



Environment and
Climate Change Canada

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Canada



Report on the 5th WGNE Workshop on Systematic Errors

Ayrton Zadra and Keith Williams



Joint WGNE/PDEF Meeting
JMA, Tokyo, Japan, 9-12 October 2018

WGNE WSE-2017

- hosted by ECCC
- co-sponsored by WMO/WCRP, NOAA/MAPP, Ouranos

Science steering committee:

Keith Williams ([WGNE](#) co-chair)
Barbara Casati ([JWGFVR](#))
Greg Flato ([WGCM](#))
Nils Wedi ([WGNE](#))
Bill Merryfield ([WGSIP](#))
Francois Bouyssel ([WGNE](#))
Hai Lin ([S2S](#))
Mike Ek ([WGNE](#), [GEWEX](#), [GLASS](#))
Eric Maloney ([MDTF](#))
Kazuo Saito ([MRI-JMA](#))
Judith Berner ([PDEF](#))

WMO liaison: Michel Rixen ([WCRP](#))

Local organizer: Ayrton Zadra ([WGNE](#) co-chair)

WGNE WSE-2017

5th workshop
on systematic errors
in weather and climate models

June 19-23, 2017
Centre Mont Royal
Montreal, Quebec, Canada

collaboration.cmc.ec.gc.ca/science/rpn/wgne_wse/index-en.html



WGNE WSE-2017

Some statistics:

- 13 keynote presentations (by invitation)
- ~230 abstracts submitted
- 166 abstracts accepted:
 - 132 posters
 - 34 oral
- 10 early-career scientists (ECS) received financial support from WCRP
- various ECS activities
- Note: most presentations and posters available on the workshop website.

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WGNE WSE-2017

Desired outcomes from the workshop

- Sharing novel diagnostic techniques for identifying (the cause of) systematic errors.
- Noting where there are gaps in our observational and/or modelling systems which hamper understanding of systematic errors.
- Agreeing the current key systematic errors in weather and climate models.
- Discovering where work is progressing to address systematic errors and connecting those working on similar problems.
- **Identifying gaps where new projects are required (e.g. with GASS/GLASS).**
- Inform the strategy of WGNE for the coming years.

WGNE WSE-2017

Meeting Summary
published in
BAMS 2018

MEETING SUMMARIES

SYSTEMATIC ERRORS IN WEATHER AND CLIMATE MODELS

Nature, Origins, and Ways Forward

AYRTON ZADRA, KEITH WILLIAMS, ARIANE FRASSONI, MICHEL RIXEN, ÁNGEL F. ADAMES, JUDITH BERNER, FRANÇOIS BOUYSSSEL, BARBARA CASATI, HANNAH CHRISTENSEN, MICHAEL B. EK, GREG FLATO, YI HUANG, FALKO JUDT, HAI LIN, ERIC MALONEY, WILLIAM MERRYFIELD, ANNELIZE VAN NIEKERK, THOMAS RACKOW, KAZUO SAITO, NILS WEDI, AND PRIYANKA YADAV

The Fifth Workshop on Systematic Errors in Weather and Climate Models (WSE) was hosted by Environment and Climate Change Canada (ECCC) under the auspices of the Working Group on Numerical Experimentation (WGNE), jointly sponsored by the Commission of Atmospheric Sciences of the World Meteorological Organization (WMO) and the World Climate Research Programme (WCRP). This major event welcomed over 200 scientists from the weather and climate communities. The workshop's primary goal was to increase understanding of the nature and cause of systematic errors in numerical models across time scales. Out of 240 abstracts submitted to the workshop, 48 talks and 132 posters

FIFTH WORKSHOP ON SYSTEMATIC ERRORS IN WEATHER AND CLIMATE MODELS

WHAT: Hundreds of scientists involved in the development and evaluation of weather and climate models held an international workshop to discuss the nature and causes of systematic model errors across time scales.

WHEN: 19–23 June 2017

WHERE: Montreal, Quebec, Canada

development bottleneck and the problem of compensating errors. Verification of parameterization

WGNE WSE-2017

List of identified systematic errors/issues:

1. **convective precipitation** — diurnal cycle (timing and intensity); the organization of convective systems; precipitation intensity and distribution; and the relationship with column-integrated water vapor, SST, and vertical velocity;
2. **cloud microphysics** — errors linked to mixed-phase, supercooled liquid cloud, and warm rain;
3. **precipitation over orography** — spatial distribution and intensity errors;
4. **MJO modeling** — propagation, response to mean errors, and teleconnections;
5. **subtropical boundary layer clouds** — still underrepresented and tending to be too bright in models; their variation with large-scale parameters remains uncertain; and their representation may have a coupled component/feedback;
6. **double intertropical convergence zone/biased ENSO** — a complex combination of westward ENSO overextension, cloud–ocean interaction, and representation of tropical instability waves (TIW);
7. **tropical cyclones** — high-resolution forecasts tend to produce cyclones that are too intense, although moderate improvements are seen from ocean coupling; wind–pressure relationship errors are systematic;
8. **surface drag** — biases, variability, and predictability of large-scale dynamics are shown to be sensitive to surface drag; CMIP5 mean circulation errors are consistent with insufficient drag in models;
9. systematic errors in the representation of **heterogeneity of soil**;
10. **stochastic physics** — current schemes, while beneficial, do not necessarily/sufficiently capture all aspects of model uncertainty;
11. outstanding errors in the modeling of **surface fluxes**;
12. errors in variability and trends in **historical external forcings**;
13. challenges in the prediction of **midlatitude synoptic regimes and blocking**;
14. model errors in the representation of **teleconnections** through inadequate stratosphere–troposphere coupling;
15. errors in meridional wind response and tropospheric jet stream impact simulations of **teleconnections**;
16. surface temperature errors (land and sea) including errors in **surface temperature diurnal cycle**.

WGNE WSE-2017

Recommendations:

- WGNE-WGCM to prioritise errors.
- Extend drag project to consider momentum more generally and consider representation of orography, etc.
- Consider setting up a group or extend drag group to look at surface flux errors.
- Encourage community to make use of S2S drifts database.
- Discuss with S2S/WGSIP regarding extension of aerosols project to seasonal timescale.
- Consider a cross weather-climate group looking at initial tendency analysis of common biases.
- Hold another WSE in 4-5 years time, possibly inviting submissions on solutions rather than just problems.

WGNE WSE-2017

Recommendations: (News)

- WGNE-WGCM to prioritise errors. (Survey in preparation)
- Extend drag project to consider momentum more generally and consider representation of orography, etc. (New WGNE/GASS project)
- Consider setting up a group or extend drag group to look at surface flux errors. (New WGNE surface flux project)
- Encourage community to make use of S2S drifts database.
- Discuss with S2S/WGSIP regarding extension of aerosols project to seasonal timescale. (Extended WGNE aerosols project)
- Consider a cross weather-climate group looking at initial tendency analysis of common biases.
- Hold another WSE in 4-5 years time, possibly inviting submissions on solutions rather than just problems.