

WGNE activities and future directions

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JSC-35
June 2014

Role of WGNE

- Working Group on Numerical Experimentation
 - Jointly established by the WCRP and the WMO Commission for Atmospheric Sciences (CAS)
 - Responsibility of fostering the development of atmospheric circulation models for use in weather prediction and climate studies on all time scales and diagnosing and resolving shortcomings.
- A distillation of the Terms of Reference.....
 - Advice, liaison
 - Co-ordinated experiments
 - Workshops, publications, meetings

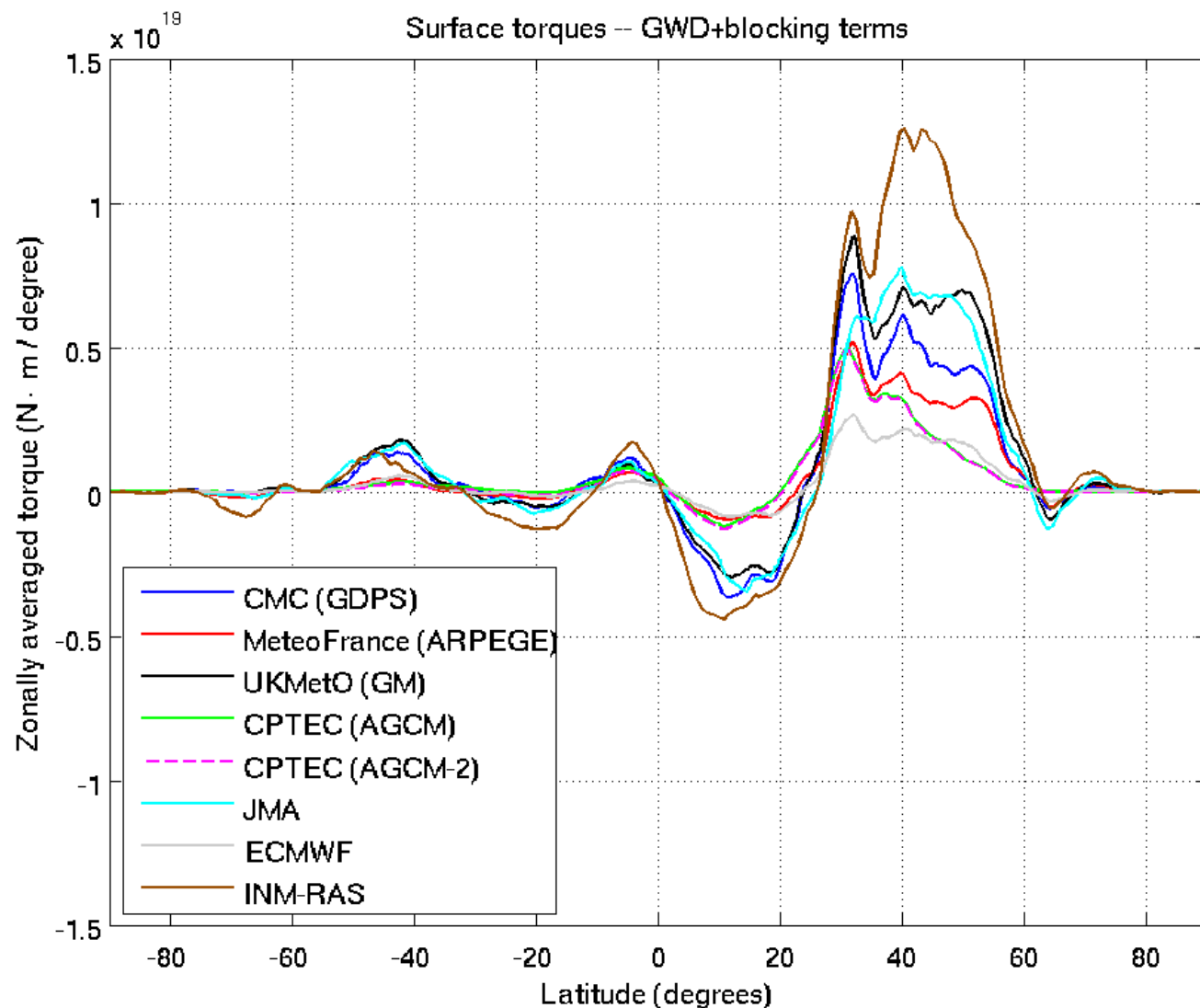
Co-ordinated projects and experiments

- Transpose-AMIP - testing climate models in weather mode
- Cloudy-radiance - comparing methods used in data assimilation
- Grey-zone - representation of cold-air outbreaks at different resolutions
- Verification
 - NWP performance (eg TCs, precipitation)
 - Polar (CBS-style; ConcordIASI intercomparison) → PPP
 - Climate metrics
 - Issues with verification against own analysis
 - MJO / Boreal Summer Intraseasonal Oscillation intercomparisons and forecast metrics (with MJO-TF)
- Comparison of model momentum budgets - how do they differ? What is right?
- Importance of aerosols for weather and climate - assessing the level of complexity required

