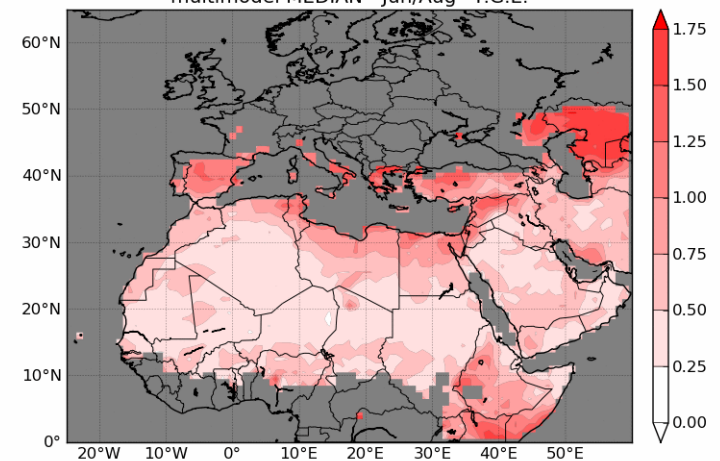


FGE

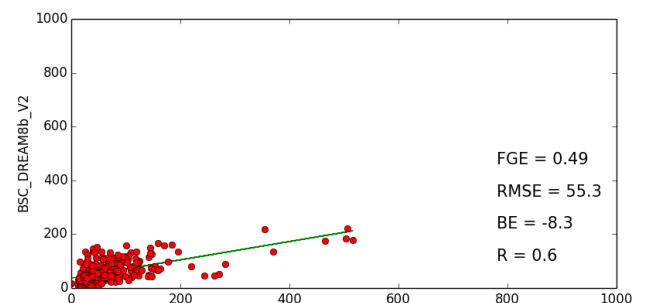
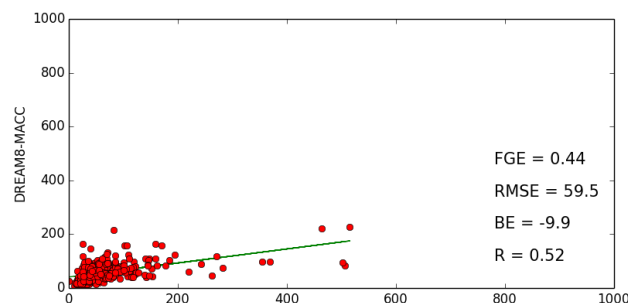
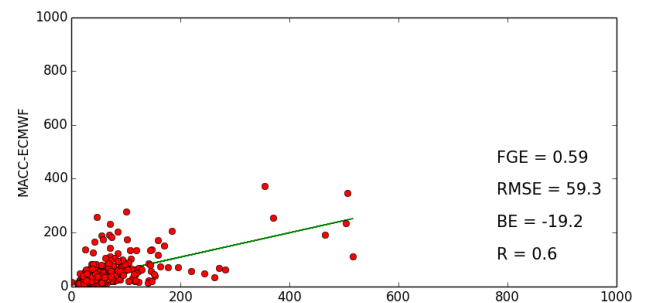
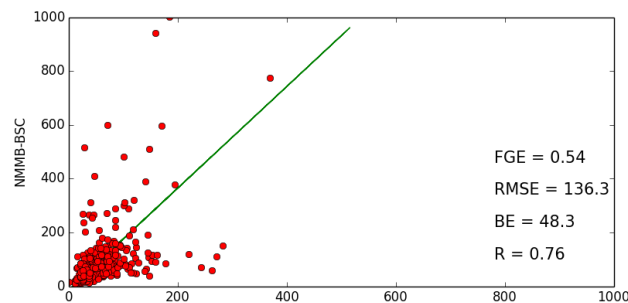
