Environnement Canada Environment Canada

Canada

Atmospheric Data Assimilation

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Joint Science Planning Meeting for MEOPAR Initial Projects IP1.1, IP1.2
Boardroom 1524, Queen Square, 45 Alderney Drive, Nova Scotia, CAN
23-24 Jan 2013
Session 1 – Detailed Discussion of IP1.1

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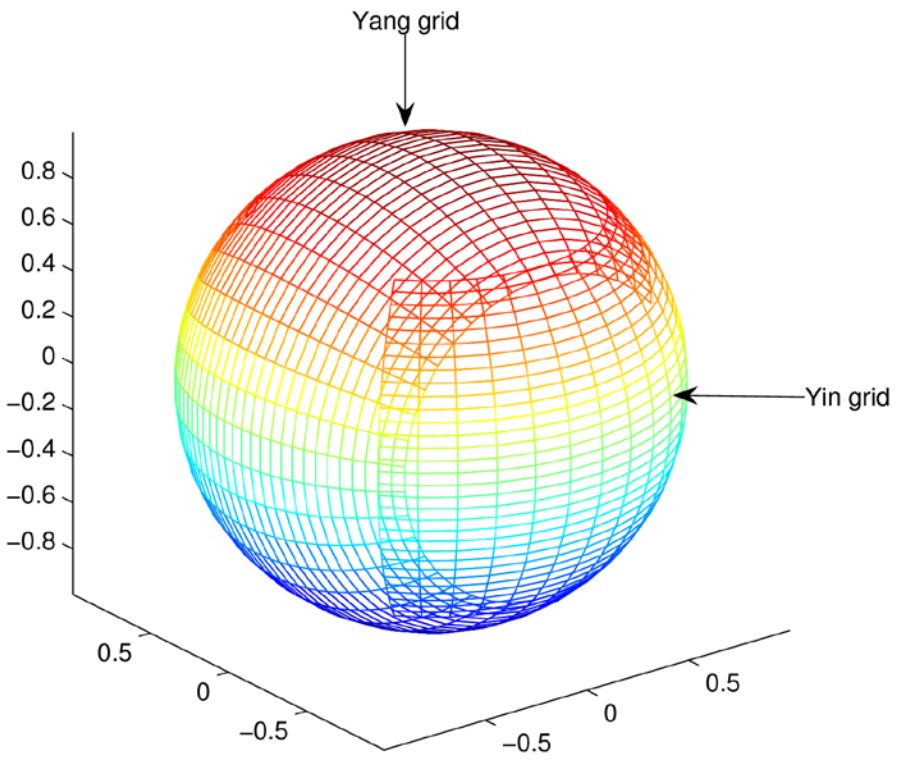
Upcoming GEM and Data Assimilation Systems at EC