MJO Task Force

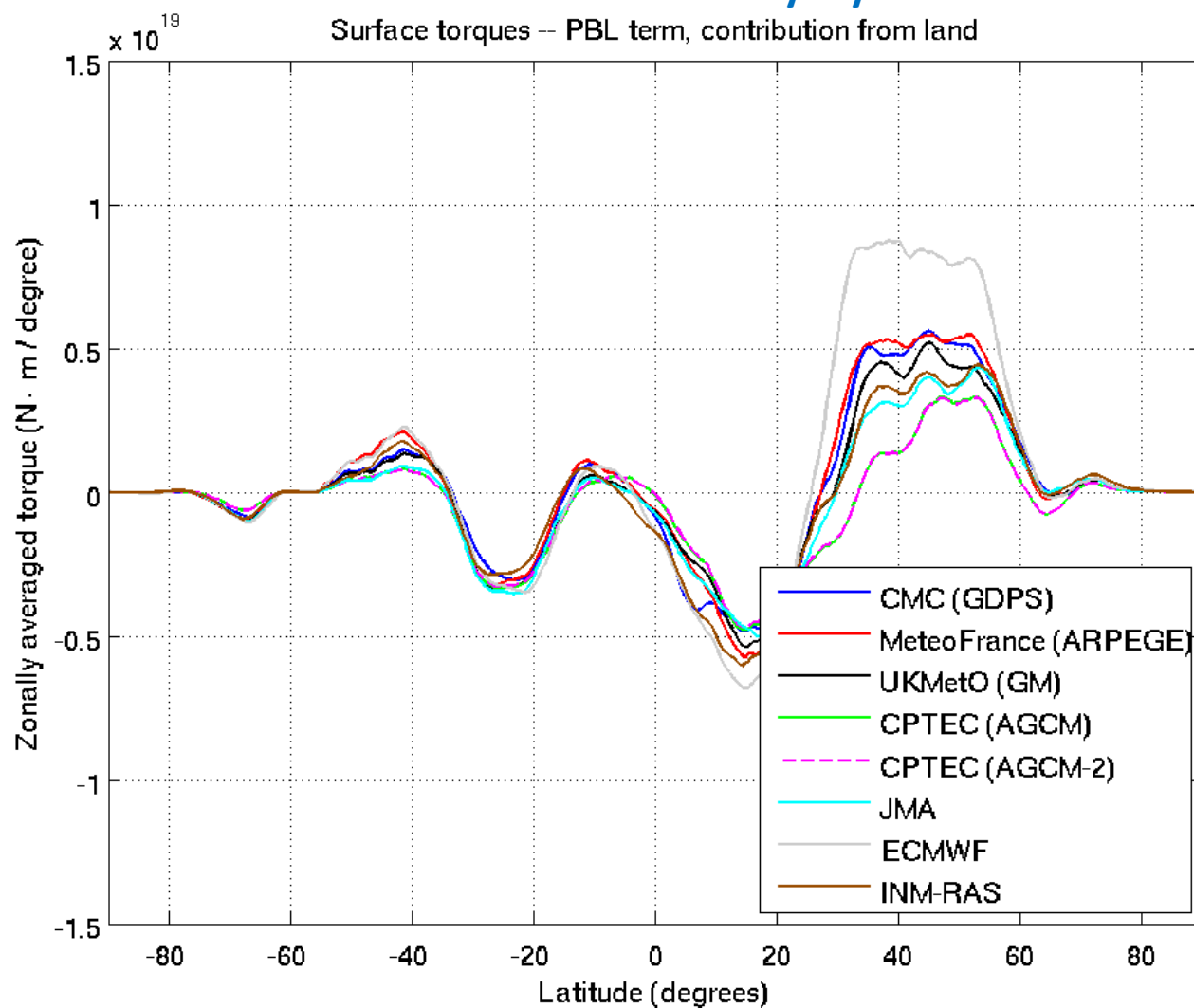
- Joined WGNE a little over 1 year ago,
- Continues to make progress towards its overall goal to facilitate improvements of the MJO in weather and climate models.
- 6 current subprojects:
 1. Process-oriented diagnostics/metrics for MJO simulation
 2. Boreal summer monsoon ISV monitoring and forecast metrics
 3. Assessment of CMIP5 model capability to simulate realistic intraseasonal variability
 4. MJO TF + GASS Multi-Model Diabatic Processes Experiment
 5. MJO air-sea interaction
 6. The MJO and the Maritime Continent (with S2S).

