World Meteorological Organization

Working together in weather, climate and water

WMO

WMO Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS)

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WMO Research Department

4th Training Course on WMO SDS-WAS products (satellite and ground observation and modelling of atmospheric dust)
17-20 November 2014, Casablanca, Morocco

WMO-WWRP/GAW Sand and Dust Storm Warning Advisory and Assessment System SDS-WAS

Mission

To enhance the ability of countries to deliver timely and quality sand and dust storm forecasts, observations, *information and knowledge* to users through an international partnership of research and operational communities

Pre-SDS-WAS history

- **Late 80'es:**
  - First demonstration that SDS dynamic simulations are possible

- **90'es:**
  - First satellite products capable to detect SDS
  - First successful daily SDS forecast test
  - First long-term daily SDS forecasts

- **2000's:**
  - Fast developments in dust observations and forecasting models
  - First tests of data assimilation in SDS forecasting

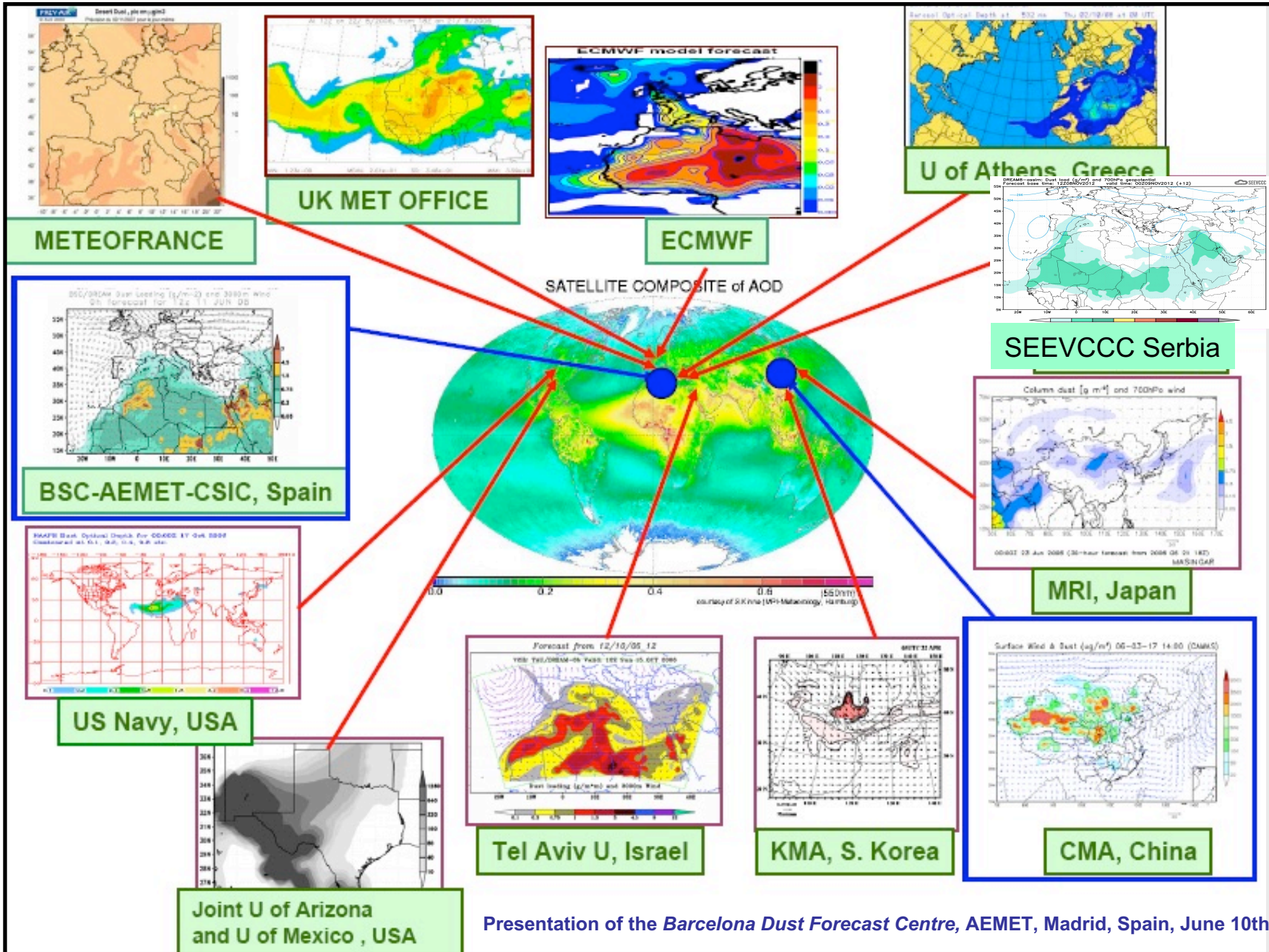
Brief SDS-WAS history

- **2004:** Beijing, China: International Symposium on SDS & a WMO Experts **Workshop** on SDS.
- **2005: More than 40 Member countries indicated interest to cooperate in SDS-WAS**.
- **2007: the 14th WMO Congress** endorsed launching of the SDS-WAS.
- **2008: the 60th EC of WMO** welcomed the establishment of the two SDS-WAS regional centres in China and Spain in support of the corresponding SDS-WAS nodes.
- **2009-2014: A series of workshops** within the SDS-WAS in: Barcelona (Spain), Niamey, (Niger), Ankara (Turkey), Antalya (Turkey), Tsukuba (Japan), Seoul (Korea), Teheran (Iran), Belgrade (Serbia), Kuwait City (Kuwait), Manama (Bahrain), Castellaneta Marina (Italy).
- **2014: Opening the Barcelona Dust Forecast Centre** - 1st WMO Operational Dust Prediction Centre

