WGNE* report for GEWEX-SSG-28

* WGNE = Working Group on Numerical Experimentation

prepared by Ayrton Zadra & Keith Williams (WGNE co-chairs)

*GEWEX 28th SSG Meeting
25-28 January 2016
ETH Zurich, Switzerland*

GEWEX

WMO OMM

WCRP
World Climate Research Programme

WWRP
WORLD WEATHER RESEARCH PROGRAMME

Role of WGNE

http://www.wmo.int/pages/about/sec/rescrosscut/resdept_wgne.html

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 (completed as an experiment in its own right; still recommended as a methodology)*

- **Cloudy-radiance** *- comparing methods used in data assimilation*

- **Grey-zone** *- representation of cold-air outbreaks at different resolutions*

- **Verification**
  - *NWP performance* (e.g. TCs, precipitation, polar)
  - *Climate metrics*
  - *Issues with verification against own analysis*
  - *MJO / Boreal Summer Intraseasonal Oscillation intercomparisons* (with MJO-TF)

- Importance of **aerosols** for weather and climate *- assessing the level of complexity required*

- Comparison of model **momentum budgets** *- how do they differ? What is right?*

Highlights from WGNE-30 meeting

http://polar.ncep.noaa.gov/conferences/WGNE-30/
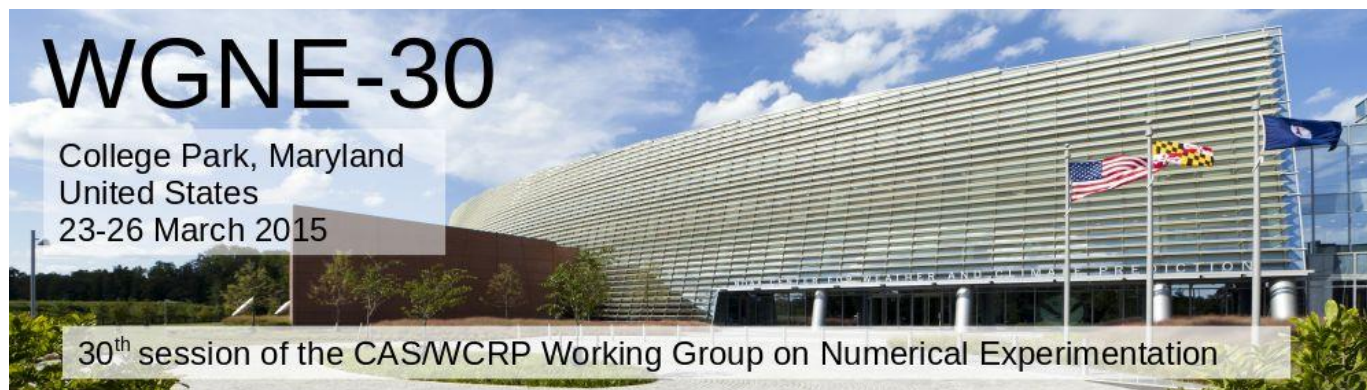
- **GASS report by Jon Petch**
  - *detailed report on Grey Zone Project*
  - *2nd Pan-GASS Science conference: summer or fall 2016, maybe jointly with GLASS*

- **GLASS report by Michael Ek**

  - *PALS-PLUMBER (land model benchmarking project, assess minimal level of performance)*
  - *PILDAS (intercomparison of land data assimilation)*
  - *DICE and GABLS-4 (surface-atmosphere coupling)*

Highlights from WGNE-30 meeting

Selected discussions & action items

- ### Following GASS/GLASS reports
  – *"Peter Gleckler noted the potential benefit of PALS for climate models, as climate model output fluxes can be extracted at particular points and this approach also holds in NWP mode."*

  – *"Stan Benjamin highlighted the complexity of the land surface problem involving the whole vertical column."*

  – *"Jon Petch noted the need to isolate some tractable pieces of the land problem. SMOS and SMAP were cited as potential game changer. Michael Ek pointed to on-going collaboration with NESDIS and NASA on SMAP data, also used in an operational context."*

Questions regarding GEWEX-PROES:
  - What is the status of the project? Does it still plan to use the Transpose-AMIP method? Should it be linked to WGNE?