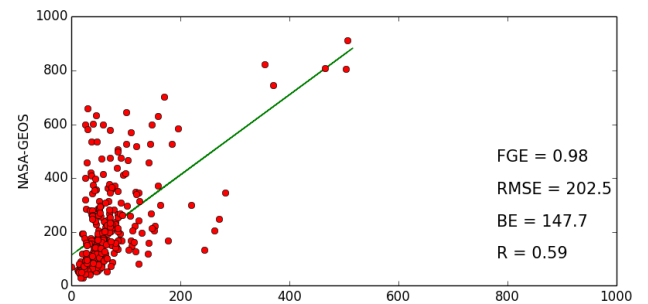
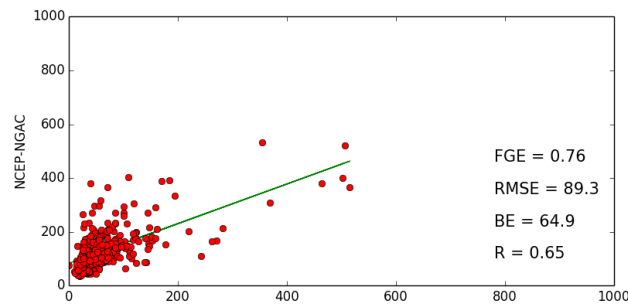
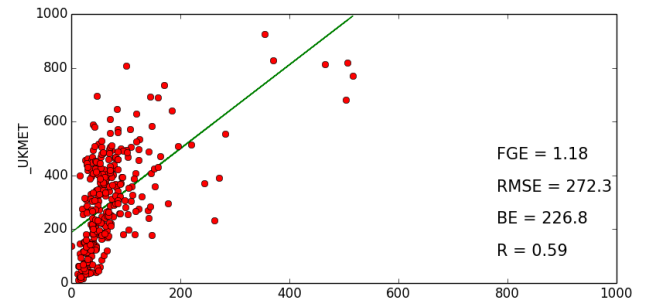
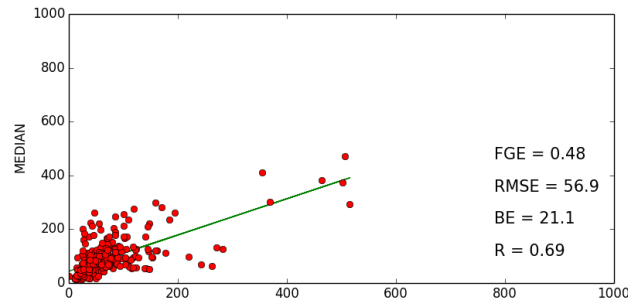
WMO SDS-WAS N.Africa-Middle East-Europe RC  
NMMB-BSC/Dust - Jun/Aug - F.G.E.