subgrid orography



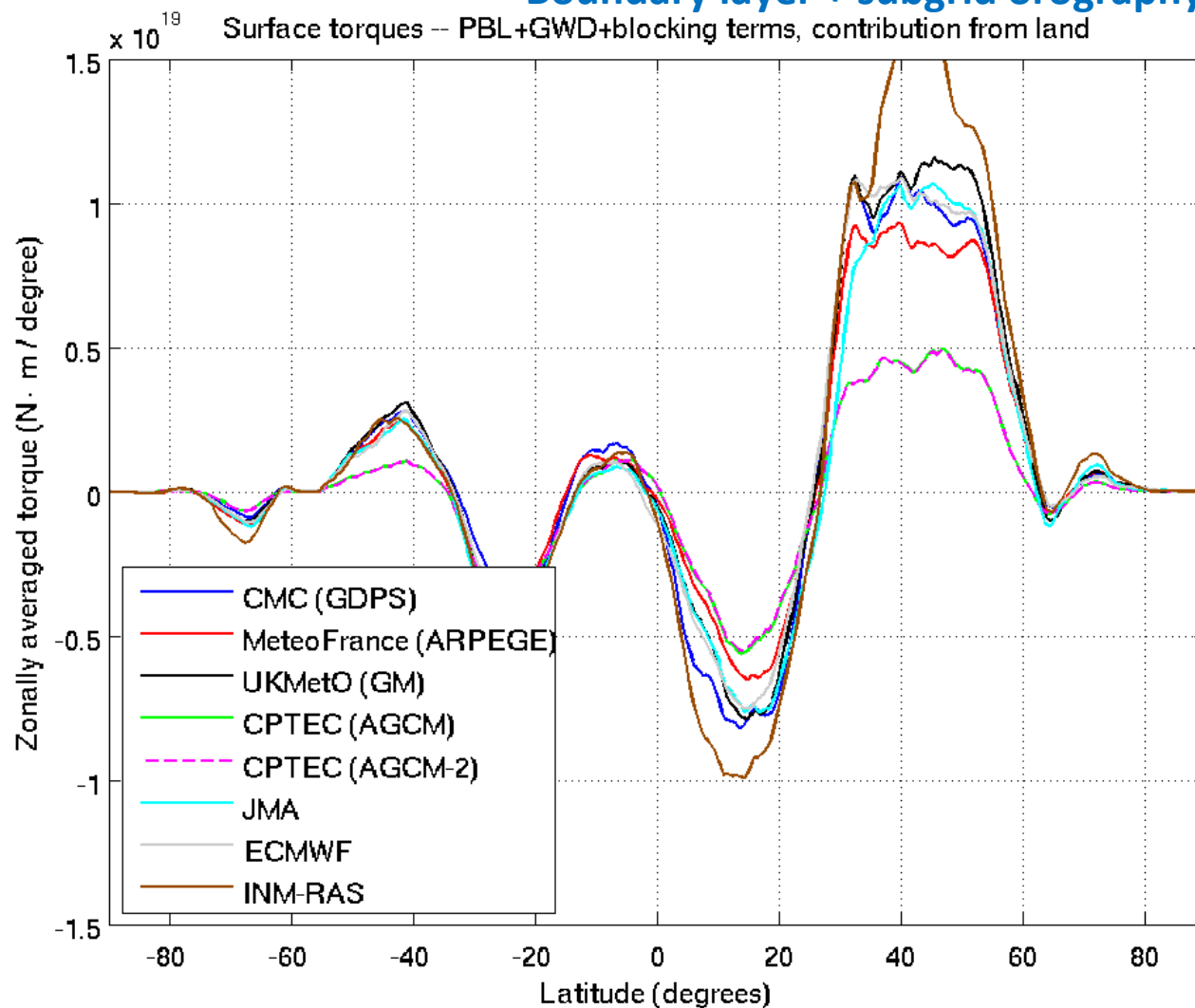
Thanks to:
Ayrton Zadra

Boundary layer



Thanks to: Ayrton Zadra

Boundary layer + subgrid orography



Thanks to: Ayrton Zadra

Evaluating aerosols impacts on Numerical Weather Prediction (NWP)

Saulo Freitas with contribution from
Angela Benedetti et al (ECMWF)

Select strong or persistent events of aerosol pollution worldwide that could be fairly represented in the current NWP model allowing the evaluation of aerosol impacts on weather prediction.

Perform model runs both including and not the feedback from the aerosol interaction with radiation and clouds.

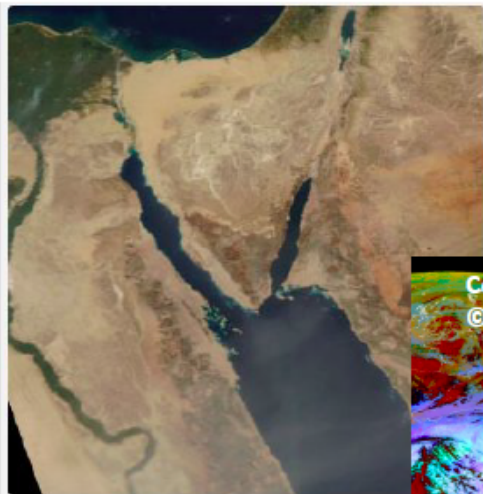
Evaluate model performance in terms of AOD simulation compared to observations (e.g. AERONET/MODIS data) or any other related aerosol observation available.

Evaluate aerosol impacts on the model results regarding 2-metter temperature, wind, rainfall, surface energy budget, ...

3 cases:

- **Egyptian dust storm – 18 April 2012**
- **Air pollution event, Beijing – 14 January 2013**
- **Biomass burning over South America**

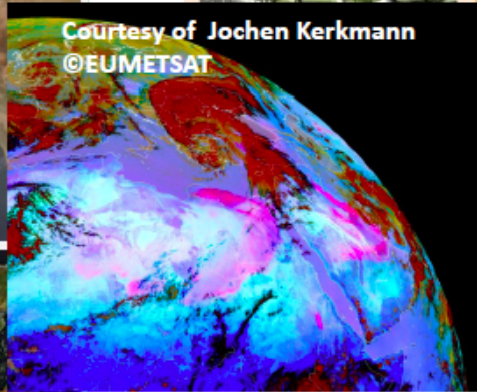
Dust Storm on April 18 2012



Dust over the Nile delta from satellite imagery.
Image courtesy of Chelys.



Courtesy of Jochen Kerkmann
©EUMETSAT



Wednesday, April 18, 2012

#Sandstorm in #Cairo

We are having the worst sandstorm in Cairo today. It is the **Khamsin** in its official time after Easter. The storm started at 8:30 AM this morning. Suddenly we got this yellow color in the air. Here is Tahrir square from short awhile ago .



Khamsin in Tahrir square *Kolena Khaled Said*



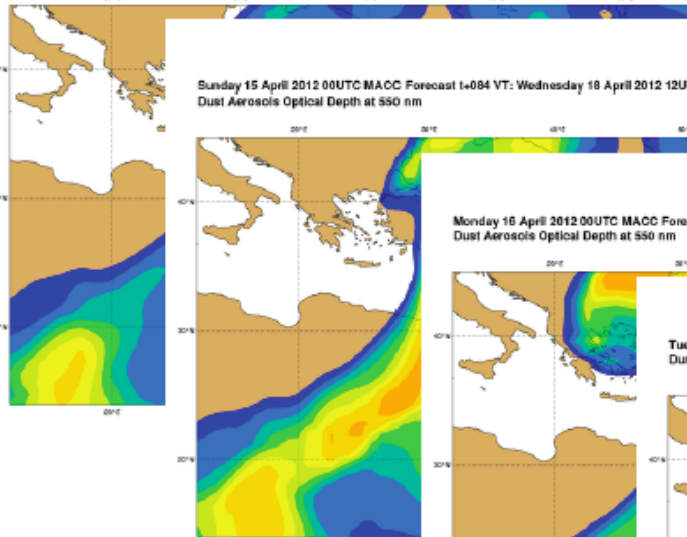
Palestinian men cross a main road as a sand storm envelops the town of Rafah along the border with Egypt in southern Gaza Strip, on April 18, 2012. (SAID KHATIB/AFP/Getty Images)