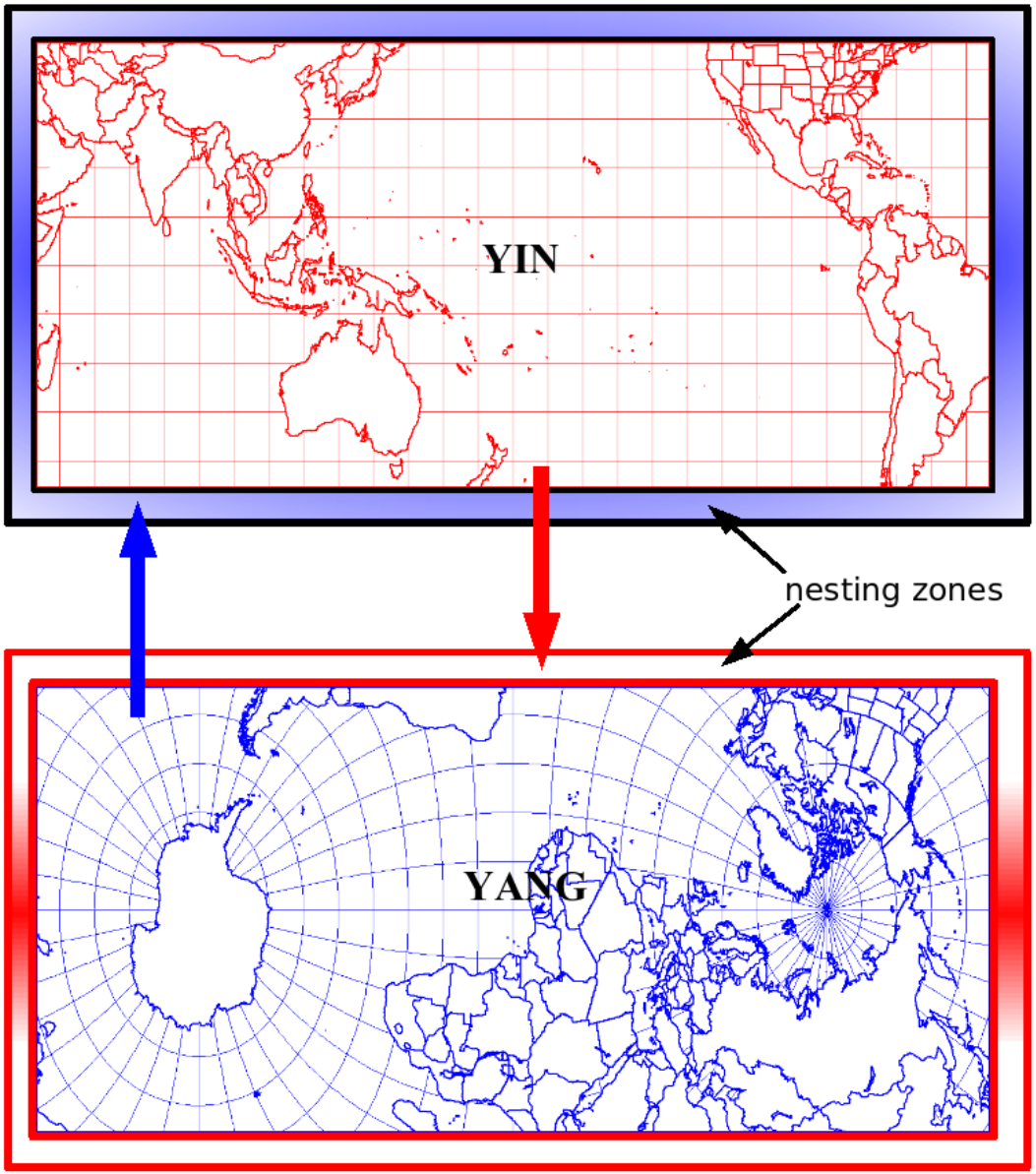
- **GEM global -> Yin-Yang at 15 km horizontal resolution globally.**
- **GEM National (Canada) at 2.5 km up to 36h.**
- **GEM Urban scale -> 250 m**

- **In the next 2 years, EC Data Assimilation systems will rely fully on Ensemble Kalman Filters (ENKF) and Ensemble Variational Analysis (ENVAR) strictly.**