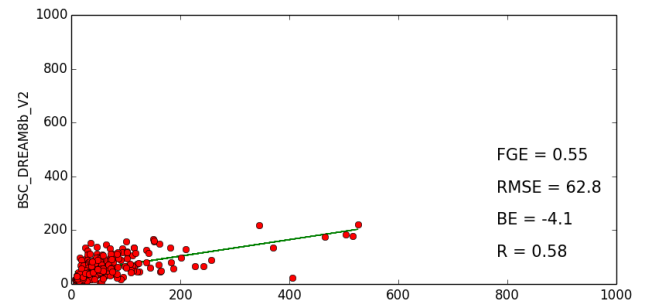
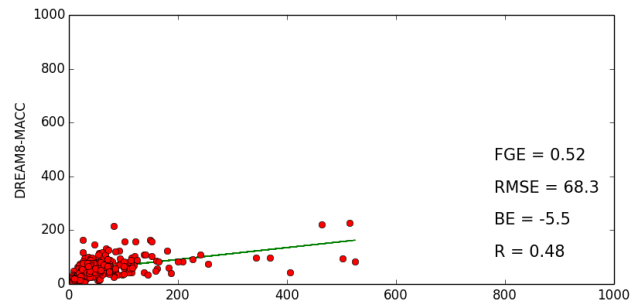
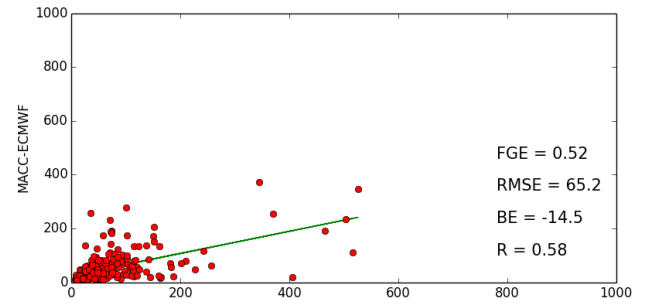
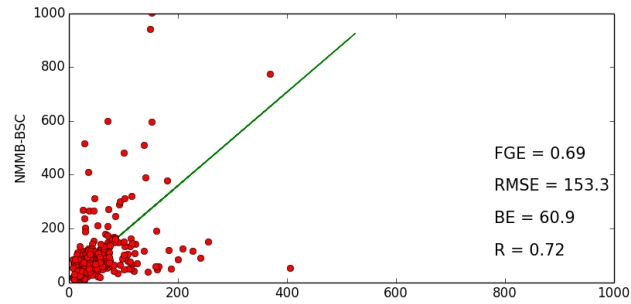
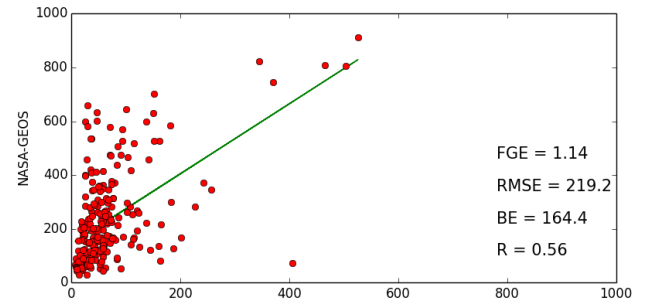
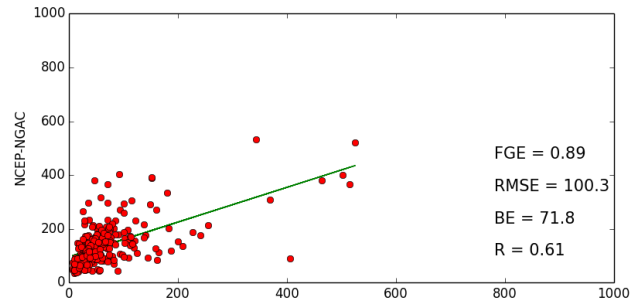
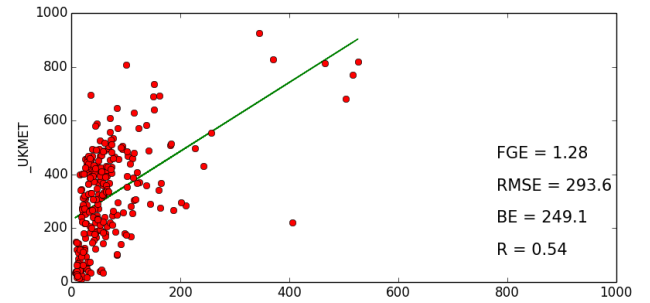
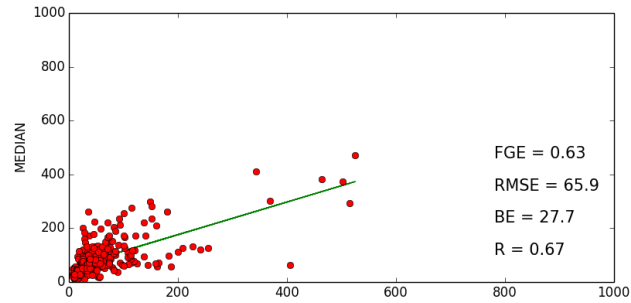
WMO SDS-WAS N.Africa-Middle East-Europe RC  
multimodel MEDIAN - Jun/Aug - F.G.E.