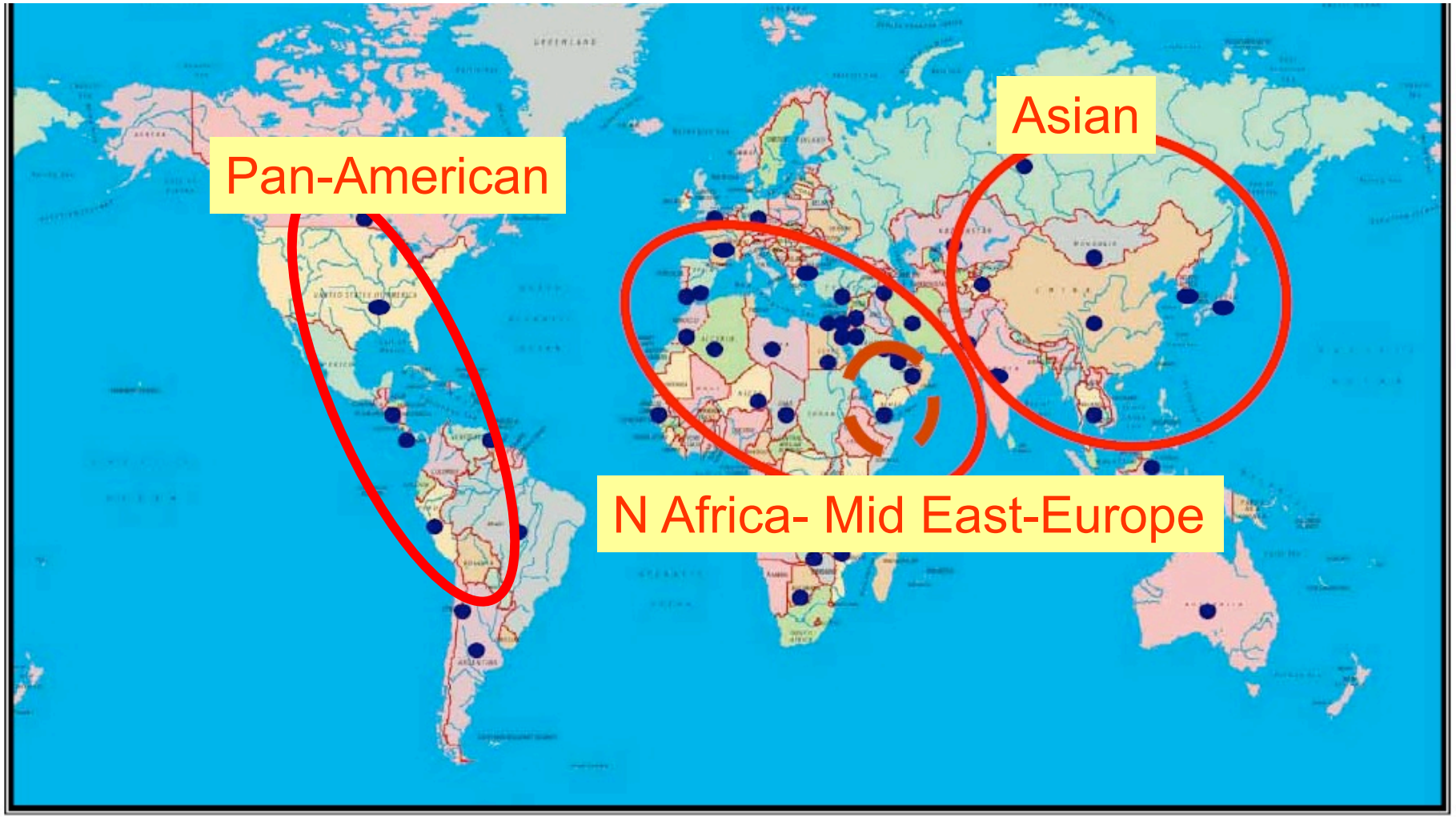
Why SDS-WAS

- Human Health (asthma, infections, meningitis in Africa, valley fever in the America's)
- Agriculture (negative & positive impacts)
- Marine productivity
- Aviation (air disasters)
- Ground Transportation
- Industry (Semi-conductor, Tourism, etc)

Dust forecasting systems



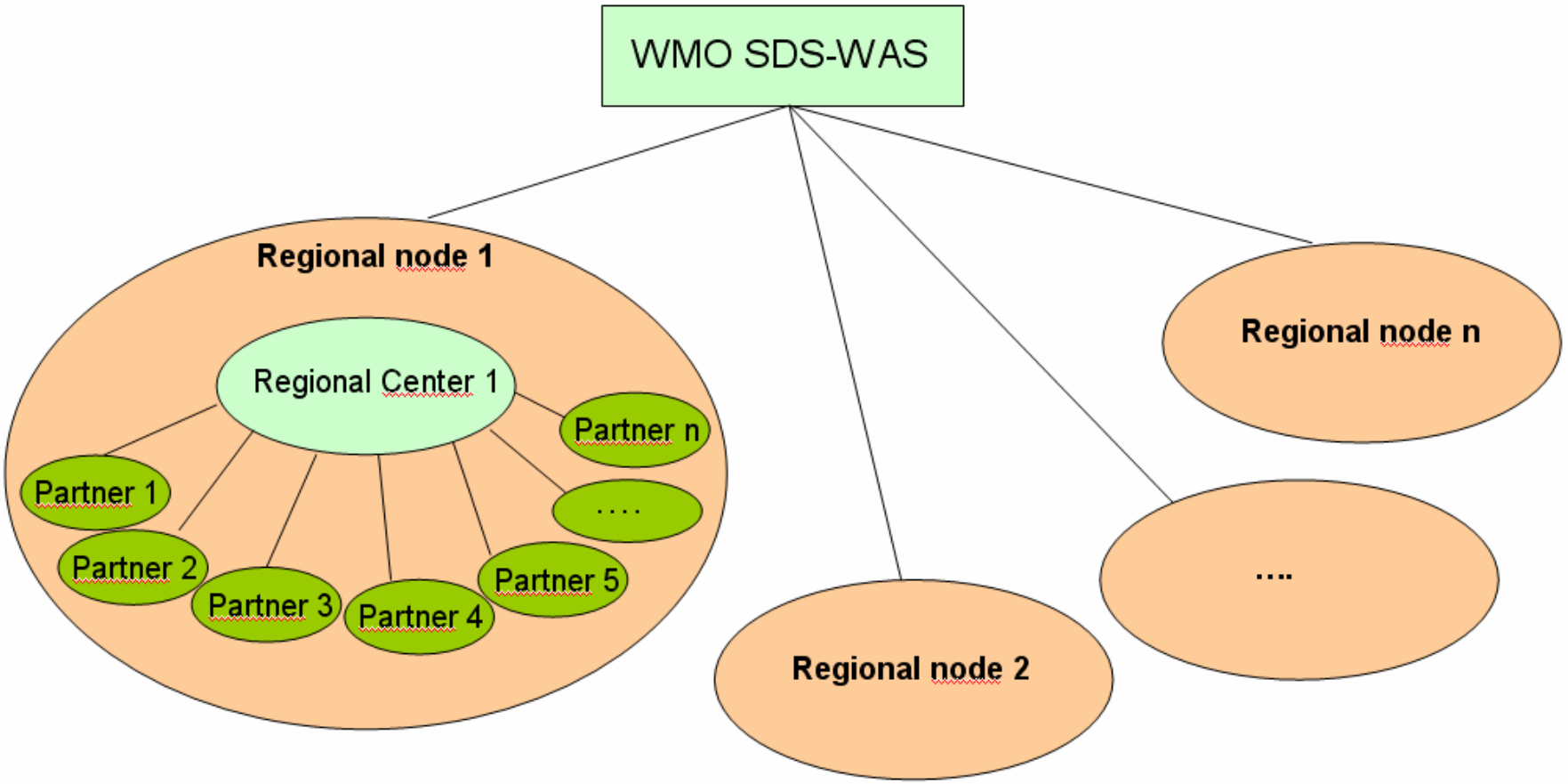
SDS-WAS Activity Nodes:
Countries expressed interest to cooperate (40+)



SDS-WAS regional nodes established by 2014:

- Regional Node for Asia, coordinated by a Regional Center hosted by the CMA (Beijing, China),
- Regional Node for Northern Africa, Middle East and Europe (NA-ME-E), coordinated by the Regional Centre as a consortium of the Spanish State Meteorological Agency (AEMET), and the Barcelona Supercomputing Center – National Supercomputing Center (BSC-CNS),
- Pan-American Regional Node hosted by the Chapman University / Arizona University (USA).