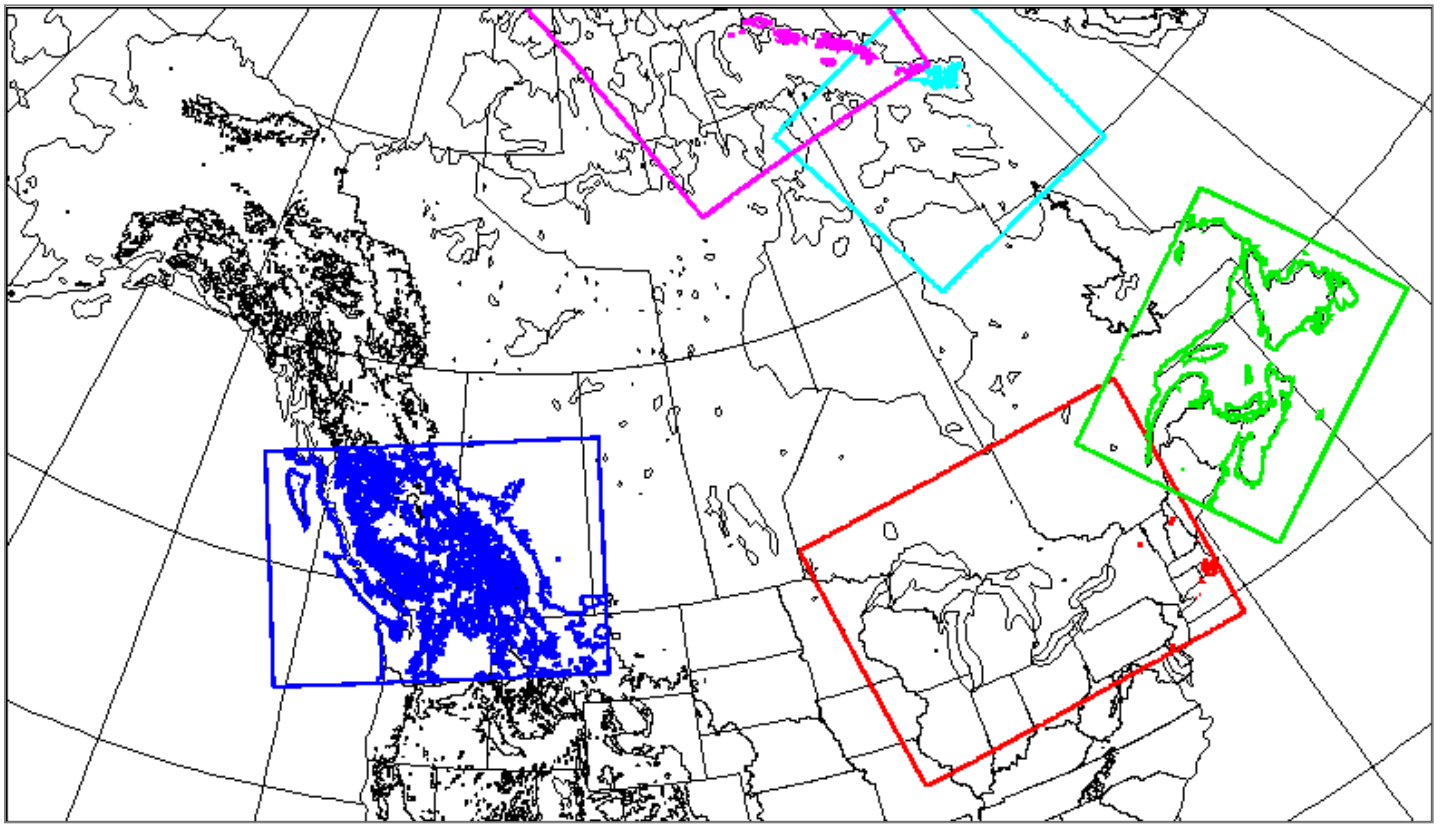
Upcoming EC Global Forecasting system: Yin-Yang LAM-15 km Models (Abdessamad Qaddouri et al. RPN/EC)