MACC-II/ECMWF forecasts for April 18 2012

Graphycs by Miha Razinger

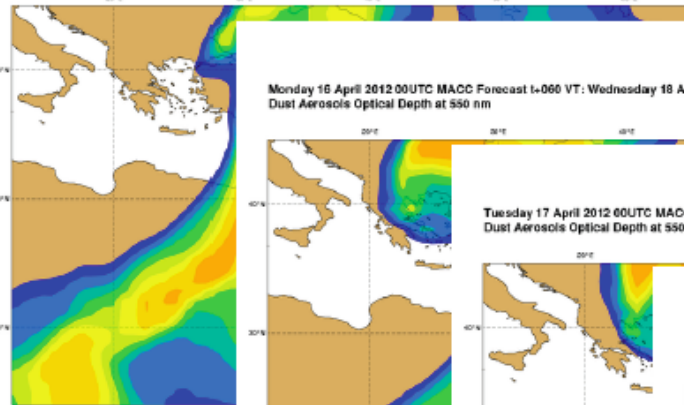
Saturday 14 April 2012 00UTC MACC Forecast t+108 VT: Wednesday 18 April 2012 12UTC
Dust Aerosols Optical Depth at 550 nm

Day 4



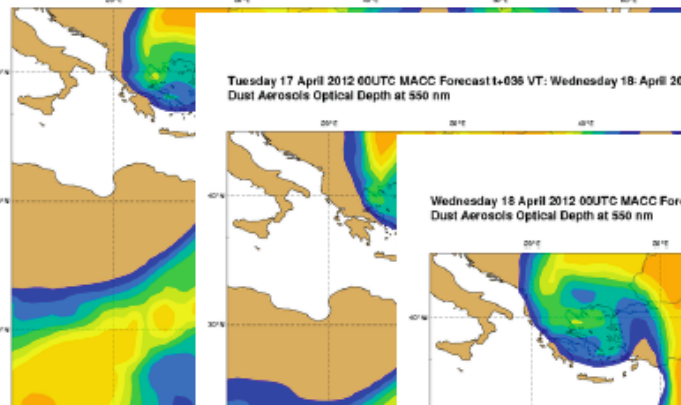
Sunday 15 April 2012 00UTC MACC Forecast t+084 VT: Wednesday 18 April 2012 12UTC
Dust Aerosols Optical Depth at 550 nm

Day 3



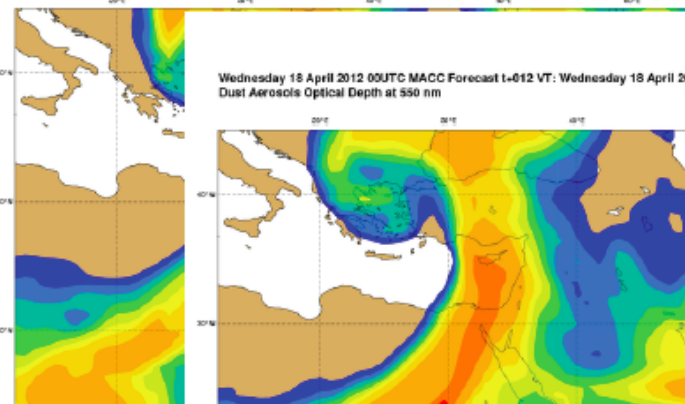
Monday 16 April 2012 00UTC MACC Forecast t+060 VT: Wednesday 18 April 2012 12UTC
Dust Aerosols Optical Depth at 550 nm

Day 2



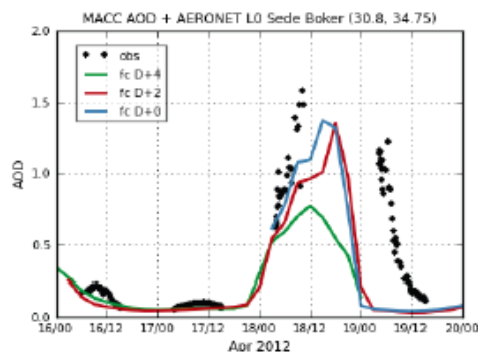
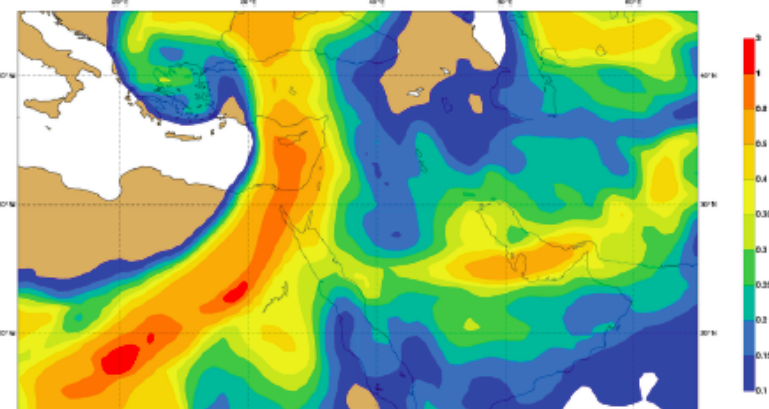
Tuesday 17 April 2012 00UTC MACC Forecast t+036 VT: Wednesday 18 April 2012 12UTC
Dust Aerosols Optical Depth at 550 nm

Day 1



Wednesday 18 April 2012 00UTC MACC Forecast t+012 VT: Wednesday 18 April 2012 12UTC
Dust Aerosols Optical Depth at 550 nm