Highlights from WGNE-30 meeting

Selected discussions & action items

- **Following report on recent developments in physical parametrizations**

    – *"Jean-Noël Thépaut noted that stochastic physics is becoming an integral part of NWPs. He further highlighted that WGNE's 'Recent development' briefs also provide a platform to report failures, lessons learnt and challenges."*

    – *"Jon Petch suggested increased collaborative work on convection, boundary layers and microphysics which require a cultural shift. Michael Ek noted the existing connections between GASS/GLASS and NWP."*

    – *"Jon Petch remarked that the success of Grey Zone project and the overshoot issue which now requires a fix."*

Highlights from WGNE-30 meeting

Selected discussions & action items

- **Verification**
    - *"ACTION ITEM ITEM 9: Report also on Tropical Cyclone false alarm ratio (Junichi Ishida, WGNE31)."*

    - *"ACTION ITEM 10: Organize a survey to review current precipitation verification practices and check NWP centers' willingness to exchange high resolution precipitation model and observational data sets for WGNE research activities (and possibly for other verifications) and report to next session (Francois Bouyssel, WGNE31)."*

    - *"ACTION ITEM 12: JWGFVR to engage with METRICS panels and S2S to collaborate towards a strategy for seamless metrics and verification – maybe through a joint activity in 2017 – e.g. systematic error workshop (report at WGNE31, co-chairs JWGFVR/METRICS/S2S panels)."*

Highlights from WGNE-30 meeting

Selected discussions & action items

- **PPP - YOPP**
  - *"ACTION ITEM 4: WGNE, SPARC/GEWEX, DAOS, GOV representatives to attend YOPP Summit." (summer 2015)*

- **Workshops**
  - *"ACTION ITEM 6: Explore options for Systematic Error Workshop in 2017 in collaboration with S2S; consider a potential teleconnection session (WGNE Co-chairs and members, Oct 2015)." -- probably in Montreal, Canada, June 2017 (tbc)*
  - *"ACTION ITEM 16: Explore possible joint workshop among WGNE, DAOS, PDEF on stochastic parameterization (see also upcoming ECMWF workshop, possible presence of WGNE reps)"*

- **Next WGNE meeting**
 - *WGNE-31, 25-28 April 2016, Pretoria, South Africa*

GASS – Grey Zone project
[from report by J. Petch presented at WGNE-30]

Next Steps

- *April – Sept 2015: Analysis and wrap up case*

- *Oct-Dec 2015: Reporting in peer reviewed journals (1 LES-paper / 2 combine GCM/LAM papers & one overview paper).*