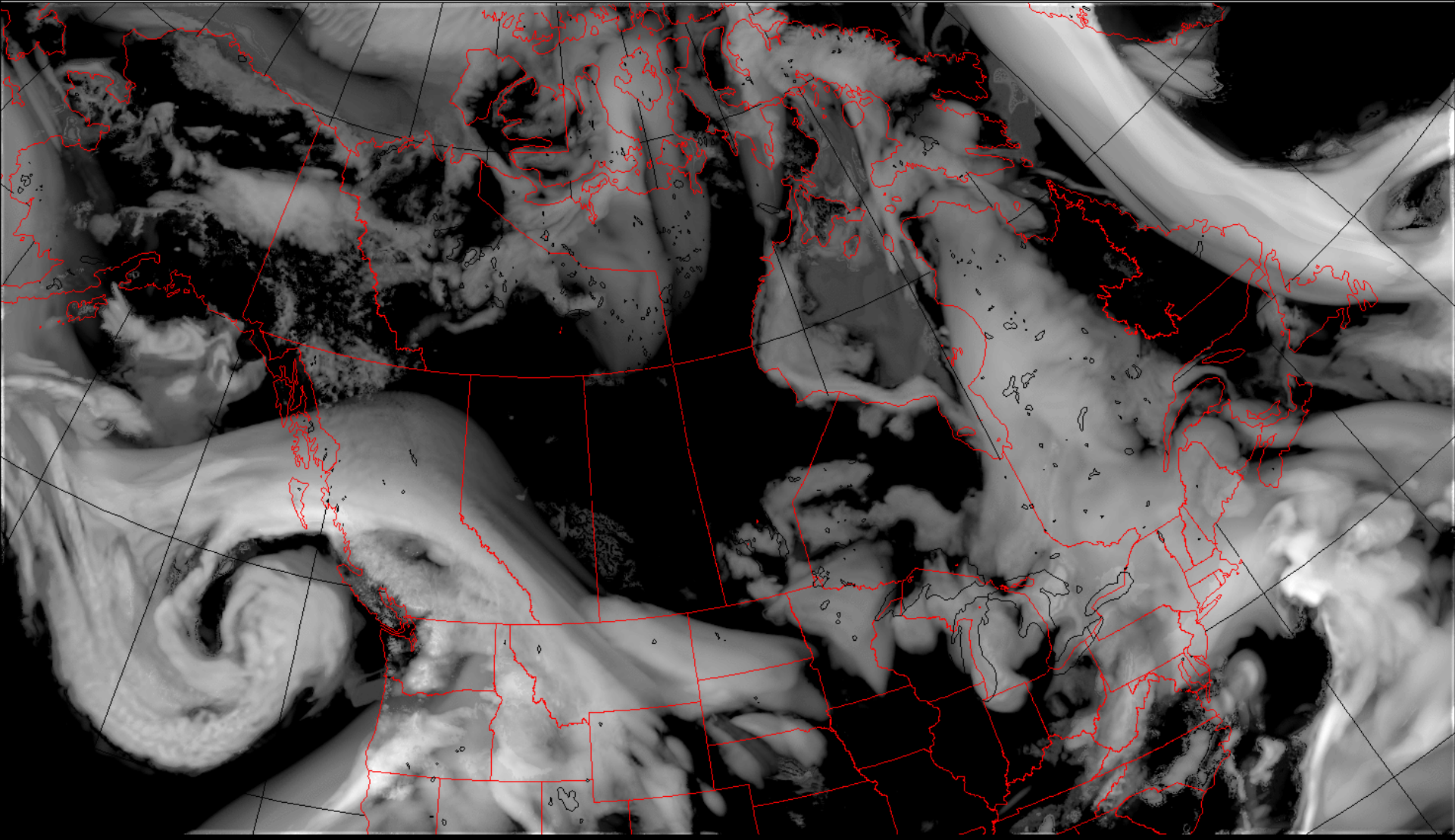


Data Exchange between Yin and Yang subgrids



Operational GEM-2.5 Km Grids





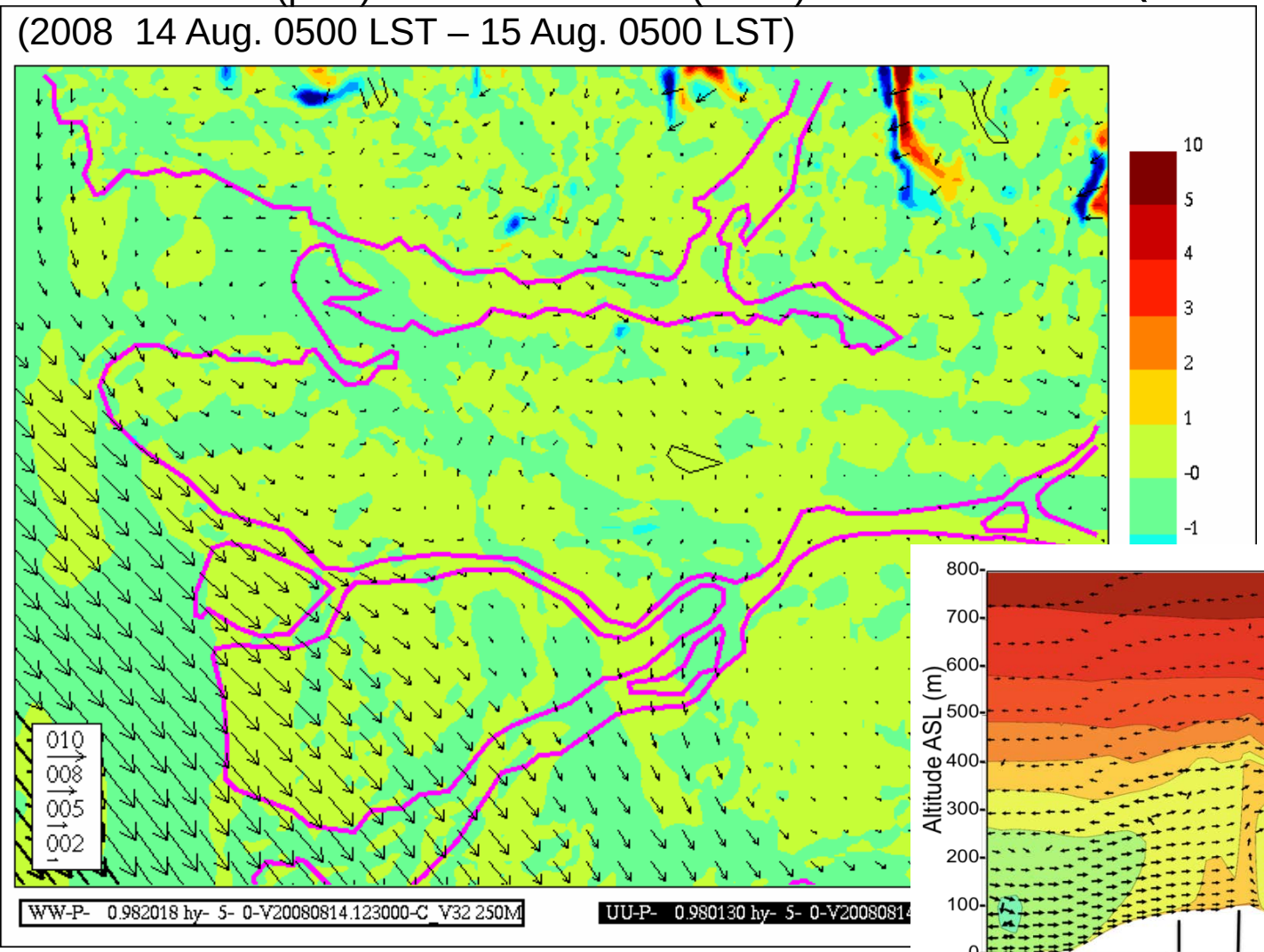
GEM-NATIONAL

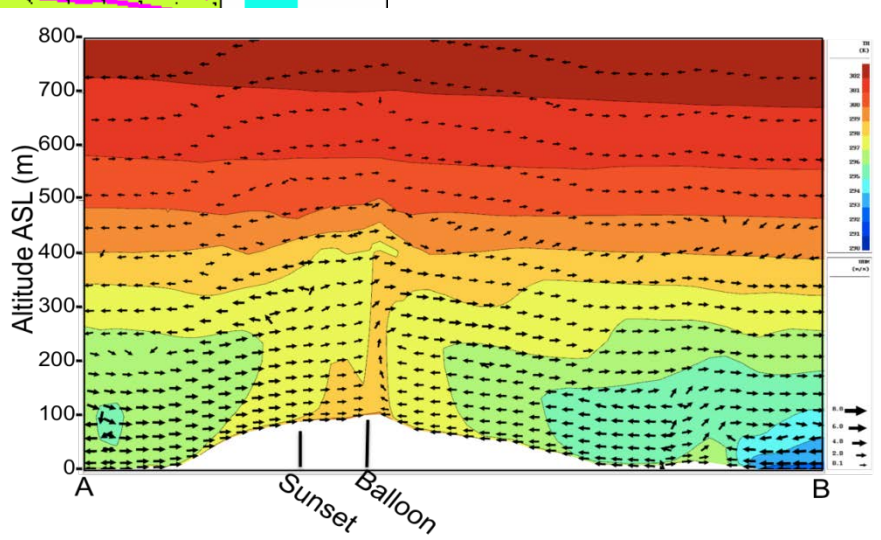
- **2500 x 1310 grid-points; 58 Vertical level; 10x32x8 = 2560 CPU**
- **National Data Assimilation Cycle (driven by External DA System)**

Vancouver, British Columbia, Canada (EPiCC)

Leroyer et al. (2013):
250-m modeling of sea breezes over Vancouver (to be submitted)

Vertical Motion (pa/s) and Wind Vectors (knots) at ~ 160 m AGL
(2008 14 Aug. 0500 LST – 15 Aug. 0500 LST)