SDS-WAS: Federated System



N African – Middle East – European Node

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Latest News

The U.K. Met Office dust product is available again

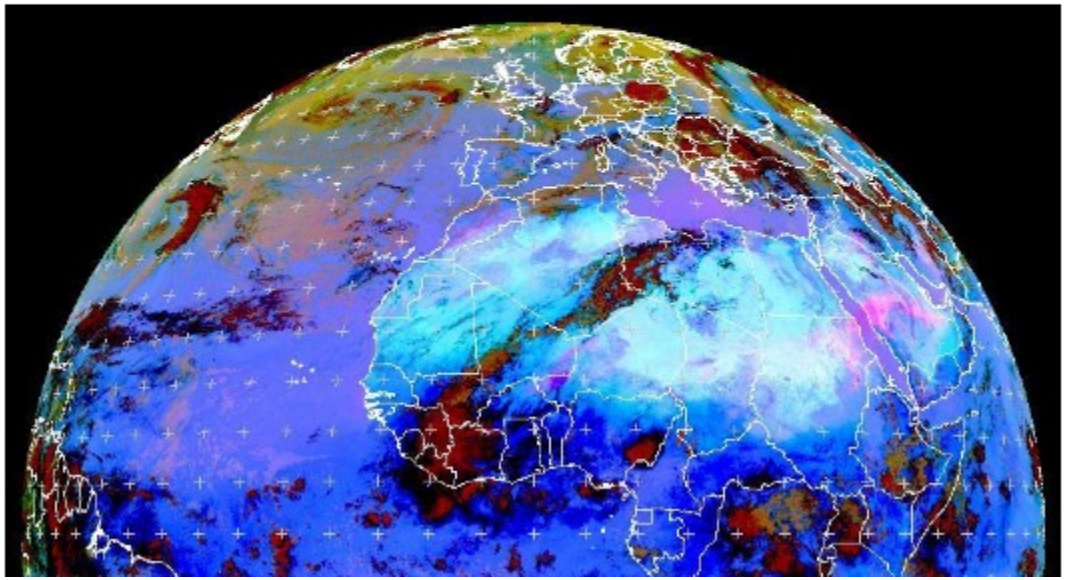
May 03, 2011

You are here: Home

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

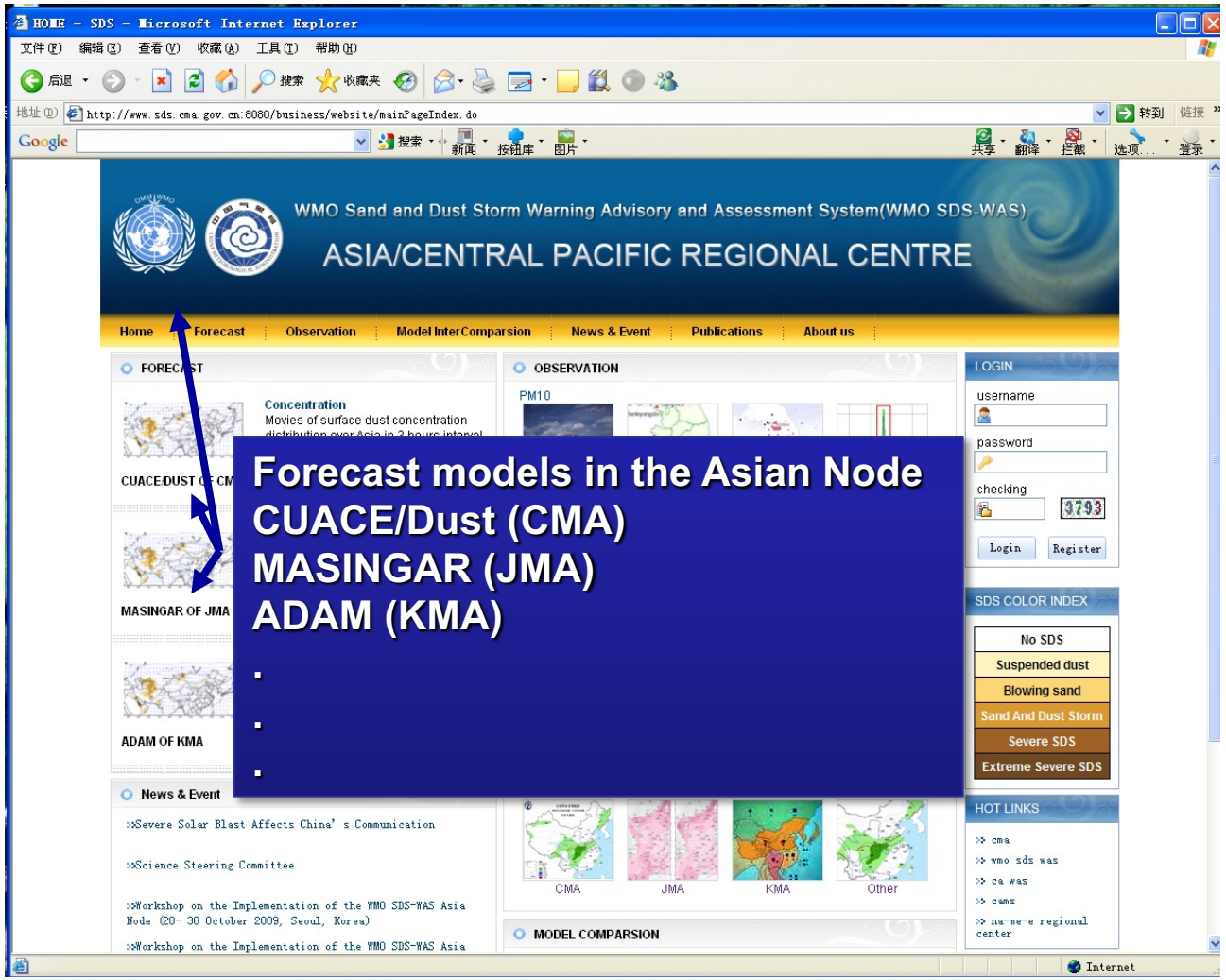
by admin — last modified Mar 14, 2011 06:05 PM

LATEST RGB dust image (courtesy of EUMETSAT)



http://sds-was.aemet.es

Asian Node



http://www.sds.cma.gov.cn

WMO Sand and Dust Storm Warning Advisory and Assessment System(WMO SDS-WAS)

ASIA/CENTRAL PACIFIC REGIONAL CENTRE

ome | Forecast | Observation | Model InterComparsion | News & Event | Publications | About us

CMA
- Concentration
- Stations
- Flux
- Deposition
- Forecast Information

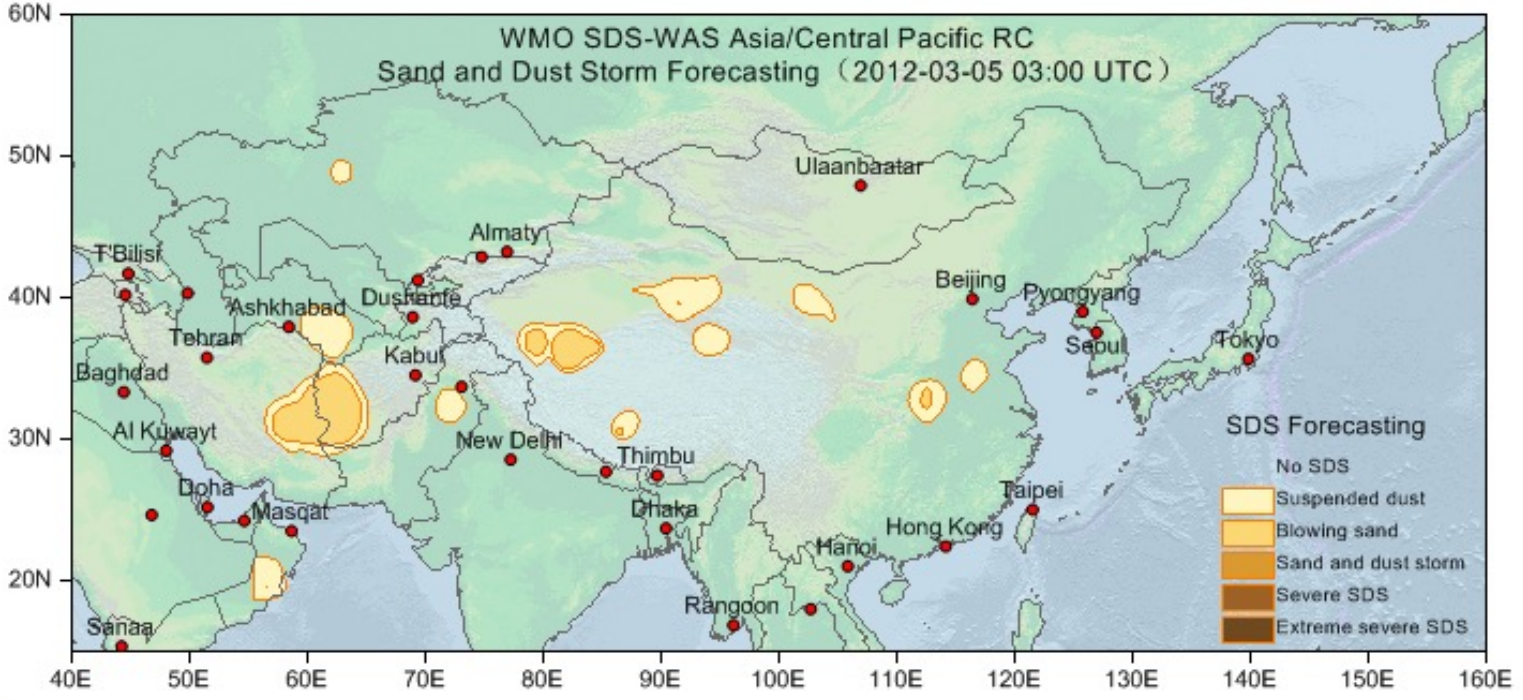
JMA
- To be decided

KMA
- To be decided

Data Sharing
- Output of CUACE/Dust

Concentration

dust110425 08 to submit Play prve next



dust110425 08:00 | dust110424 20:00 | dust110424 08:00 | dust110423 08:00 | dust110422 08:00 | dust110421 08:00 | dust110