- ***Discussion is open for a next case (Preferred one which is addressing deeper convection). This could be based on an already existing case --*** *with right volunteers it might be time to move to the tropics…*
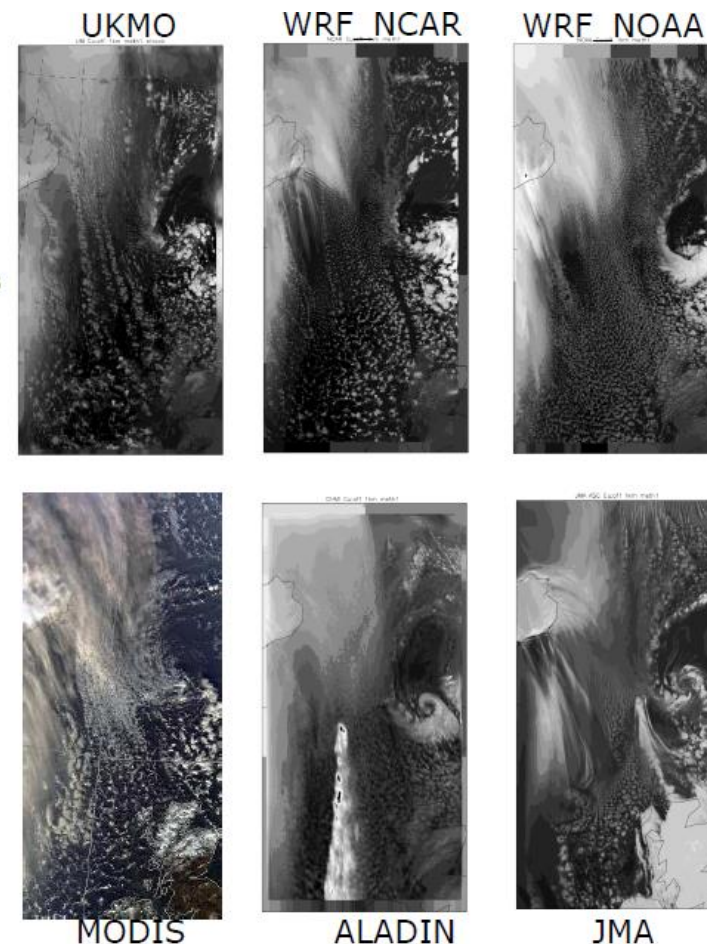
OLR from 6 participating Limited Area Models at ~ 1km resolution.
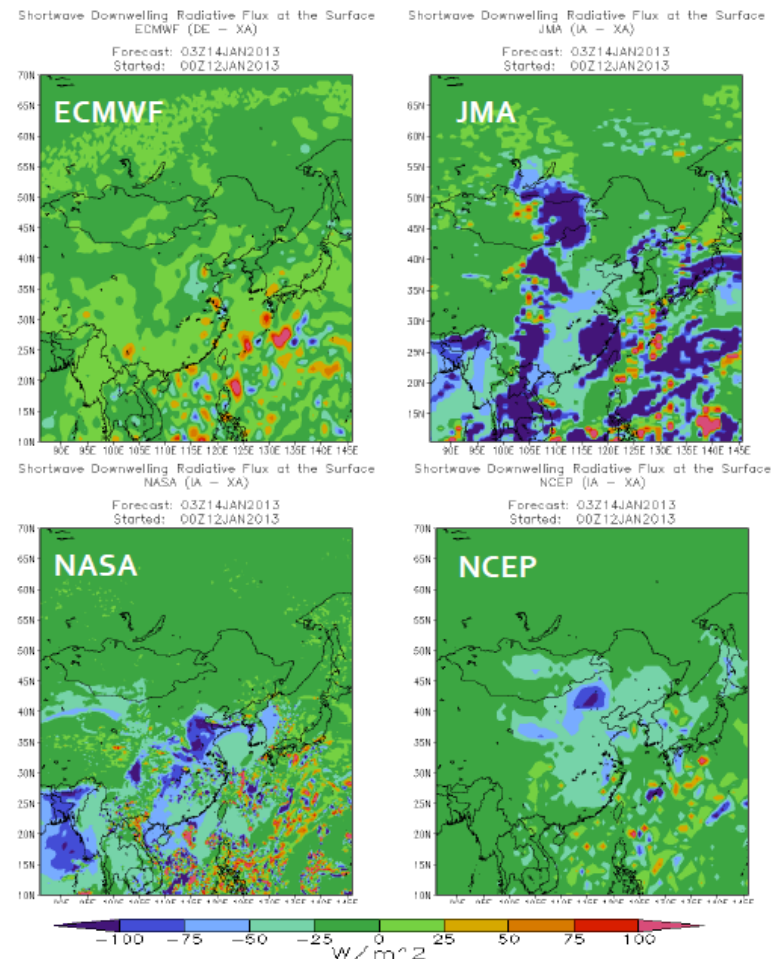
WGNE Aerosols project
[from report by S. Freitas presented at WGNE-30]

Objective

- *Evaluate the impact of aerosols on Numerical Weather Prediction*

Approach

- *Select events of aerosol pollution*
- *Perform model runs with and without feedback from the aerosol interaction with radiation and clouds.*
- *Evaluate aerosol simulation of AOD (aerosol optical depth) or related parameter*
- *Evaluate aerosol impact on meteorology (2-meter temperature, dew point temperature, 10-meter wind, rainfall, surface energy budget, etc.)*

Case 2 – Pollution over China -- SW Radiation at Surface Impact: difference between Aero and NoAero runs from 4 participating models

WGNE Aerosols project
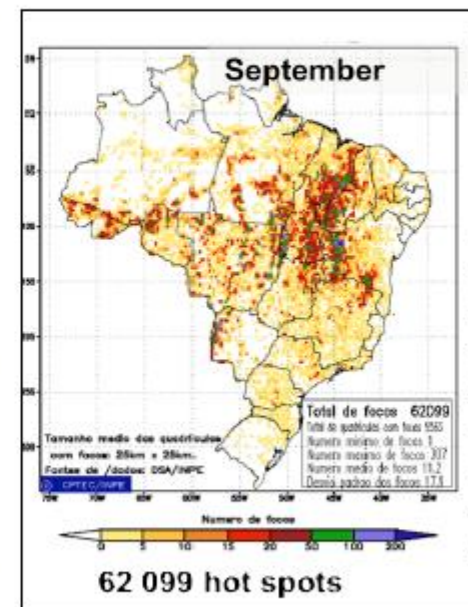## [from report by S. Freitas presented at WGNE-30]