# Evaluation with PM data in the Sahel



# Evaluation with PM data in the Sahel



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# Barcelona Dust Forecast Center

WMO Regional Specialized Meteorological Center with activity specialization on Atmospheric sand and Dust Forecast

The screenshot shows the website for the Barcelona Dust Forecast Center. At the top, there is a navigation menu with links for HOME, FORECAST, EVALUATION, OTHER PRODUCTS, METHODS, NEWS, EVENTS, ABOUT US, and CONTACT. Below the menu, there is a 'NEWSLETTER' section with a form to subscribe, including fields for 'Full Name' and 'Your email', and a 'Subscribe' button. To the right of the newsletter form, there is a section titled 'Dust forecasts available on the WMO Global Telecommunications System' with a 'Read More' link. Below this, there is a 'SEARCH' section with a search box and a 'SEARCH' button. The main content area features a 'HOME' section with a list of links: Forecast, Evaluation, Other products, Methods, News, Events, About us, and Contact. Below the home section, there is a 'LATEST NEWS' section with three news items, each with a date and a 'Check it here' link. The first news item is about a 4th Training Course on WMO SDS-WAS products, dated Oct 14, 2014. The second is about the book 'Mineral Dust - A key player in the Earth system' that has been released, dated Feb 03, 2014. The third is about dust forecasts available on the WMO Global Telecommunications System, dated Aug 16, 2014. Below the news section, there is an 'UPCOMING EVENTS' section with one event: 4th Training Course on WMO SDS-WAS products, dated Nov 17, 2014. At the bottom of the page, there is a calendar for October 2014 and social media icons for RSS, NEWS, EVENTS, LinkedIn, and Twitter.

## STARTING FEBRUARY 2014:

- Dust forecast (6 parameters, up to 72 h)
- Forecast evaluation with AERONET data (NRT and monthly, seasonal, annual scores)
- Monthly-averaged values

<http://dust.aemet.es>  
[dust@aemet.es](mailto:dust@aemet.es)



GOBIERNO  
DE ESPAÑA

MINISTERIO  
DE MEDIO AMBIENTE  
Y MEDIO RURAL Y MARINO

AEMet  
Agencia Estatal de Meteorología



Barcelona  
Supercomputing  
Center



Centro Nacional de Supercomputación



# Barcelona Dust Forecast Center – NMMB/BSC-Dust

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**BARCELONA DUST FORECAST CENTER**


 

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NEWSLETTER

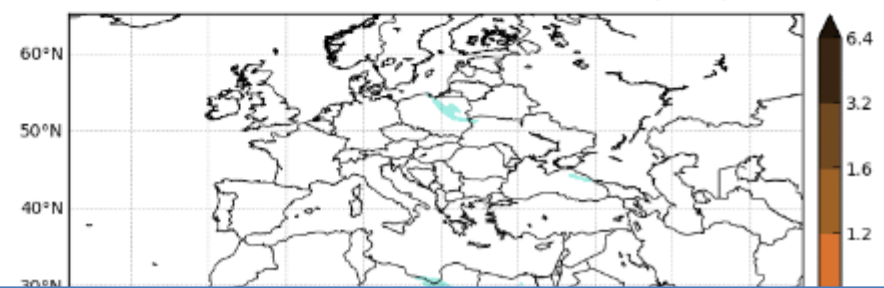
You are here: [Home](#) / [Forecast](#)

**Dust Optical Depth**

Date: 2014-12-03  H+ anim Variable: Dust Optical Depth

[The NMMB/BSC-Dust model](#)

Barcelona Dust Forecast Center  
NMMB/BSC-Dust Res:0.1°x0.1° Dust AOD  
Run: 12h 03 DEC 2014 Valid: 12h 05 DEC 2014 (H+48)



60°N  
50°N  
40°N  
30°N

6.4  
3.2  
1.6  
1.2

NMMB/BSC-Dust is the model that has been selected to generate operational dust forecasts