Web portal of Asian Node Centre
http://www.sds.cma.gov.cn

Operational dust forecast continuously throughout the year on a daily basis

Suggestions of Asian-node

Presented by Sang-Sam Lee and Keiya Yumimoto

- We plan to boost up the activities of SDS-WAS Asian node soon (from Dr. Mikami, chairperson)

- We'd like to ask you to provide global ensemble model results produced by WMO SDS-WAS NA-ME-E node for East Asia region. It will be very helpful for the data assimilation treatment and IC/BC set-up of Asian models(mostly Regional model).

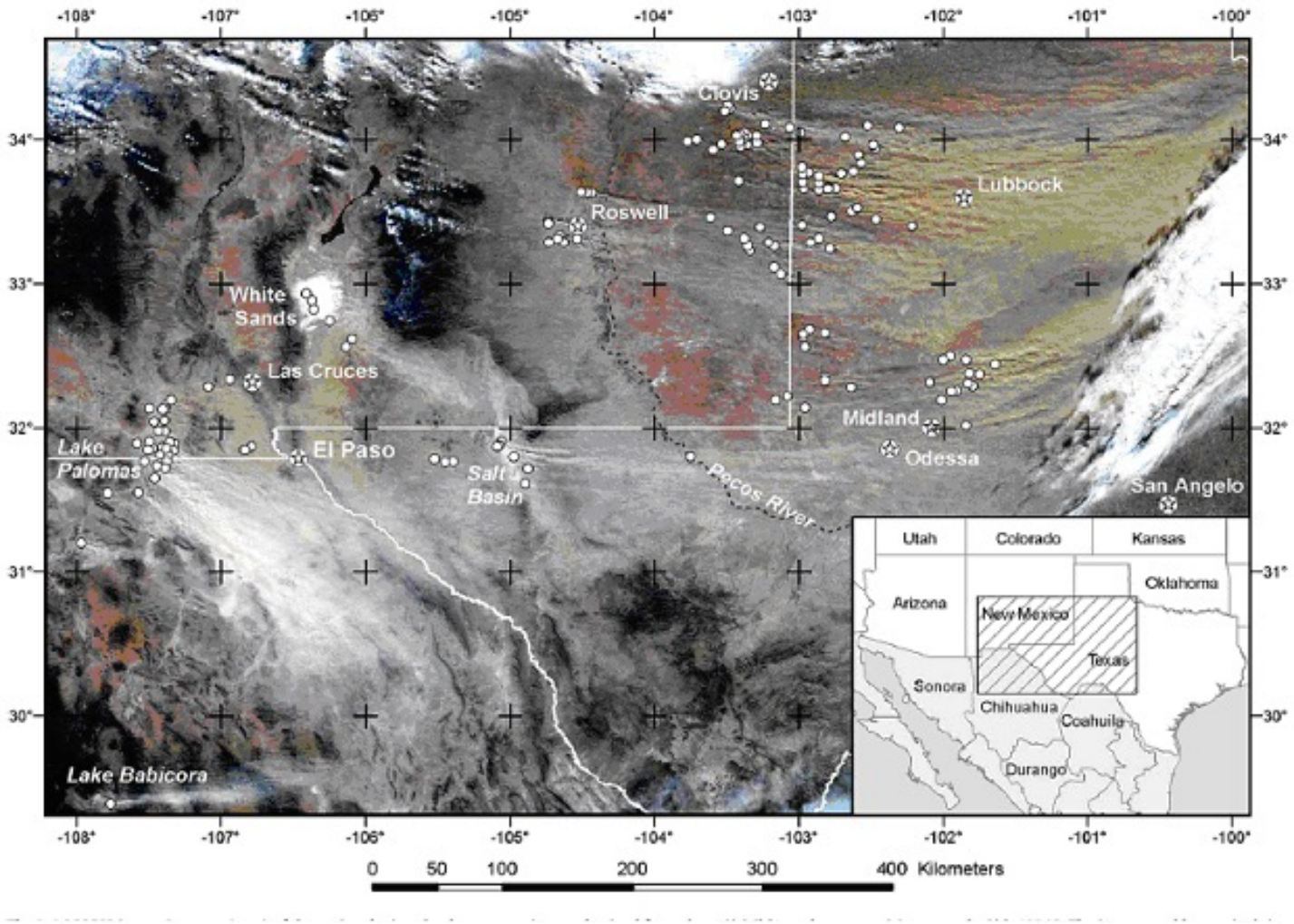
- We'd also like to encourage NA-ME-E node participation in model intercomparison for East Asia region. Through this activity,

  - we can share observation data in East Asia for model validation
  - we can do knowledge sharing for dust/aerosol modelling
  - we believe that model performance will be greatly enhanced.