Case Studies

1) Dust over Egypt: 4/2012   2) Pollution in China: 1/2013   3) Smoke in Brazil: 9/2012

3 strong or persistent events of aerosol pollution that could be fairly represented in the current NWP models

WGNE Aerosols project
[from report by S. Freitas presented at WGNE-30]

Participating Models

| Institution Model	Domain Resolution	Aerosol Species	A & BB Emissions	Aerosol Physics	Cloud Physics	Aerosol Assimilation
CPTEC BRAMS LAM+CCAT	Regional 10 km	BC, Sea-Salt, OC, SO4	EDGAR 4.3BEM	bulk	2-mom	no
JMA MASINGAR	Global TL319L40	Dust, Sea-Salt, BC, OC, SO4	MACCity GFAS 1.0	2-mom	2-mom	no
ECMWF Global	Global T511L60			Bulk	Bulk	yes
Météo-France ALADIN + ORILAM	Regional 7.5 km	Dust	DEAD model	3-mom log-no normal	Bulk	no
ESRL/NOAA WRF-Chem	Regional cloud res.	(many)	EDGAR 4.3BEM	Bulk and Modal	2-mom	no
NASA/GSFC GEOS-5+GOCART	Global 25 km	Dust, Sea-Salt, BC, OC, SO4	EDGAR 4.1 QFED 2.4	Bulk	Bulk or 2-mom MG	yes
NCEP NGAC+GOCART	Global T126	Dust, Sea-Salt, BC, OC, SO4	Climatological Aerosols	Bulk	Bulk	no
Barcelona SC	regional	dust	BSC-dust model	8 dust size bins	Same as in WRF	no

WGNE Aerosols project
[from report by S. Freitas presented at WGNE-30]

Ongoing work

- *Establish database and web platform for model assessment and comparison against observations.*
- *WGNE data sets: standard format for the was defined (to conform with EuMetChem's); data to be converted to standardized NetCDF.*
- *Meteo station data format being converted to a format compatible with CPTEC's GrADS Online*
- *Looking into OpenDAP/GDS to supply simulation data and meta-information to the public*
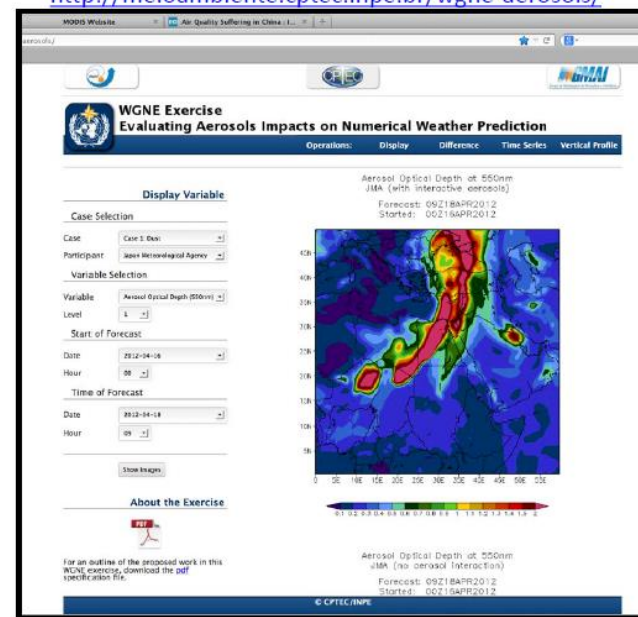
Developed by M. Zarzur

Next steps

- *Perform data evaluation*
- *Produce a report and a paper*
- *Second phase?*

- *Merge/collaborate with other activities?*
  - *MICS (Model Intercomparison Study—Asia – phase III)*
  - *a meeting suggested to integrate the initiatives (e.g. GAW/WGNE)*

WGNE Drag Project
[from report by A. Zadra presented at WGNE-30]