Day 0

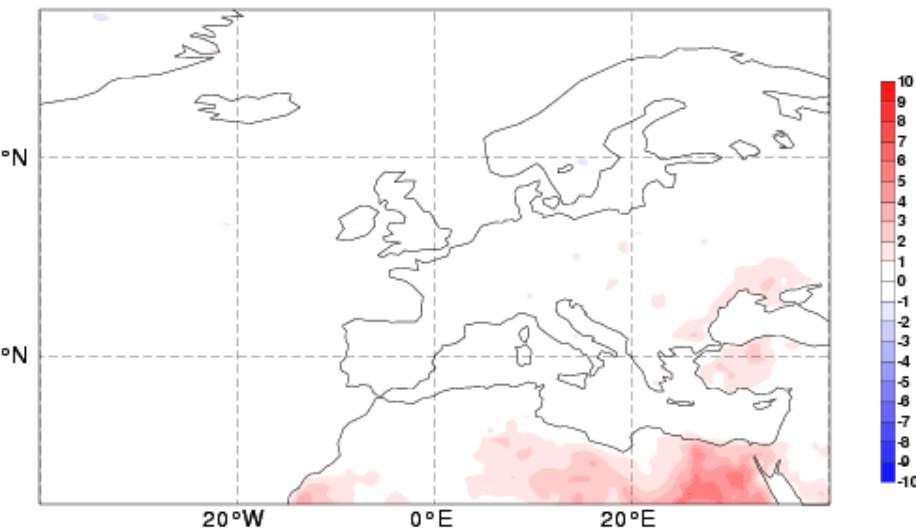


AERONET verification at Sde Boker, Israel

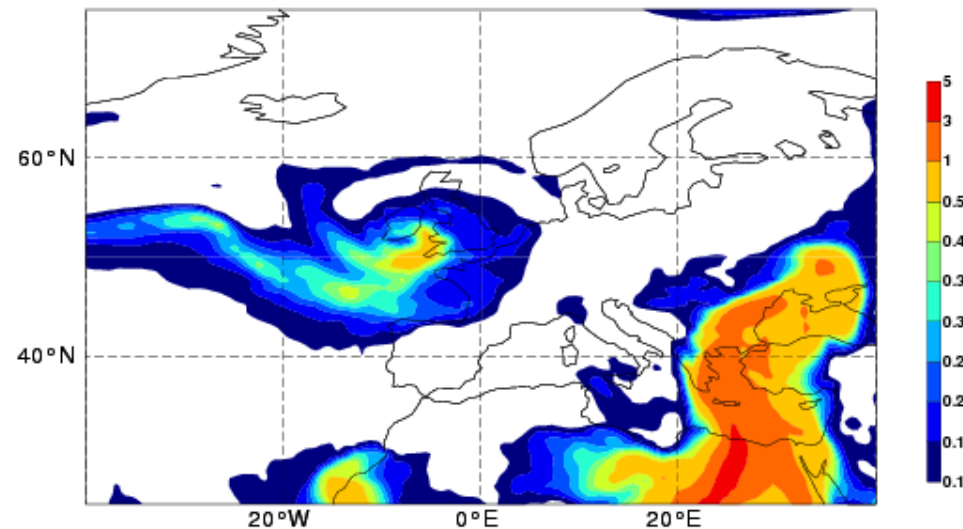
Impact of aerosols direct effect on minimum temperatures

- Taking into account the direct effect brings warmer night-time temperatures over land, by up to 4 degrees
- Near-perfect collocation with AOD patterns
- For most stations in desertic area, it reduces a cold bias at night
- Creates a local heat low
- Generates stronger local wind
- Lifts more aerosols (in agreement with observations)

T2m g0j4-g0j3 VT: 2012-04-18 00UTC




AOD550 g0j4 VT: 2012-04-18 00UTC



Workshops and meetings

GOV/WGNE Ocean coupling workshop



GODAE OceanView

Search:

[Home](#) | [About](#) | [Organisation](#) | [Science](#) | [Outreach](#) | [Publications](#) | [Documents](#) | [News](#) | [Calendar](#) | [Contacts](#)

Location: Outreach / Meetings Workshops / Coupled Prediction Workshop Gov Wgne /

Meetings & workshops

- GOVST III meeting
- GOVST II meeting
- GOVST I meeting
- GODAE OceanView - GSOP- CLIVAR workshop
- COSS-TT workshop
- MEP-TT Workshop
- Joint GOV/WGNE workshop for coupled prediction
- Background and motivations

Capacity building

Education & Training

Joint GOV/WGNE workshop for coupled prediction

[Workshop home](#) | [Background](#)

Joint GODAE OceanView/WGNE workshop for coupled prediction

Status, needs and challenges in Short- to Medium-Range Coupled Prediction of the Earth System

Where:	Washington DC /TBC, USA
When:	19-22 March 2013
Duration:	4 Days (Tues - Fri)
Organisers:	Dr Bill Lapenta, EMC/NCEP/NWS/NOAA, U.S. Dept. Of Commerce, WGNE representative Dr Gary Brassington, CAWCR, Bureau of Meteorology, GOV representative, JCOMM ET-OOFS chair Dr. Glenn White, EMC/NCEP/NWS/NOAA, U.S. Dept. Of Commerce

Workshop objectives

1. Conduct a workshop to invite members of the WGNE and GODAE OceanView community with interests in developing coupled high resolution earth systems for short- to medium- range prediction
2. Present the latest evidence of the impact of coupled modelling on the earth system analysis and forecasts
3. Present the latest progress in the development and identify gaps in knowledge and leading scientific questions to be addressed for:
 - a. coupled earth system observations
 - b. coupled earth system physical parameterisation
 - c. coupled earth system dynamical modelling
 - d. coupled earth system data assimilation
4. Discuss the requirements and opportunities for collaboration between each area
5. Discuss the formation of a joint group (Why/How/Who/When/Where)
6. Report on progress, gaps and challenges in the field and specific actions/recommendations for further progress