Pan-American Node

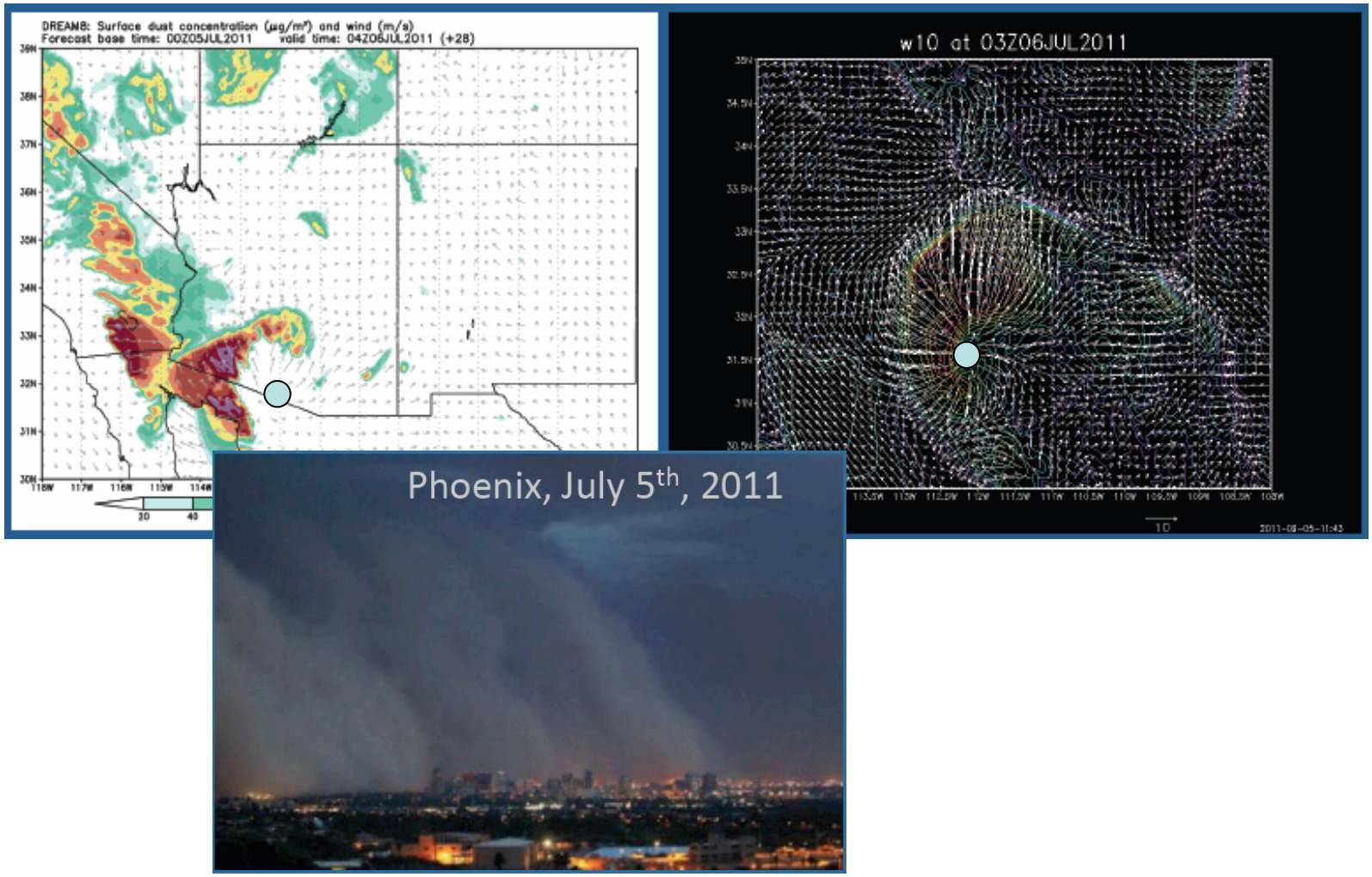
in construction

Dust hot spots in the SW USA



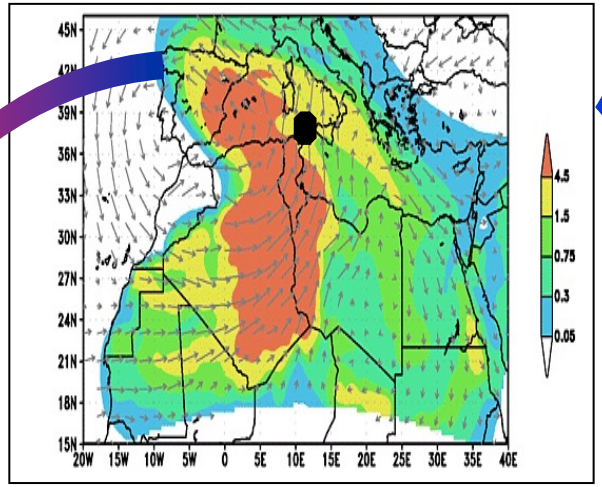
3.5 km model simulation - Phoenix haboob (Pan-American Node)

(a)

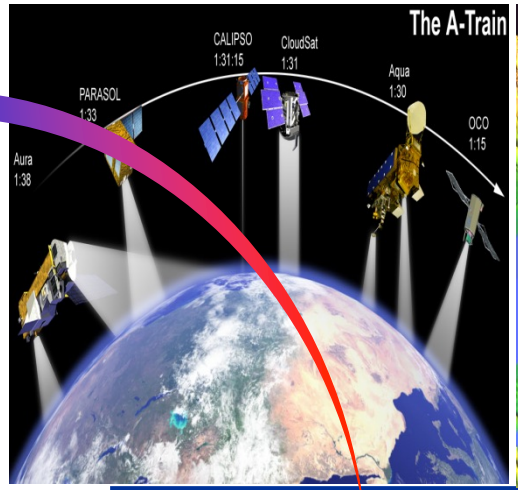


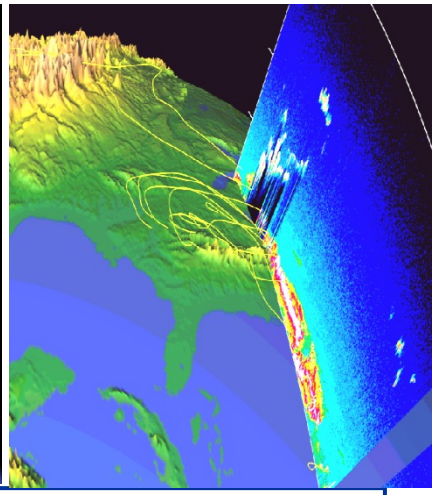
WMO Supported Aerosol and Weather Prediction Research

Forecast Models

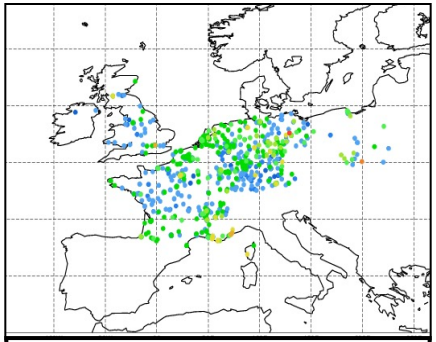


18 UTC, 7 May 2002 30-hr forecast

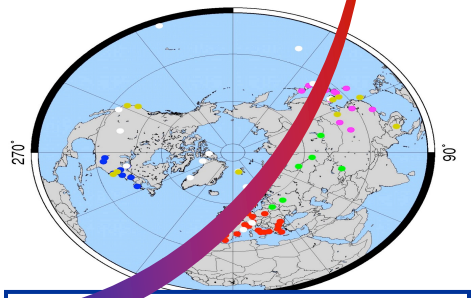




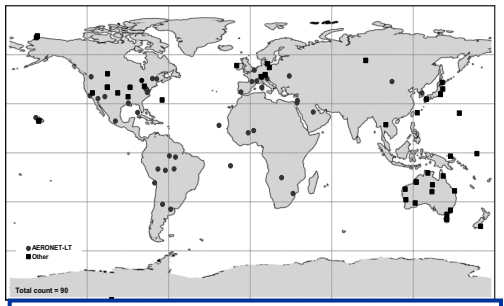
NASA A-Train MODIS CALIPSO
&
Geostationary Satellite IR Obs