Main goal: compare the **parametrized** or physics component of this surface stress, i.e. the stress from parametrizations such as the planetary boundary layer (**PBL**) and the subgrid orographic (**SGO**) schemes.

$$\vec{\tau}^{phy} = \vec{\tau}^{pbl} + \vec{\tau}^{sgo}$$

$$\vec{\tau}^{pbl} = \text{stress from PBL scheme}$$

$$\vec{\tau}^{sgo} = \text{stress from subgrid orographic scheme(s)}$$

Basic output requested: x- and y-components of the parametrized stress, in units of N/m2, averaged over the 1st day (24h) of a month of forecasts. The months proposed were Jan and Jul 2012.
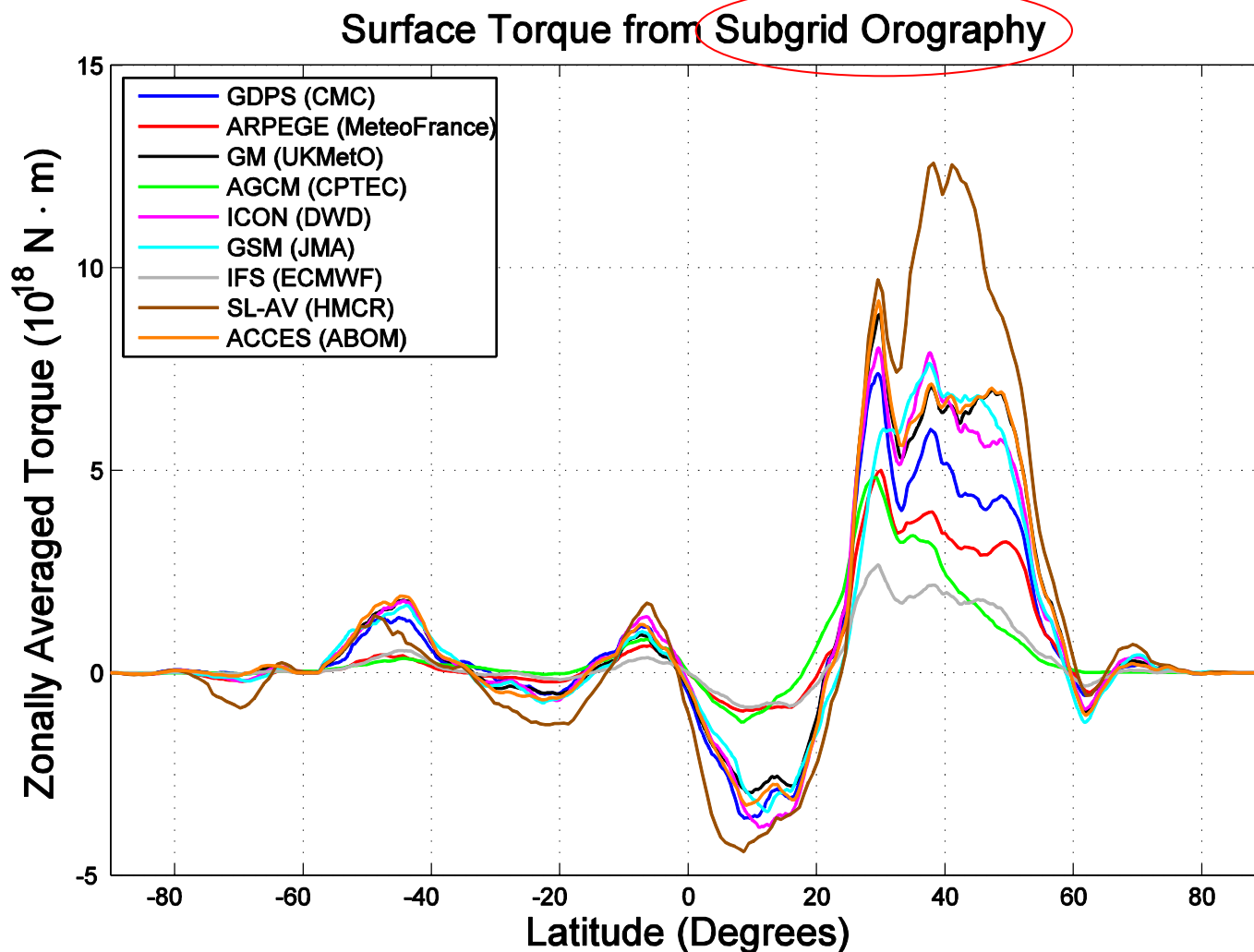
WGNE Drag Project
[from report by A. Zadra presented at WGNE-30]

