## The Observing System Simulation Experiment setup at Environment Canada



 Global 3D-FGAT assimilations are done over successive 6-hr intervals. Incremental assimilation resolution is T108. The applied background error correlations are horizontally isotropic and homogeneous with the vertical and horizontal correlations being non-separable for all variables except for ozone.

Environment Environnement Canada

Yves J. Bochon, Jacek W. Kaminski\*, Sylvain Heilliette, Louis Garand, Jean de Grandoré, and Bichard Ménard nospheric Sc

1. Assimilation model and system

Sylvain Heinette, Louis Garand, Sea cience and Technology Directorate, Enviror \*WxPrime Corporation, Toronto, Canada Email: y

2. Nature Run for the two presented cases ECMWF Joint OSSE T511NR free model run (e.g. Reale et al. 2009) with model configuration of the CY31r1 IFS cycle
 Fields are available at 3-hour intervals covering the period of May 2005 to May 2006 (13 months) · Sea surface temperatures and ice provided by the National Centers for Environment Prediction (NCEP) Studies were conducted for the summer and winter periods 1024x512 Gaussian grid with a horizontal resolution equivalent to a ~40 km horizontal resolution · 91 vertical levels extending from just above the surface to the lower mesosphere 3 Control observation sets Characteristics of 2008-09 observation sets were transposed to the corresponding months in 2005-06. Synthetic observations were produced in-house from the nature run mostly using the assimilation system observation models. radiosondes and dropsondes · surface observations (from land stations, ships and buoys) · cloud drift winds (AMVs) • AMSU-A, AMSU-B, MHS AIRS, IASI, SSMI, and SSMIS GPS-RO micro satellites wind profilers (NOAA network) scatterometers SBUV-2 ozone partial columns from NOAA17, 18 (averaging kernels used)

winds and temperatures from aircrafts GOES, MVIRI, SEVIRI, and MTSAT-01 imagers

Radiance data are thinned to resolution boxes of 150 km x 150 km (i.e. with one used pixel per box). Similar imposed resolutions for AMVs and aircraft data. See Heilliette et al. poster for radiance simulations.

## 4. Observation noise calibration and assessment of control ass on (cases a and b)

 Standard deviations of the Gaussian random perturbations added to noise-free simulated observations Statistic deviations of the Gabssian random perturbations added to hole-meet simulated observations are defined as fractions  $\beta$  of the assigned observation error standard deviations (following Errico et al.; NASA Goddard Global Modelling and Assimilation Office; personal communication)

Canadian Global Environmental Multiscale (GEM) NWP model with a uniform 800x600 longitude-latitude grid,

80 vertical levels and a model lid at 0.1 hPa was used. The added simplified ozone model consists of the LINOZ parameterization of McLinden et al. (2000) which has the form of the Cariolle scheme (2007, 1986).

· Spatial and channel error correlations not introduced here. Perturbations also currently independent of vertical level.







## 5.1 Observations

5. Case A: Impact of IRLS and MLS-type observations

MLS-type: Simulated temperature, water vapour and ozone profiles having characteristics of the data from the Microwave Limb Sounder on Aura (e.g. Waters et al., 2006)

IRSL-type of PREMIER mission (ESA. 2008): Simulated retrieved temperature, water vapour, and ozone profiles from the InfraRed Limb Sounder (IRLS). The spatial resolution for IRLS is 1 km in the vertical, ~50 km along-track, and ~35 km acrosstrack with twelve across-tracks. Horizontal thinning was applied for an effective resolution of ~100 km. The profiles extend vertically from 4-8 km to 50 km for IRLS. [Experiments also done for the PREMIER Millimetre Wave Limb Sounder , MWLS. Results not included here.]



## 6.1 Observations

6. Case B: Impact of PCW Atmospheric Motion Vector observations

Atmospheric Motion Vector (AMV) wind images covering the Arctic region (50° to 90°N) for the proposed PCW mission (PCW, 2009) would, in practice, be derived from brightness temperatures of 16 MODIS IR and near-IR channels. The simplified AMV simulation is described in section 3. The resultant AMVs are thinned to resolution boxes of 75km x 75 km.

Eleven micron channel transmittances were first simulated using the Simulrad software package and the nature run. Corresponding cloud tops were set as the levels at which the cloud transmittances from the 11 micron channel dropped to 0.9. The simulated AMVs are the wind vectors extracted from the nature run at these cloud top levels which range between ~250 and 850 hPa and cover the region 50-90 N.





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