European PM10



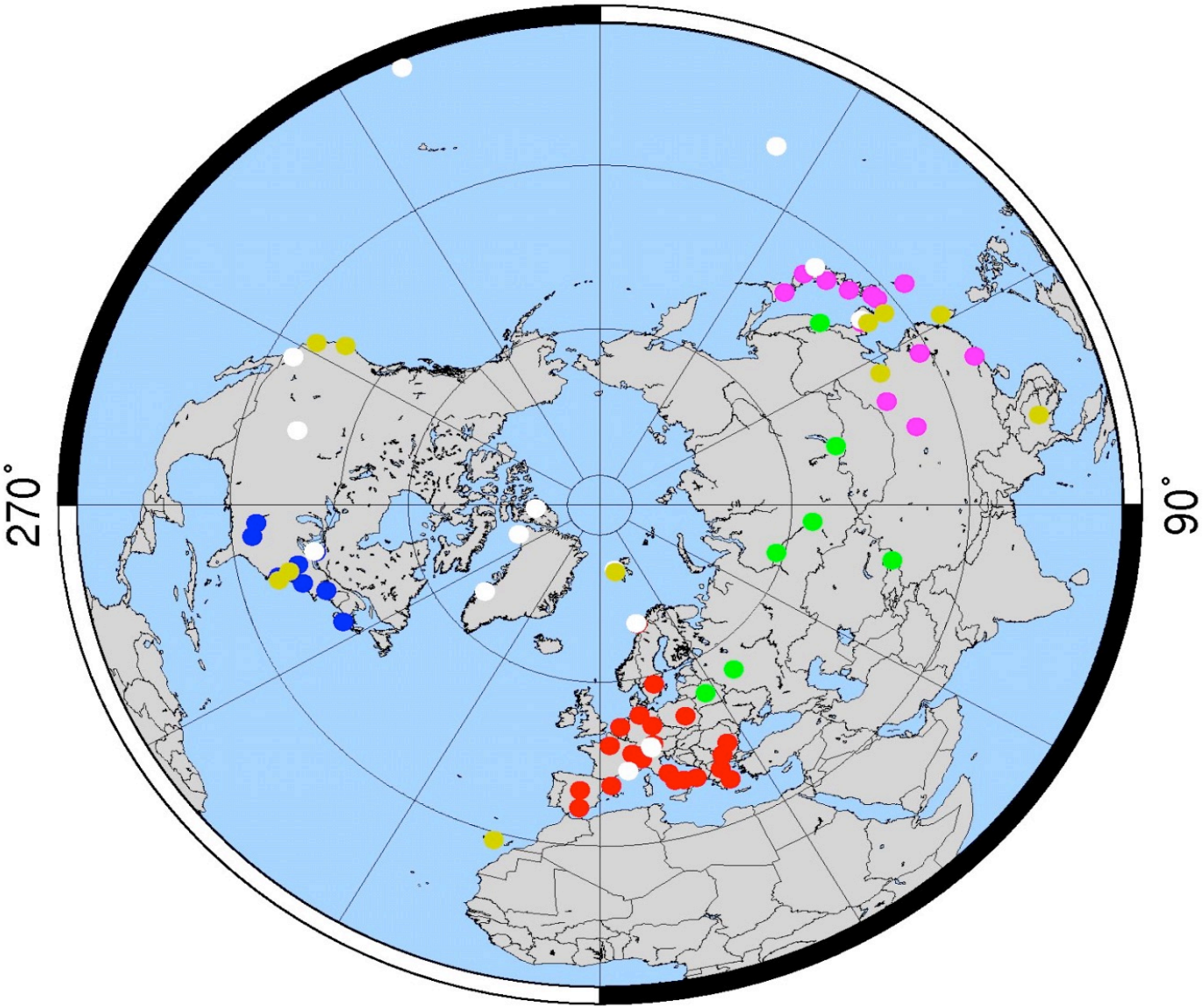
GALION
Surface-based LIDAR



GAW/AERONET/SKYNET
Surface-based AOD

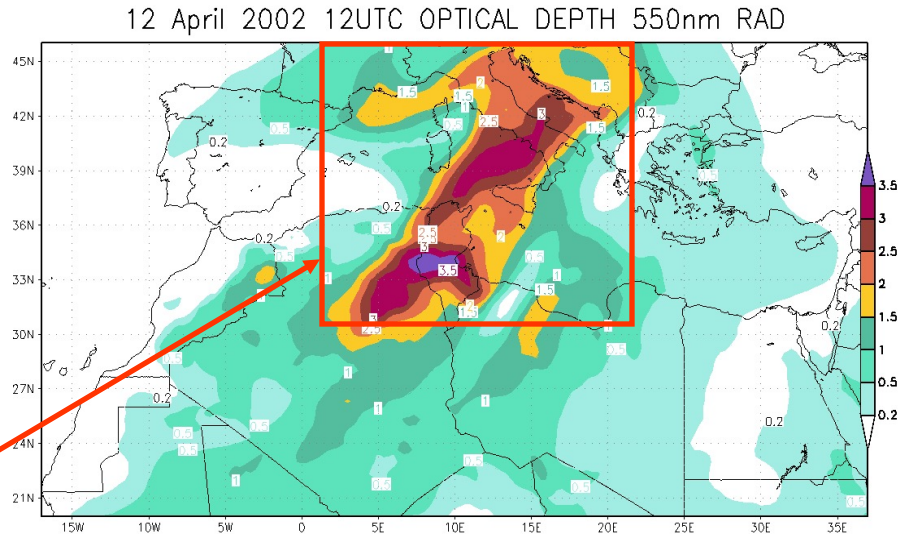
GAW Aerosol Lidar Network (GALION)
Northern Hemisphere

AD-NET violet,
ALINE yellow,
CISLiNet green,
EARLINET red,
MPLNET brown,
NDACC white,
REALM blue

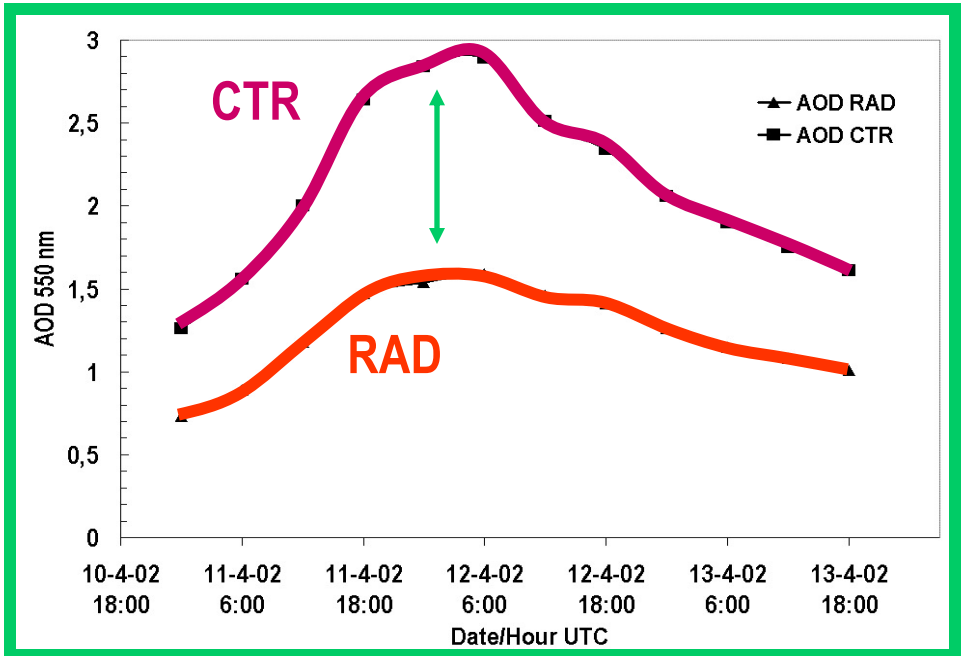


DUST NEGATIVE FEEDBACK

35-45 % reduction of the average AOD over the area covered by the main dust plume



Strong negative feedback upon dust emission by dust radiative forcing



From Slobodan Nickovic

European Cooperation in the field of Scientific and Technical Research

www.cost.esf.org

Action COST ES1004

European framework for online integrated air quality and meteorology modelling (EuMetChem)

ESSEM

www.eumetchem.info

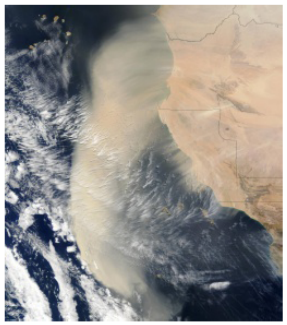
COST countries: AT, BG, CH, DE, DK, EE, ES, FI, FR, GB, GR, HU, IL, IT, MT, NL, NO, PL, SE

Chair of the Action: Alexander Baklanov, DMI, Denmark, alb@dmi.dk

Co-Chairs: Sylvain Joffre, FMI, Finland; **Heinke Schluenzen**, Uni Hamburg, Germany

COST Science Officer: Stefan Stueckrad, sstueckrad@cost.esf.org




The overall objective is to set up a multi-disciplinary forum for online integrated air quality/meteorology modelling and to elaborate an European strategy for an integrated ACT/NWP-CLIM modelling capability/framework.

