

WGNE

short & crisp report

Jean-Noël Thépaut & Ayrton Zadra

WGNE co-chairs

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.
- What we do, in a nutshell
 - Advice, liaison
 - Co-ordinated experiments
 - Workshops, publications, meetings

WGNE-30

College Park, Maryland
United States
23-26 March 2015

30th session of the CAS/WCRP Working Group on Numerical Experimentation



Co-ordinated projects and experiments

- **Transpose-AMIP** - testing climate models in weather mode
- **Grey-zone** - representation of cold-air outbreaks at different resolutions – Grey Zone workshop, MPI, December 2014
- **Verification**
 - NWP performance (eg TCs, precipitation)
 - Polar (CBS-style; ConcordIASI intercomparison) → **PPP**
 - (WGNE/WGCM) **Climate metrics**
 - Issues with verification against own analysis
 - MJO / Boreal Summer Intraseasonal Oscillation intercomparisons and forecast metrics (with **MJO-TF**) → **S2S**
- **Comparison of model momentum budgets** - how do they differ? What is right? – workshop on Angular Momentum Budgets, Reading, April 2015
- **Importance of aerosols for weather and climate** - assessing the level of complexity required – combined GAW/WGNE meeting on way forward



What has been successful?

- More centres submitted data than to T-AMIP I / CAPT.
- Consequently more centre's now have the ability to easily run this type of expt in the future.
- Comprehensive set of diagnostics saved (e.g. satellite simulators) and the data are much more accessible thanks to being on the ESG.
- Methodology widely supported and strongly encouraged at key workshops (e.g. *WGNE systematic errors workshop*, *Pan-GASS meeting*) as necessary to fix model biases.
- The methodology is now being used by other MIP's (e.g. YOTC MJO-TF/GASS diabatic processes project), with a very strong take up (more models submitted to this than T-AMIP II).

K. Williams



What has been less successful?

- The data have been under-utilised with only a handful of analysis projects being conducted.
 - *Not obvious why this is the case. Possibly the funding for analysis projects is more focussed around climate change projections than evaluation of processes? (although the two are not mutually exclusive!)*
 - *The data will remain in place and use of the data are still strongly encouraged!!!*
- Hard to cover everyone's needs with set hindcasts/diagnostics lists (e.g. those studying MJO likely to want different cases than those studying mid-lat depressions).

K. Williams



Met Office

The future

- The steering committee share the view that any new T-AMIP expts are best formed around a particular science question (e.g. continental warm bias; cloud biases; MJO; mid-latitude dynamics)
- T-AMIP should stop as a project (i.e. NOT be a separate MIP in CMIP6), but WGNE/WGCM/GASS/etc. should strongly encourage the methodology be used within other MIPs (e.g. CFMIP, MJO-DP, NAWDEX, GEWEX-PROES)
- Transpose-CMIP (raised at the WGNE workshop) – would require exploratory work; no one has volunteered to take this on. Issues (and solutions) may fall out as NWP centres move to coupled modelling.

www.transpose-amip.info

Recent surge in research topics related to model metrics...

- Succinct performance summaries, monitoring performance changes over time
- Process-oriented metrics
- Exploring the dependence between different models
- Use in model tuning
- Comparing error characteristics of MME and PPE
- Weighting model projections

Challenges for the Metrics Panel

- Limited opportunities to verify climate model simulations
- Metrics used for many purposes; appropriate set is application dependent
- Observations lacking for many processes believed important for climate change
- Identifying what is most important for ESM projections remains very much a research topic
- No consensus on a short list of metrics or how/if such a list should be used (e.g., in model tuning, weighting, ...)

MJO Task Force

- Joined WGNE 2 years ago,
- Continues to make progress towards its overall goal to facilitate improvements of the MJO in weather and climate models.
- 5 current subprojects:
 1. Process-oriented diagnostics/metrics for MJO simulation
 2. Evaluation of real-time forecasts of tropical intraseasonal variability
 3. Assessment of CMIP5 model capability to simulate realistic intraseasonal variability
 4. MJO TF + GASS Multi-Model Diabatic Processes Experiment
 5. Develop, coordinate, and promote analyses of MJO air-sea interaction
- + MJOTF-S2S Joint Effort on the Maritime Continent (MC): improving understanding of MJO propagation through the Maritime Continent

MJO-TF activities

In cooperation with the WGNE MJO TF, APCC has hosted real-time monitoring and forecast of BSISO indices since 2013 summer.