# Barcelona Dust Forecast Center – Dissemination

BARCELONA DUST FORECAST CENTER

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06/10/2014

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16/09/2014

Dust forecasts available on the WMO Global Telecommunications System

Aug 19, 2014

UPCOMING EVENTS

4th Training Course on WMO SDP/MS products

06/10/2014

→ Click on the Photos

OCTOBER 2014

Mo Tu We Th Fr Sa Su

1 2 3 4 5

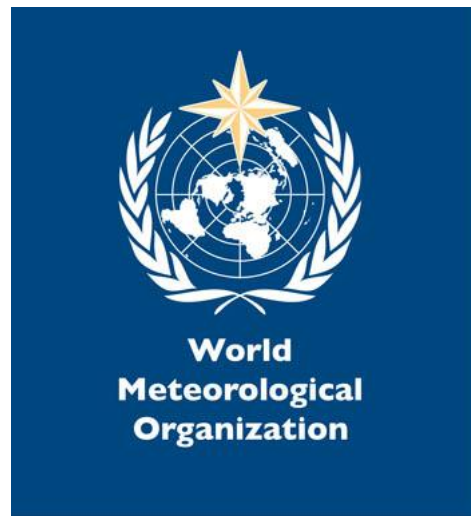
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13 14 15 16 17 18 19

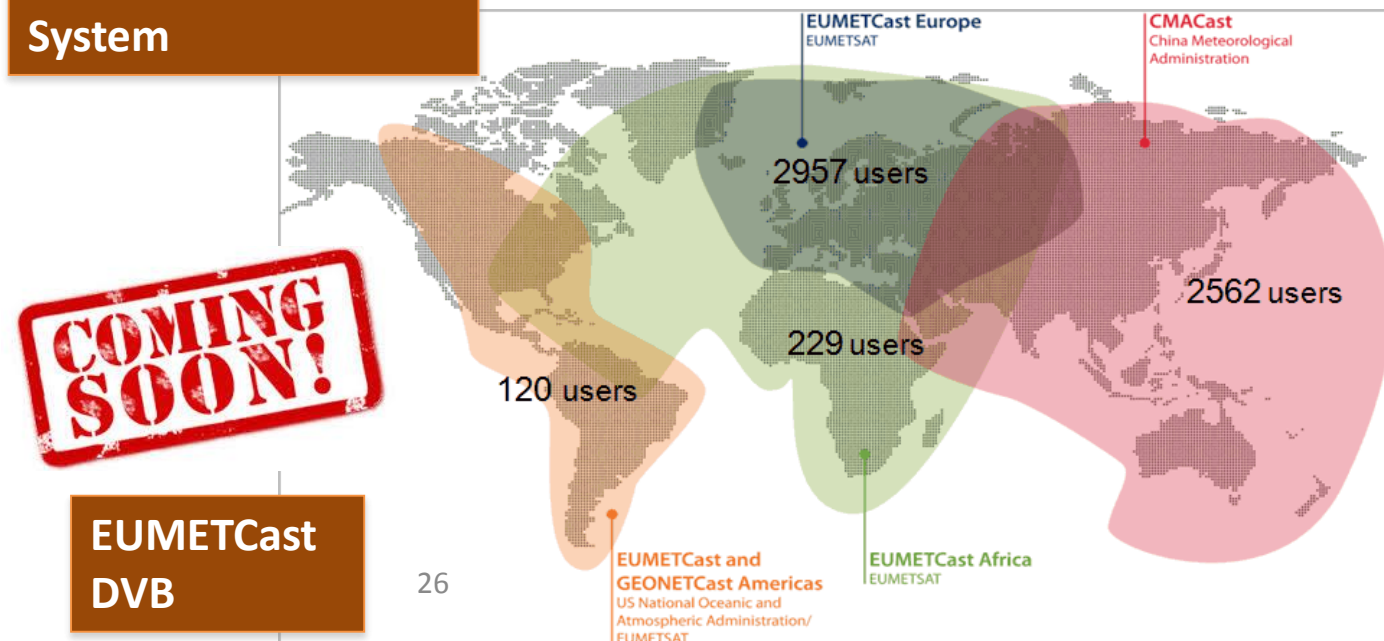
20 21 22 23 24 25 26

27 28 29 30 31 1 1

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**WMO Global Telecommunications System**



**COMING SOON!**

**EUMETCast DVB**

# Thanks for your attention

## WMO SDS-WAS Regional Center for Northern Africa, Middle East and Europe

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## Barcelona Dust Forecast Center

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