Table 1: Participating models

model name	resolution	center	stress components provided
GDPS	25km	CMC	pbl, gwd, blc, res
ARPEGE	10-60km	Meteo-France	pbl, sgo
GM	25km	UK MetOffice	pbl, sgo
IFS	15km	ECMWF	pbl, sgo, res
GSM	20km	JMA	pbl, lgw, sgw, res
ACCESS	40km	Australian BOM	pbl, gwd, blc
AGCM	45km	CPTEC	pbl, gwd, res
AGCM-2	45km	CPTEC	pbl, gwd, res
SL-AV	80km	HMCR	pbl, sgo
CAM-5	100km	UCAR	pbl, gwd, tms
ICON	13km	DWD	pbl, sgo, res

Comparison of averaged surface torque components – winter month

Surface Torque from Subgrid Orography

Comparison of averaged surface torque components – winter month

Surface Torque from PBL
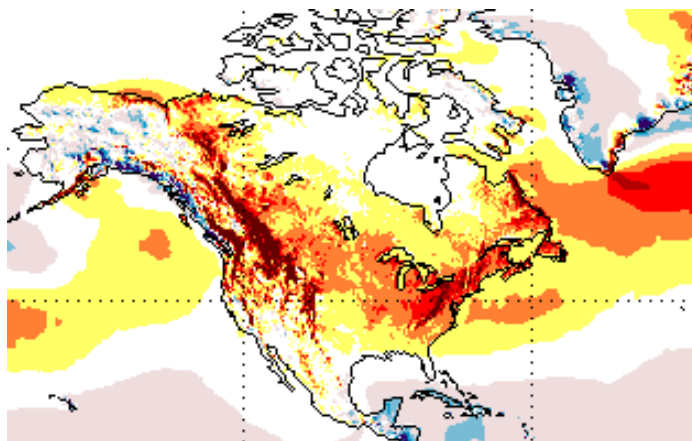
Comparison of averaged surface torque components – winter month
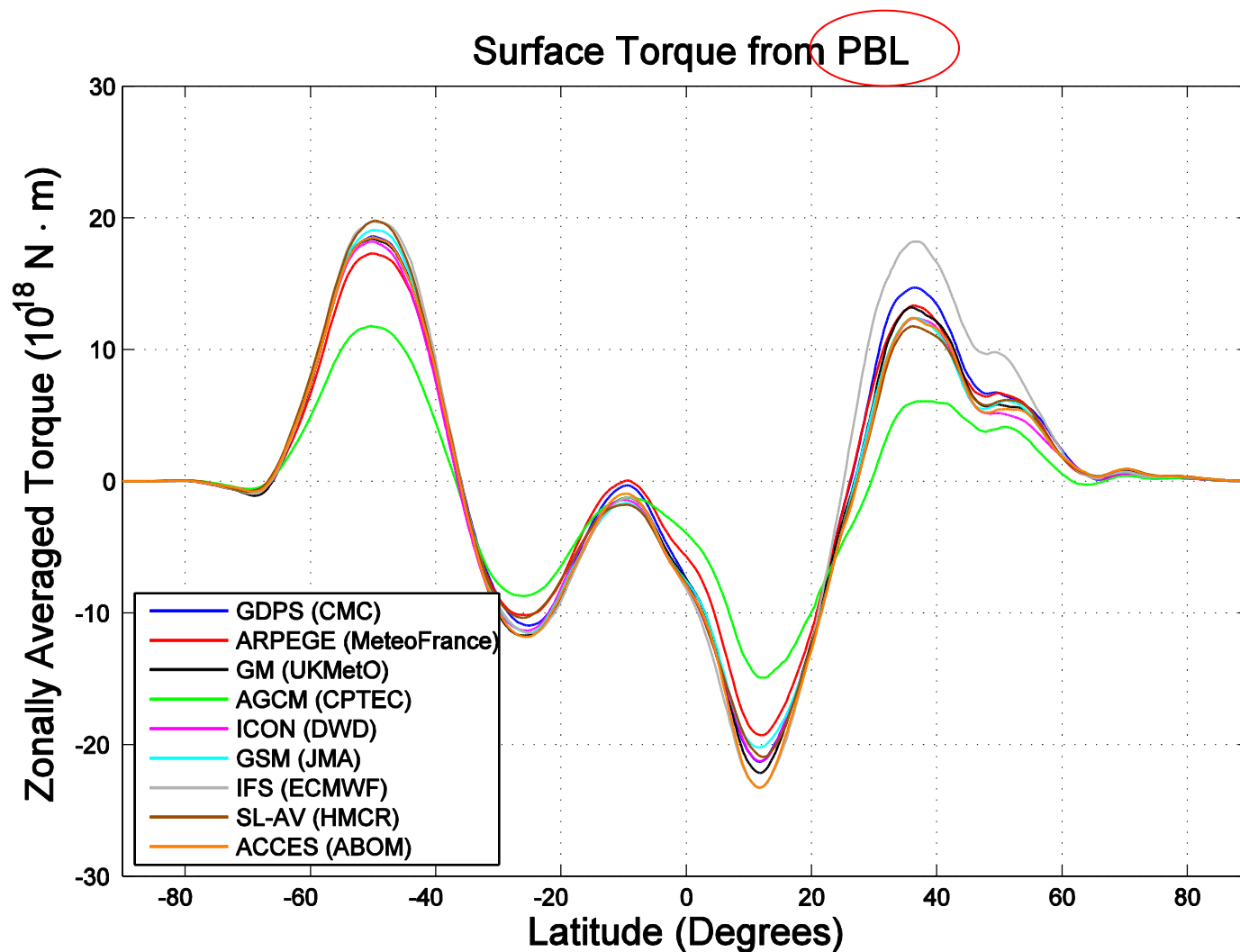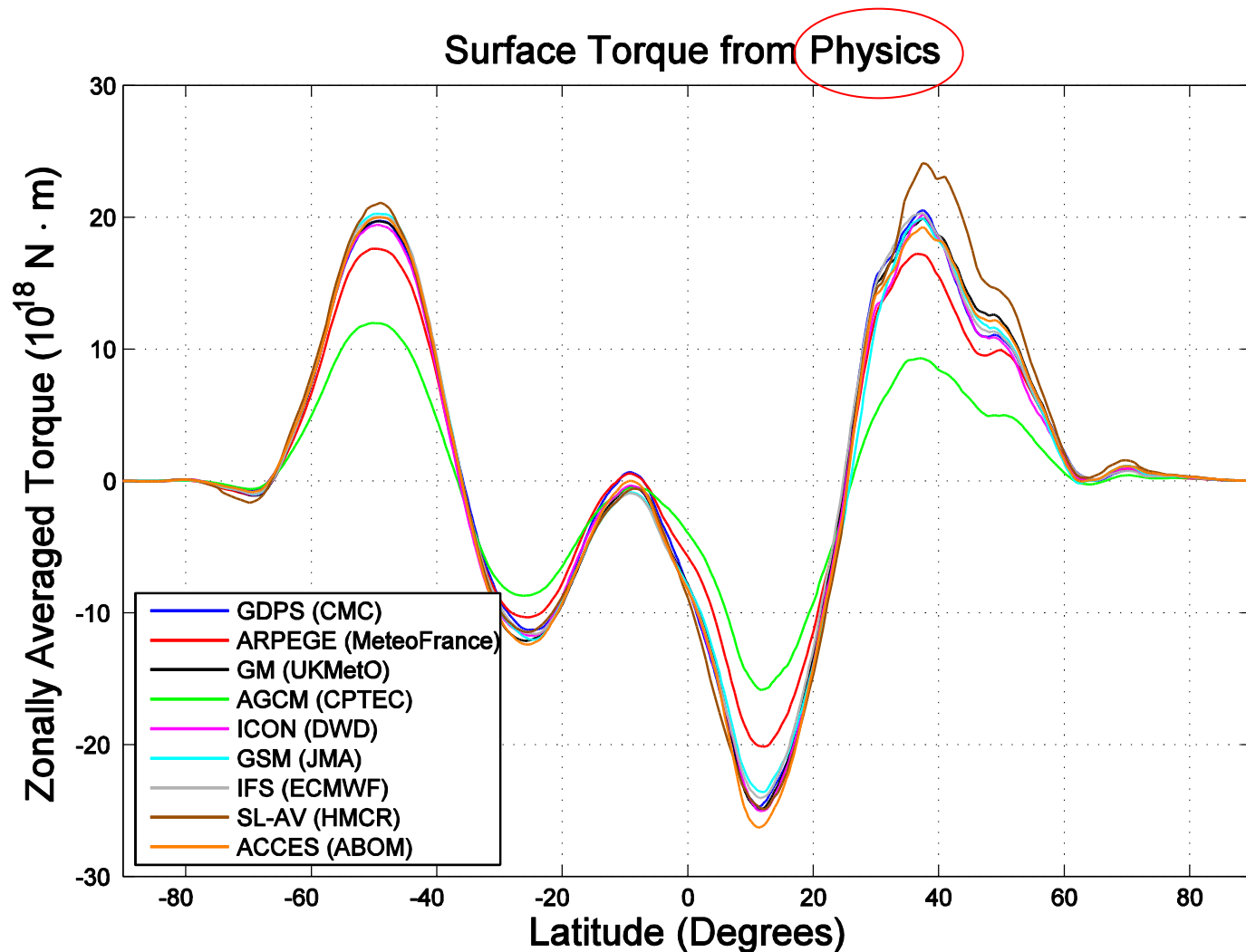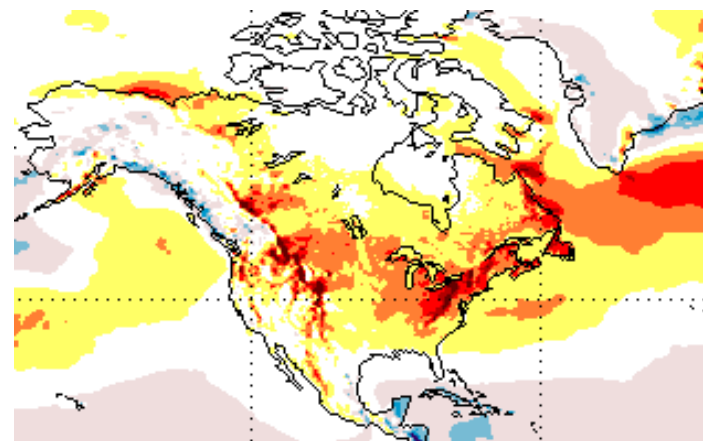
WGNE DRAG-project
inter-comparison of stress fields