Participating Institutions

Institute	Model	Ensemble Size	Forecast Period	Update frequency	Resolution
NCEP	Climate Forecast System	4	40 days	Once a day	T126 L64
	Global Forecast System	1	16 days	Once a day	T574, T190 L64
	Global Ensemble Forecast System	20	35 days	ASAP	
Australia	POAMA 2.4 multi-week model	33	40 days	Twice per week	T47 L17
ECMWF	ECMWF Ensemble Prediction System	51	32 days	Twice per week	T639, T319 L62
UK Met Office	MOGREPS-15	24	15 days	Once a day	60km L70
Taiwan CWB	CWB EPS T119	1	40 days	From 2015	

MJO-TF activities



Content | Strategy | Register | Login | Home

About Us

Activities

Service

Research

Notice

4-month forecast | 7-day forecast | **BSISO forecast** | 2025 outlook week | CLM | TNAO

Home > Activities > BSISO forecast > Forecast

Service

4-month forecast

7-day forecast

BSISO forecast

Forecasts

State of the climate

CLM

TNAO

Forecasts

Welcome to the European Centre for Medium-Range Weather Forecasts (ECMWF) BSISO forecast activity. The BSISO forecast activity has been initiated in 2015 with the goal of increasing the ability to understand and forecast the BSISO based on numerical models in cooperation with the CAP/ACMWF Working Group on Meteorological Experimentation (WOME) Madden-Julian Oscillation (MJO) Task Force, and hosted at the APCC. The activity is to develop an information website to become a valuable service for climate scientists and various areas of climate forecast information generated. Below are links to the BSISO forecast website and the BSISO model forecasts.

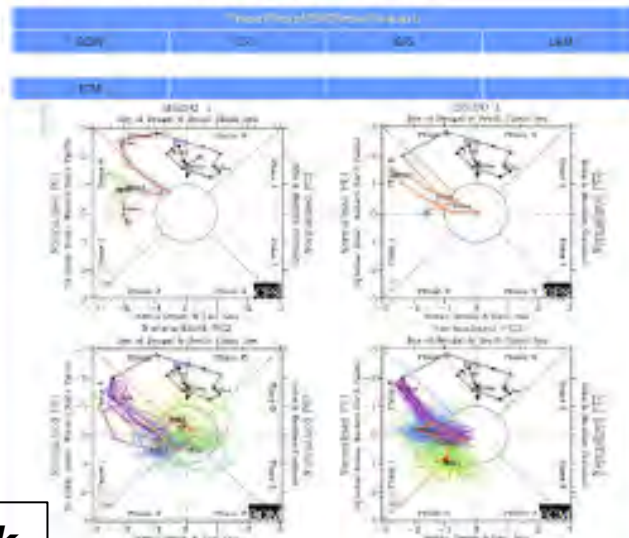
BSISO Business Monitoring

Operational Real-time Forecast Model (MJO) Forecasts

Dynamical Model BSISO Forecasts

Free for the latest real-time time functions is provided below.

Water shows can be produced in real-time display. Click for additional information.



The final product is a **phase diagram** displaying BSISO1 and BSISO2 values, including the values for **the recent 15 days and forecasts for the next 20 days**.

- The BSISO forecast is updated every day with the latest information and is available from May to October at APCC webpage (<http://www.apcc21.org>).
- BSISO real-time forecast webpage (<http://www.apcc21.org/eng/serv>)