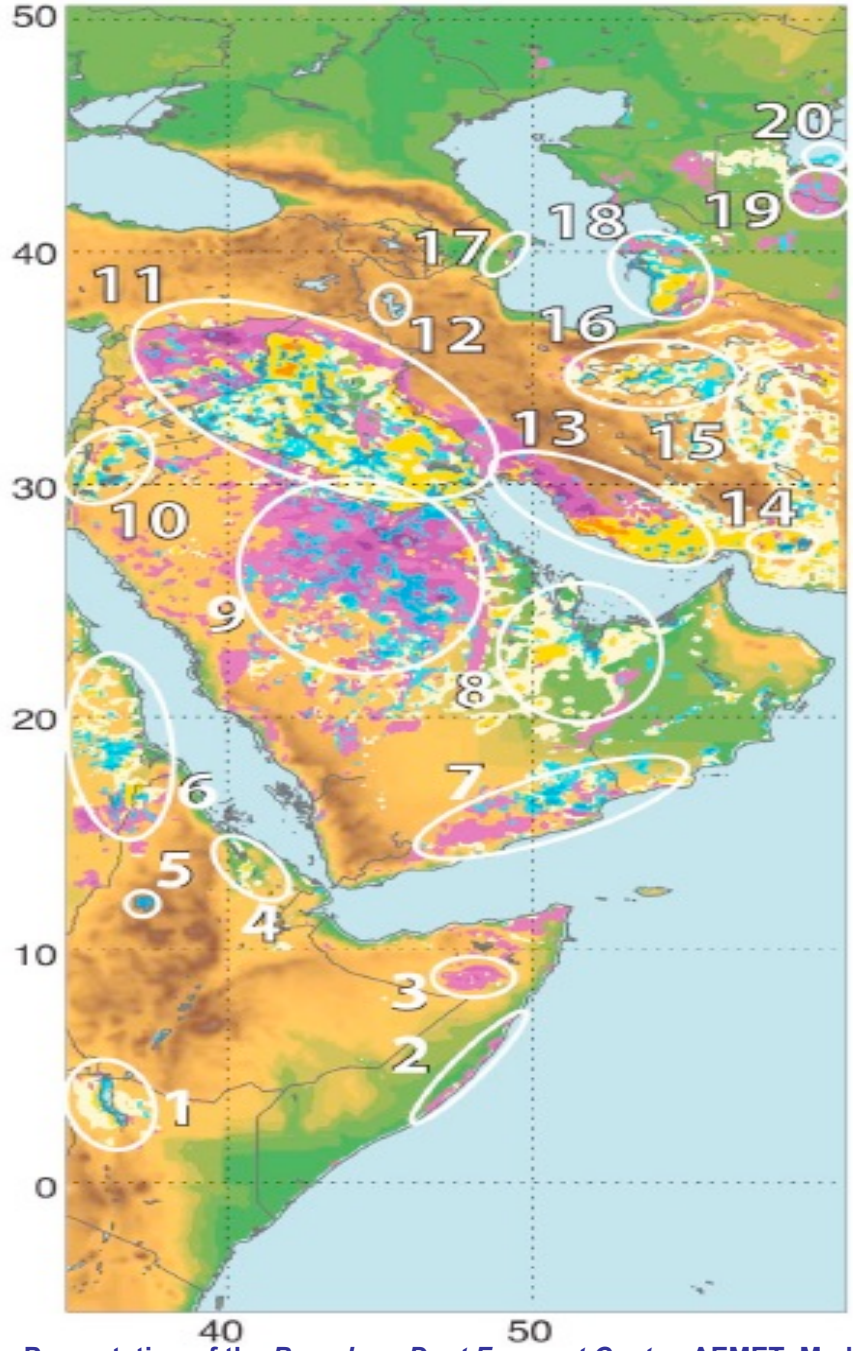
Benefits for the Society

This European action (involving also key American experts) will enable the EU to develop world class capabilities in integrated ACT/NWP-RCM modelling systems, including research, education and forecasting. More than 40 teams from 19 European COST countries, as well as ECMWF, JRC, WMO, US EPA, NOAA, etc. are already involved in the Action. In detail the action will contribute to

- a better forecasting of severe weather events and their consequences (forest fires, dust storms, flooding, volcano eruption, etc.)
- the reduction of detrimental combined health

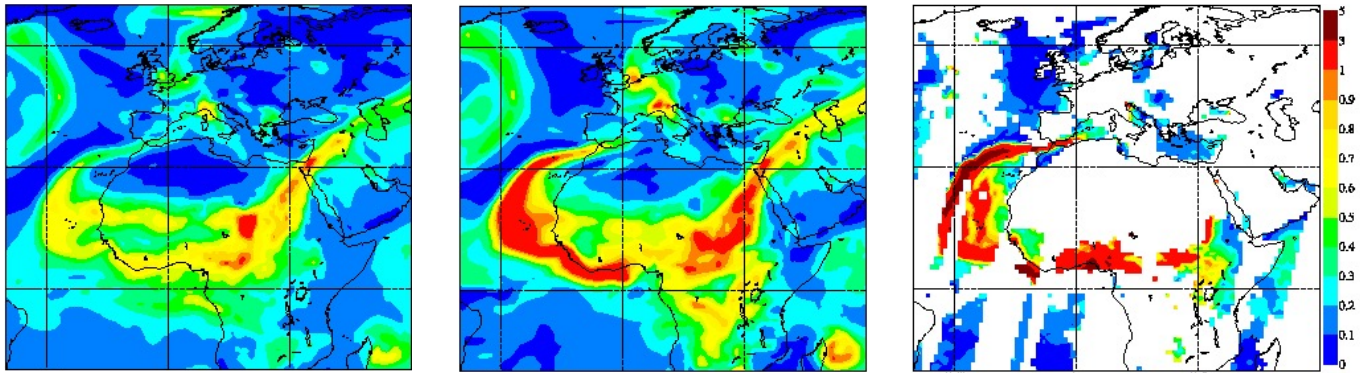
The Action aims towards a new generation of online integrated Atmospheric Chemical Transport (ACT) and Meteorology modelling systems (NWP and RCM) using two-way interactions between different atmospheric processes including chemistry, clouds, radiation, boundary layer, emissions, meteorology and climate (Fig. 1). The Action intends to consider at least two application areas of integrated modelling:
i.improved numerical weather prediction (NWP) and chemical weather forecasting (CWF) with short-term feedbacks of aerosols and chemistry on meteorological variables,
ii.two-way interactions between atmospheric pollutions / composition and climate variability / change.

The action covers four working groups:
WG1 Strategy and framework for online integrated modelling (coordinated by Peter Suppan, Jose Baldasano),
WG2 Interactions, parameterisations and feedback mechanisms (coordinated by Michael Gauss),
WG3 Chemical data assimilation in integrated models (coordinated by Christian Seigneur),
WG4 Evaluation, validation, and applications (coordinated by Heinke Schluenzen, Dominic Brunner, Pavlos Kassomenos).

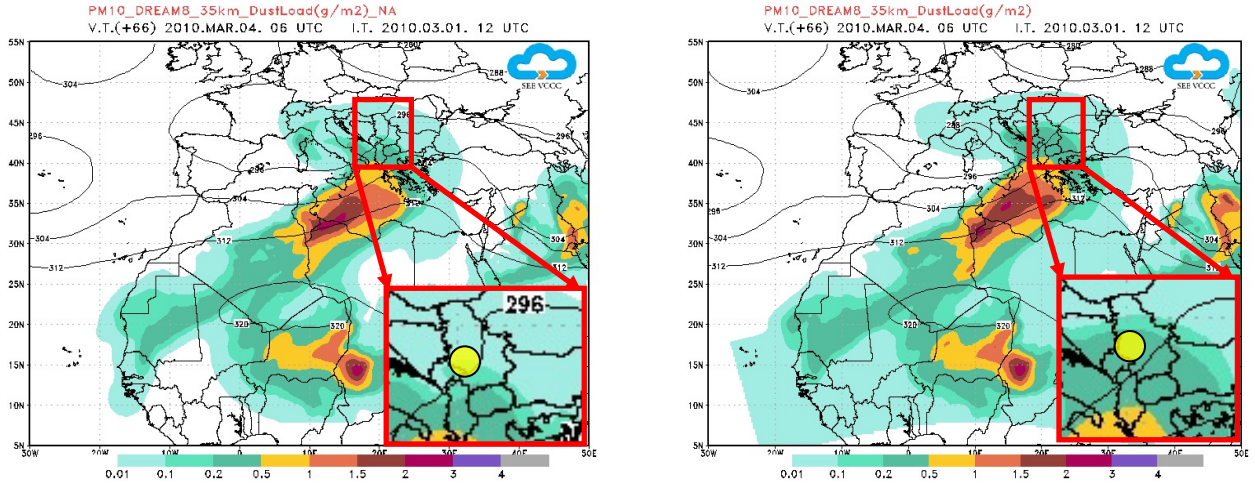


GLOBAL-SCALE ATTRIBUTION OF ANTHROPOGENIC AND NATURAL DUST SOURCES AND THEIR EMISSION RATES BASED ON MODIS DEEP BLUE AEROSOL PRODUCTS