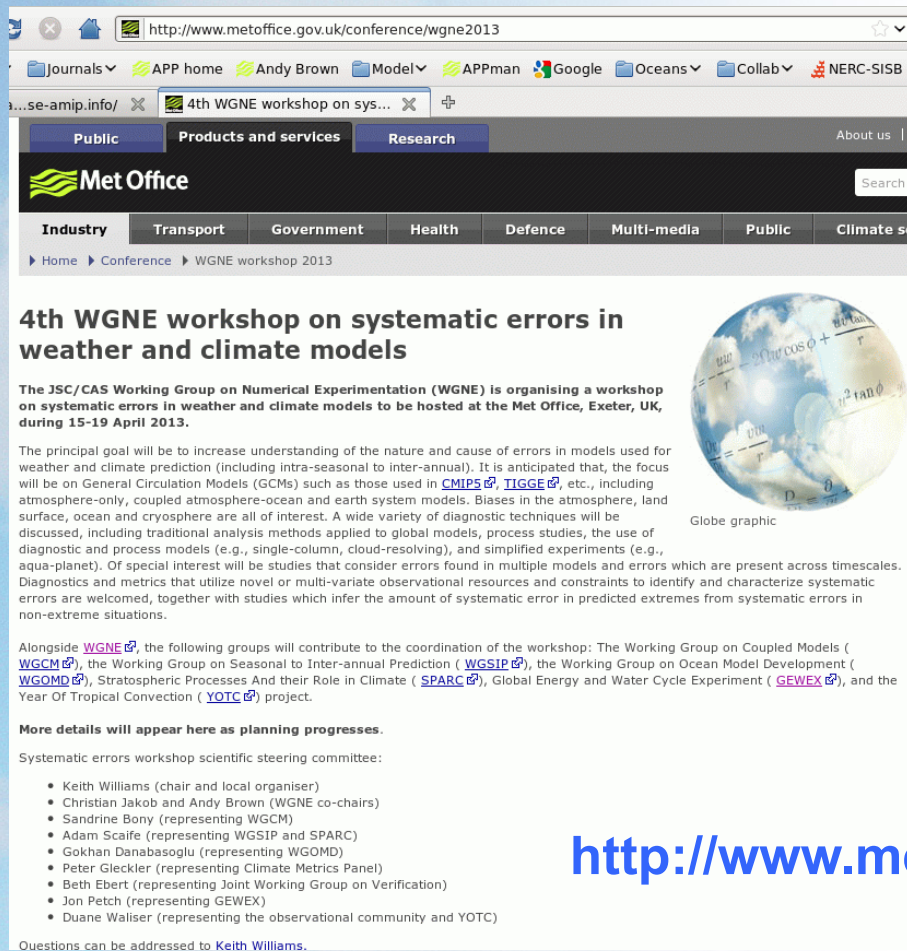
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- **Washington, USA. 19th-22nd March 2013**
- Follow on to ECMWF (2008) and Met Office (2009) workshops
- Focus on coupled modelling for short and medium range
- Use of short-range coupled to understand issues for longer range (e.g. subseasonal-seasonal)

<https://www.godae-oceanview.org/outreach/meetings-workshops/task-team-meetings/coupled-prediction-workshop-gov-wgne-2013/>

4th WGNE Workshop on Systematic Errors in Weather and Climate Models



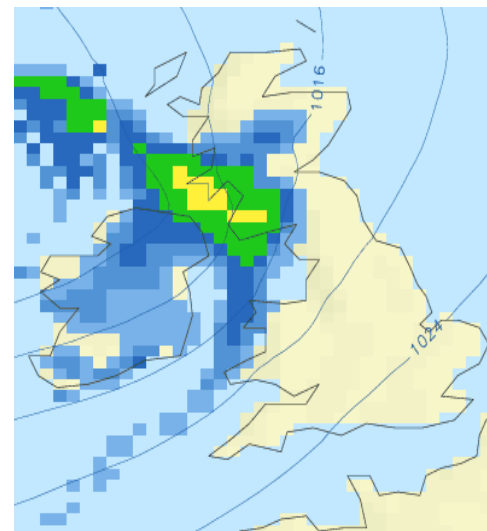
The screenshot shows a web browser window with the URL <http://www.metoffice.gov.uk/conference/wgne2013>. The page features the Met Office logo and navigation tabs for Public, Products and services, and Research. A search bar is also present. The main heading is "4th WGNE workshop on systematic errors in weather and climate models". Below this, a paragraph states: "The JSC/CAS Working Group on Numerical Experimentation (WGNE) is organising a workshop on systematic errors in weather and climate models to be hosted at the Met Office, Exeter, UK, during 15-19 April 2013." To the right of the text is a globe graphic with mathematical symbols like \sin , \cos , \tan , ϕ , θ , and D . Below the globe, the text "Globe graphic" is visible. Further down, a paragraph describes the principal goal of the workshop: "The principal goal will be to increase understanding of the nature and cause of errors in models used for weather and climate prediction (including intra-seasonal to inter-annual). It is anticipated that, the focus will be on General Circulation Models (GCMs) such as those used in CMIP5, TIGGE, etc., including atmosphere-only, coupled atmosphere-ocean and earth system models. Biases in the atmosphere, land surface, ocean and cryosphere are all of interest. A wide variety of diagnostic techniques will be discussed, including traditional analysis methods applied to global models, process studies, the use of diagnostic and process models (e.g., single-column, cloud-resolving), and simplified experiments (e.g., aqua-planet). Of special interest will be studies that consider errors found in multiple models and errors which are present across timescales. Diagnostics and metrics that utilize novel or multi-variate observational resources and constraints to identify and characterize systematic errors are welcomed, together with studies which infer the amount of systematic error in predicted extremes from systematic errors in non-extreme situations." Another paragraph lists the groups contributing to the coordination of the workshop: "Alongside WGNE, the following groups will contribute to the coordination of the workshop: The Working Group on Coupled Models (WGCM), the Working Group on Seasonal to Inter-annual Prediction (WGSIP), the Working Group on Ocean Model Development (WGOMD), Stratospheric Processes And their Role in Climate (SPARC), Global Energy and Water Cycle Experiment (GEWEX), and the Year Of Tropical Convection (YOTC) project." A section titled "More details will appear here as planning progresses." is followed by a list of the systematic errors workshop scientific steering committee members: Keith Williams (chair and local organiser), Christian Jakob and Andy Brown (WGNE co-chairs), Sandrine Bony (representing WGCM), Adam Scaife (representing WGSIP and SPARC), Gokhan Danabasoglu (representing WGOMD), Peter Gleckler (representing Climate Metrics Panel), Beth Ebert (representing Joint Working Group on Verification), Jon Petch (representing GEWEX), and Duane Waliser (representing the observational community and YOTC). The page concludes with the statement: "Questions can be addressed to Keith Williams."

