Sochi-2014: Environment Canada’s Plans together with Perspectives from the WWRP’s Working Group on Mesoscale Weather Forecasting Research

Stéphane Bélair
Science and Technology Branch, Environment Canada
Member of the WWRP’s WG-MWFR

Materials from the following presentations

Onvlee, J., WG-MWFR activities, WGNR Meeting, 8-10 Feb. 2011
Belair, S., General information about VO2010, 1 Dec. 2008
Mailhot et al., High-resolution NWP for VO2010, SNOWV10 workshop, 13 Jan. 2011
Belair, S., High-resolution land surface system for VO2010, SNOWV10 workshop, 13 Jan. 2011
WG-MWFR, Report on the 5\textsuperscript{th} Meeting..., 26-27 August 2010 in Boulder.

1-3 March 2011, First meeting for Sochi-2014 RDP/FDP, Sochi, Russia
WWRP’s Working Group on Mesoscale Weather Forecasting Research

Mission:

To promote, organize and/or endorse end-to-end weather research and development projects (RDPs) that advance understanding of weather processes, improve forecasting techniques and increase the utility of forecast information with an emphasis on high-impact weather.

Scientific Issues Considered:

Mesoscale data assimilation

Convection and complex topography

Surface modeling

Predictability and probabilistic forecasting

Verification and validation

(missing on photograph: Volker Wulfmeyer)
Activities of the WG-MWFR

- Focus on 0.5-5km grid size models, mostly extratropics so far
- Push mesoscale weather research questions in several fora
- Help set up / involvement in RDP’s/FDP’s
- Just started activities on:
  - “Grey zone” studies in context of WGNE
  - Considering how to set up internationally coordinated experimentation on mesoscale data assimilation
  - Promote worldwide standards for mesoscale verification, routine quality assessment and exchange (together with JWGV)
  - Inventory of available mesoscale training material, gaps therein
- Liaisons with other WMO WG (e.g. Thorpex/TIGGE-LAM, WWRP/NWC, JWGV, WGNE, …)
- WMO symposia, dedicated workshops on specific topics

RDPs and FDPs
MAP-DPHASE, COPS, Beijing 2008 RDP, HYMEX Programme, and Sochi-2014 RDP/FDP ... but not Vancouver-2010...
Vancouver-2010: EC’s Experimental Mesoscale Systems

1. HIGH-RESOLUTION ATMOSPHERIC SYSTEM
   - 15-km GEM-LAM
   - 2.5-km GEM-LAM
   - 1-km GEM-LAM
   - IC + LBC

2. REGIONAL EPS
   - 33-km GEM-LAM
   - 20 members

3. EXTERNAL LAND SURFACE SYSTEM
   - 2D-external land surface System (100 m)
   - Single-Point

Adaptor
EC’s 1-km LAM System for VO2010

FEATURES:

- Improved dynamics
- Improved physics
- New model diagnostic outputs
- Customized output package

2-D maps (1 km)

Meteograms (1 km)
EC’s External Land Surface Modeling for VO2010

100-m snow analyses

Great decrease of T2m errors (bias shown here)
To be Expected for Sochi (I)

From EC’s point of view, Sochi-2014 will be used as an opportunity for improving operational mesoscale NWP

**Initial conditions**

*Conventional data*

- 4DVAR 10-km LAM
- Upper-air downscaling
- 10-km GEM-LAM → 1.5-km GEM-LAM → 250-500m GEM-LAM
- ICs ↔ ICs / LCs
- High-resolution external land surface system (100m)
- Surface ICs

*Surface databases available for the region?*
More vertical resolution compared with VO2010 system;

Vertical nesting (top near the tropopause)

Improvement to the representation of physical processes:

Land surface modeling (M²ISBA almost completed)

More “intimate” surface / atmosphere coupling

Better treatment of low-level drag effects

Urban modeling (is it worth being include for Sochi?)

Quasi-3D turbulence for the sub-km models

Microphysics (Milbrandt-Yau double or triple moment, interactions with radiation, partially melted snow)

Have started development of EPS-LAM (few km grid size), but implementation over Sochi may require a lot of resources... does not prevent from having multi-model EPS
Possible Elements of the Sochi-2014 RDP / FDP

- **Aim**: combined RDP/FDP on nowcasting/mesoscale modelling, as meteorological support of Sochi 2014 Winter Games.

- Winter nowcasting and short-range mesoscale forecasting in complex terrain

- Special emphasis on prediction of wind speed and wind gust, visibility, fog, precipitation intensity, types, and timing

- High-resolution ensemble prediction of high-impact winter weather events in a region with complex terrain.

- Emphasis on more extensive use of remote sensing data for nowcasting, regional data assimilation, and forecast/nowcast validation

- New products (nowcasting, weather elements from NWP, probabilistic predictions)

- Capacity building for regional forecasters
Final Words... Specific Recommendations from the WG-MWFR (I)

Cautiousness when deciding which components of the project are for Development (RDP) vs Demonstration (FDP).

Working Group recommends that the LAM-EPS component be considered as RDP, because the technical requirements and forecasters training may be too much for FDP.

How much room / time will the forecasters have to prepare for the use of demonstration tools?

Working Group recommends that the requirements for mesoscale data assimilation versus downscaling be reviewed.
Final Words... Specific Recommendations from the WG-MWFR (II)

Probably more realistic to consider the data assimilation component as a RDP, because of FDP’s severe constraints for timeliness, data availability, QA/QC, which would require early use of data from observation network - clear plan for observational network?.

Consider “after the fact” (retrospective) experiments (especially in the context of data assimilation)

Data archival?

The role of Roshydromet?

Other considerations: existing probabilistic products from other centres, visualisation tools