IFS (ECMWF)   **UM (UKMetO)**

u-component of PBL stress (N/m2) – Jan 2012 – 00-24h average

WGNE Drag Project

Recent developments, ongoing and planned activities

- *Website and 1st report submitted to participants*
- *Concept paper in preparation (to be submitted to BAMS)*
- *Results presented at*
  - *21st Symposium on Boundary Layer and Turbulence (Jun 2014, Leeds, UK)*
  - *World Weather Open Science Conference (Aug 2014, Montreal, Canada)*
  - *Workshop on Angular Momentum Budget (April 2015 at Univ. Reading, organized by Dr. T. Shepherd)*
- *Julio Bacmeister is WGNE's contact with climate community*
  - *additional output for CMIP6 (for free atmosphere momentum balance, following TEM approach)*
  - *participated in Workshop on CMIP5 Model Analysis and Scientific Plans for CMIP6, Oct 2015, Dubrovnik, Croatia*
- *Proposed session on momentum-related issues at next Systematic Errors Workshop (probably in Montreal, Canada, June 2017)*
- *ECWMF to organize a workshop on "Drag processes and their links to large-scale circulation", in Sep 2016*

WGNE: 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. Links to EUMETCHEM

- 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 **HIW**

- Support to **CMIP**
  High resolution time slice intercomparisons

WGNE: future directions

> Continue to look **cross-timescale**
  - *weather and climate (and air quality/chemistry) communities together*

> Keep championing the **importance of model development**
  - *focus on systematic errors*

> Maintain **strong links** to many other groups and projects
  - *e.g. WWRP, DAOS, GASS, PPP, S2S, HIW, EUMETCHEM, WGCM, SPARC, WMAC, GODAE, WCRP Grand Challenges......*

> Maintain an active portfolio of **projects and workshops and conferences**

Thank you

Environment and
Climate Change Canada

Environnement et
Changement climatique Canada

Canada