- Met Office, Exeter, UK.
15th-19th April 2013
- Weather and climate
- Nature and causes of errors
- Use of diagnostic techniques, observations, process models and simplified experiments to understand errors

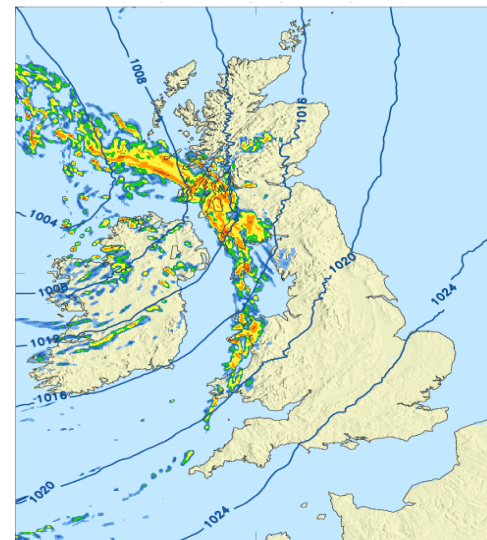
<http://www.metoffice.gov.uk/conference/wgne2013>

Future directions

- Short-range weather prediction
 - Changing focus – cloud, rain, surface temperature (not Z500!)
 - Increased emphasis on high resolution – especially convection permitting
 - Grey-zone project
 - Appropriate metrics for high resolution models (with JWGVR) and routine use of them
 - Link to climate downscaling?



25km

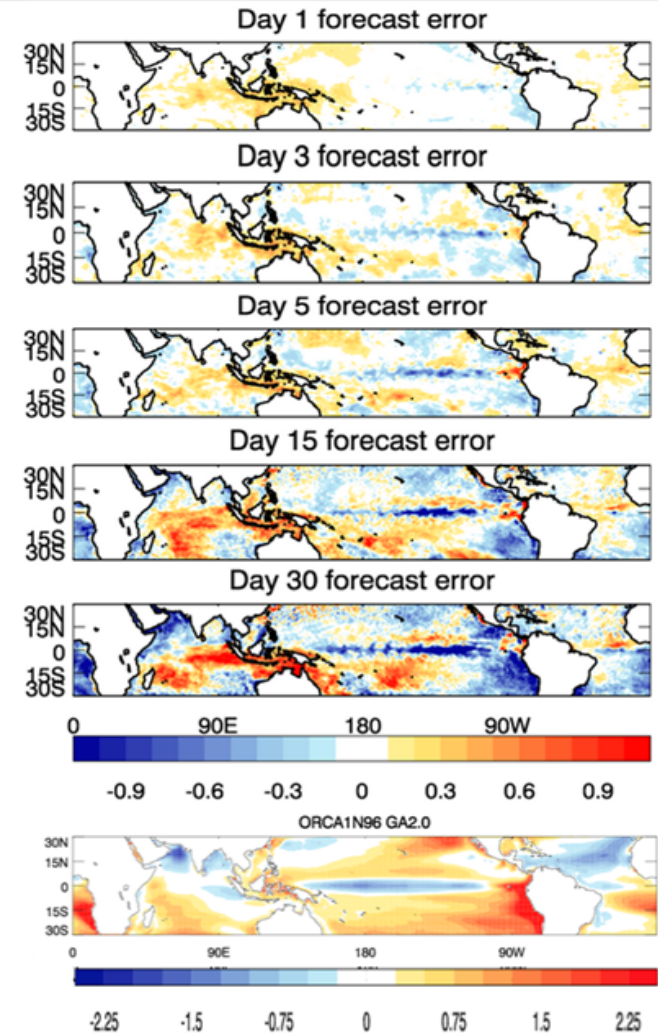


1.5km

Future directions

- Earth system prediction
 - (Ensemble) atmospheric weather prediction models coupled to ocean, composition, air quality, hydrology, ice.....
 - Bringing together communities (GODAE coupling workshop; systematic errors meeting)
 - Importance of aerosol for NWP: review [and test cases](#)
 - **TRANPOSE-CMIP?**