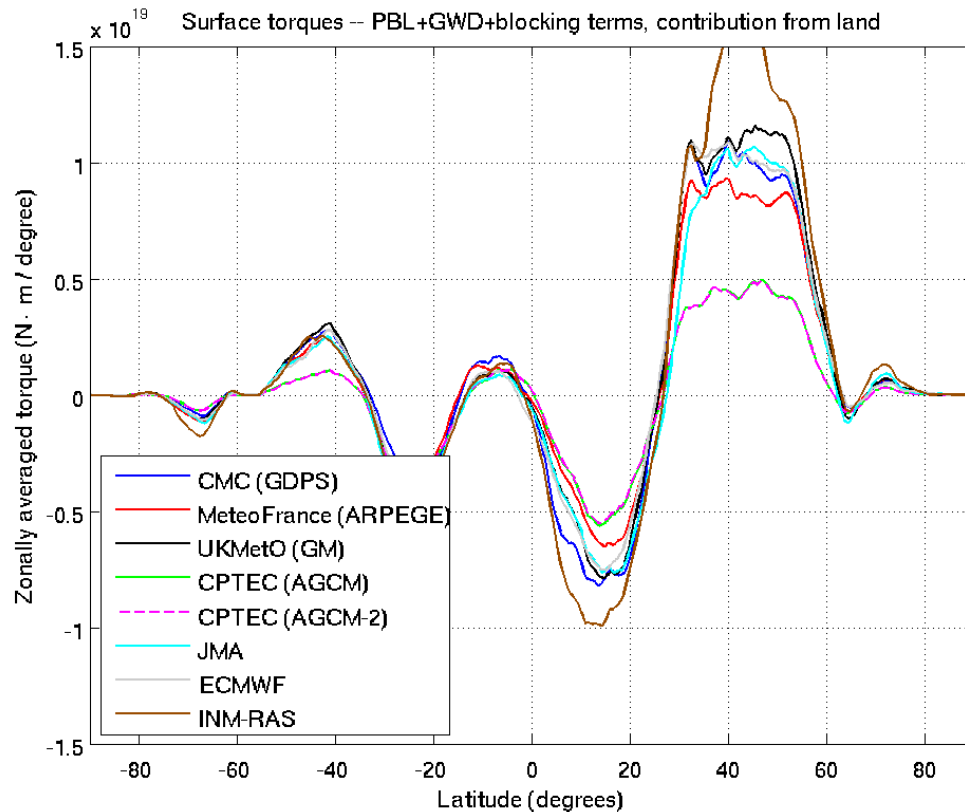
J. Gottschalck

ECMWF – 12

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Boundary layer + subgrid orography



Future work:

- Exchange/intercomparison of ancillary fields
- Use a high resolution simulations to understand partitioning of processes
- Design a SCM experiment to compare parametrisations
- Use observations from supersites to evaluate models

Workshop on Angular Momentum Budget, April 2015, UoR, UK

- Opportunity to engage with a larger community

Links with SPARC GW activities, ISSI momentum budget intercomparisons, QBOi,...

Evaluating aerosols impacts on Numerical Weather Prediction (NWP)

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

AEROSOL impact on NWP

This project aims to improve our understanding about the following questions:

How important are aerosols for predicting the physical system (NWP, seasonal, climate) as distinct from predicting the aerosols themselves?

How important is atmospheric model quality for air quality forecasting?

What are the current capabilities of NWP models to simulate aerosol impacts on weather prediction?

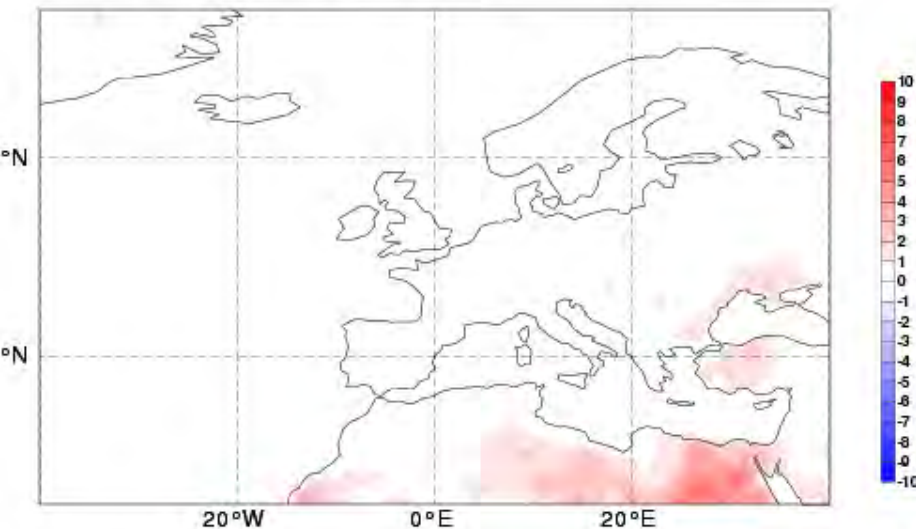
3 cases:

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

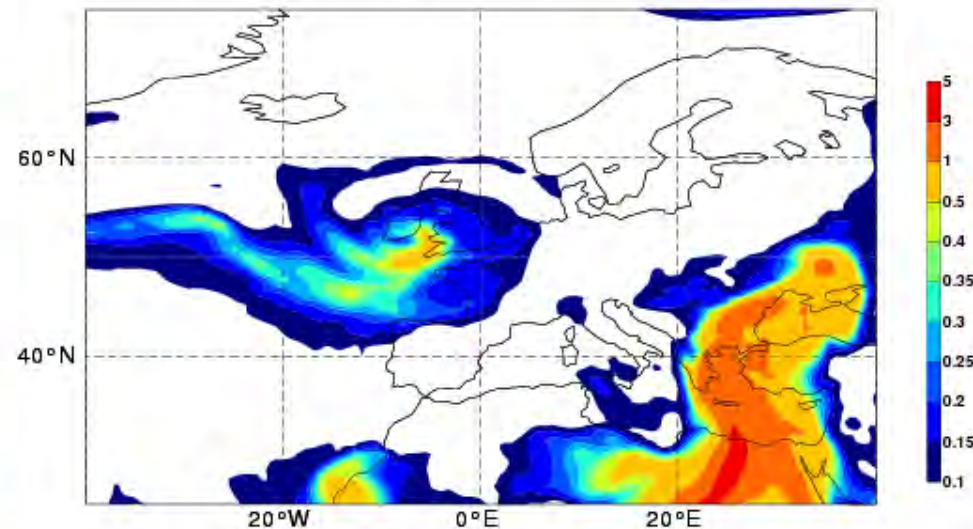
Impact of aerosols direct effect on minimum temperatures

- 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



Future directions: short-term focus and immediate actions

- Comparison of model momentum budgets
 - Consolidate results, engage with more participants
 - Define way forward, publish
- Importance of aerosols for weather and climate
 - Expand cases, refine protocols, expand beyond NWP angle, publish, link with GAW, etc.
- Support to S2S
 - Systematic error workshop, special focus on teleconnections (2017)
- Support to PPP (PCPI)
 - Verification (quality of (re-)analyses), observational system design, etc.
- Support to CMIP
 - High resolution time slice intercomparisons – engage NWP community in HiResMIP

1 MAY 2012

JUNG ET AL.

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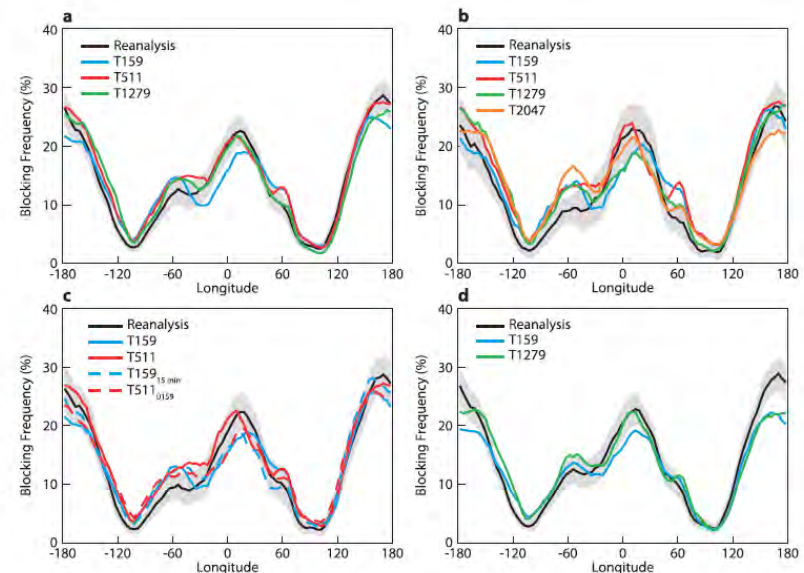


FIG. 8. Frequency of occurrence (in %) of days at which the wintertime (December–March) Northern Hemisphere midlatitude flow is blocked: (a) ERA reanalysis (black with 95% confidence level using a two-sided Student's t test), T159 (blue), T511 (red), and T1279 (green) for the period 1960/61–2007/08. (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.

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
 - Systematic error workshops cycle to maintain

Thank You