Ginoux at al, 2012



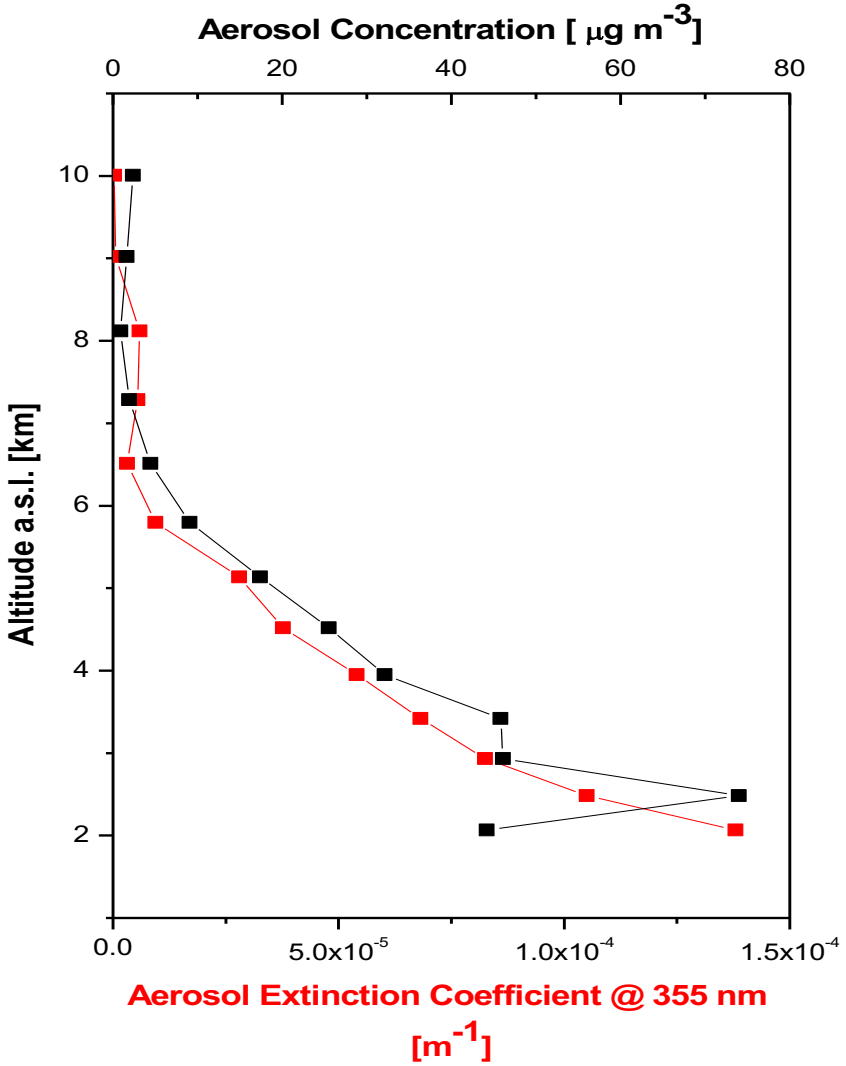
MACC/ECMWF forecast without (left), and with assimilation (central); MODIS satellite observation (right) (Credit: ECMWF)



Serbian Met Service NMM-DREAM8 forecast without (a) and with (b) assimilation based on MACC/MODIS (yellow snow case)

HOW GOOD ARE DUST MODELS?
Example: Model validation against lidar observations

A systematic comparison between DREAM model and Potenca EARLINET lidar observations May 2000 – April 2005 period



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But also large differences between models…

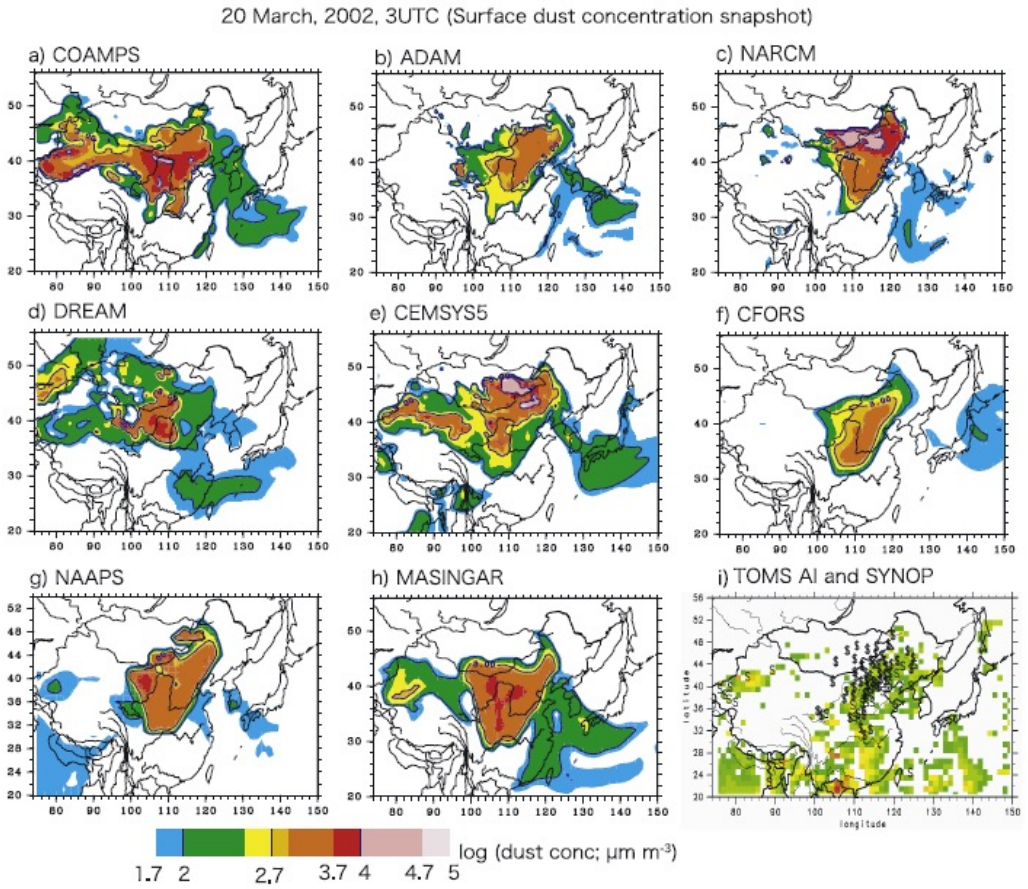

Figure 2. (a–h) Surface level dust concentration for each model at 20 March 2002 0300 UTC. Note that the color range of dust emission flux is logarithmic. (i) TOMS Aerosol Index (color) and individual SYNOP dust report (dollar signs) on that day.

SDS-WAS Implementation and Research Issues

- Improvements/developments of the node portals
- Nodes coordination and establishing the West Asian sub-node
- Model validation and intercomparisons
- Dust reanalysis
- High-resolution dust modelling (1-3 km) – towards non-hydrostatic and cloud-resolving scales
- Data assimilation
- Dust interaction with radiation and clouds and impacts to weather and climate => online coupled models
- Chemical and physical characterization of dust and impacts
- Dust and meningitis

WMO SDS-WAS web

http://www.wmo.org/sdswas