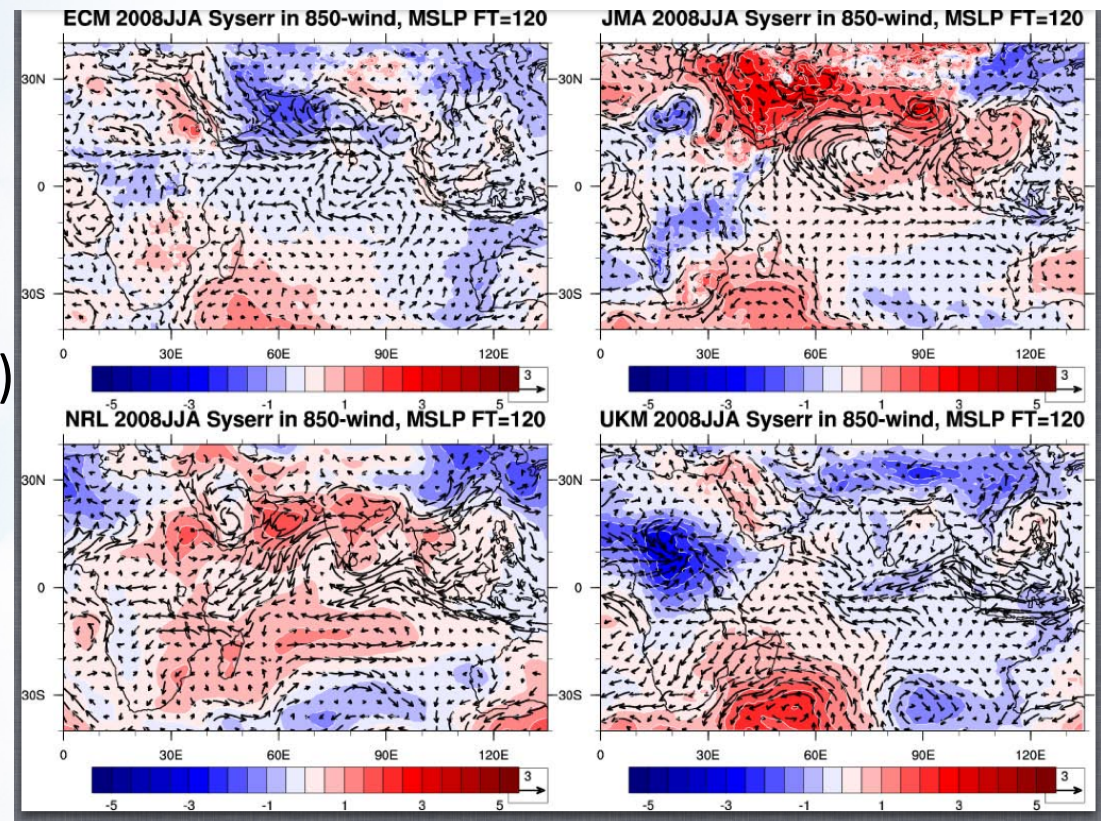
Time evolution of coupled model SST errors



Future directions

- “Traditional model evaluation and development”

- Still important – and importance under-recognized
- Champion (with partners) e.g. Conferences
- Specific projects to engage community and tackle key issues



Future directions

- Continue to look cross-timescale – weather and climate (and air quality/chemistry) communities together
- Need to keep championing the importance of model development
- Maintain strong links to many other groups and projects e.g. WWRP, DAOS, GASS, PPP, S2S, WGCM, SPARC, WMAC, WDAC, GODAE, WCRP GCs and CPs,...
- Maintaining active portfolio of focused projects and workshops/conferences

Future directions: short-term focus and immediate actions

- Comparison of model momentum budgets
 - Consolidate results, engage with more participants, expand to climate (SPARC)
- Importance of aerosols for weather and climate
 - Expand cases, refine protocols, expand beyond NWP angle, etc.
- Support to S2S
 - Systematic error workshop, special focus on teleconnections
- Support to PPP (PCPI)
 - Verification (quality of (re-)analyses), observational system design, etc.
- Support to CMIP
 - High resolution time slice intercomparisons

1 MAY 2012

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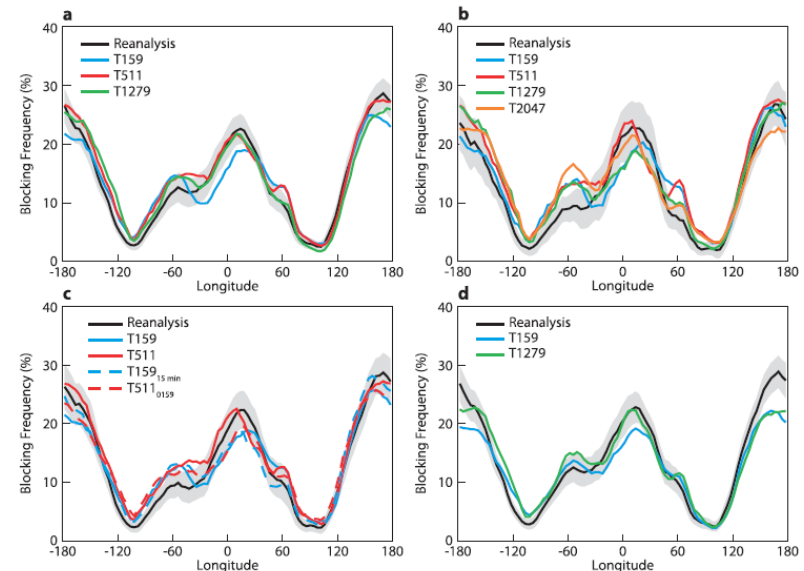


FIG. 8. Frequency of occurrence (in %) of days at which the wintertime (December–March) Northern Hemisphere midlatitude flow is blocked: (a) ERA reanalysis (black with 95% confidence level using a two-sided Student's t test), T159 (blue), T511 (red), and T1279 (green) for the period 1960/61–2007/08. (b) As in (a), but for the shorter period 1989/90–2007/08 and with T2047 results (orange) included. Results in (a) and (b) are based on 13-month integrations. (c) As in (a), but for the period 1980/81–2007/08 and at T159 (blue), T511 (red), T159_{15min} (dashed blue), and T511₀₁₅₉ (dashed red). (d) As in (a), but for AMIP-style experiments and the shorter period 1962/63–2006/07.

Thank You

WGCM/WGNE links

- Several modeling groups contributed high-resolution (~25km) AMIP experiments to CMIP5 with companion "time-slice" AGCM simulations that used mid-21st century SSTs from a coupled model configuration as boundary forcing.
- Given the need to further explore the added value of higher resolution in climate change experiments, there is considerable interest to increase the opportunities for high-resolution intercomparison in CMIP6.
- It is expected that a formal "MIP" will be organized, and WGNE will be available to provide some guidance given WGNE's experiences with high resolution NWP, the Grey Zone, and other projects.
- Julio Bacmeister will provide this link.