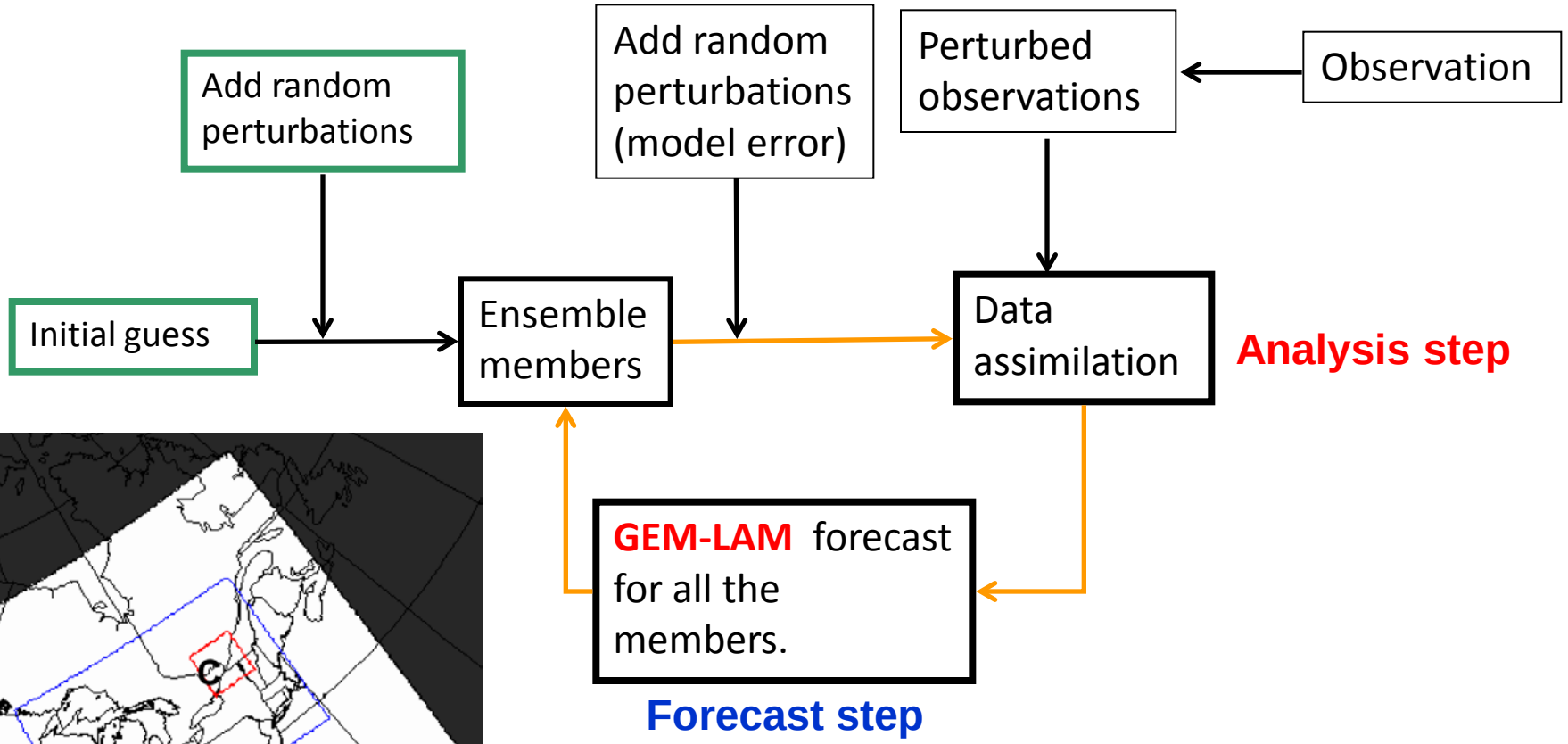


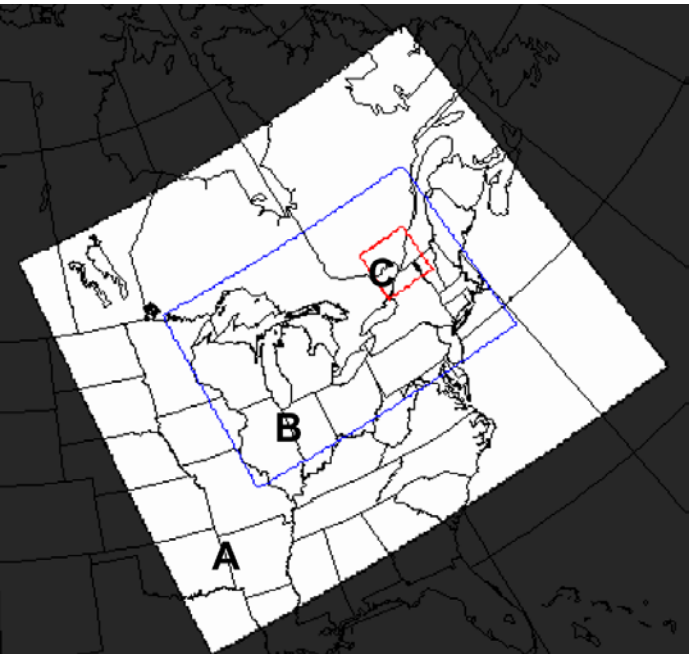


HRENKF

(in development at EC since 2010 by Luc Fillion, Kao-Shen Chung, Weiguang Chang, Frédéric Fabry, Monique Tanguay)

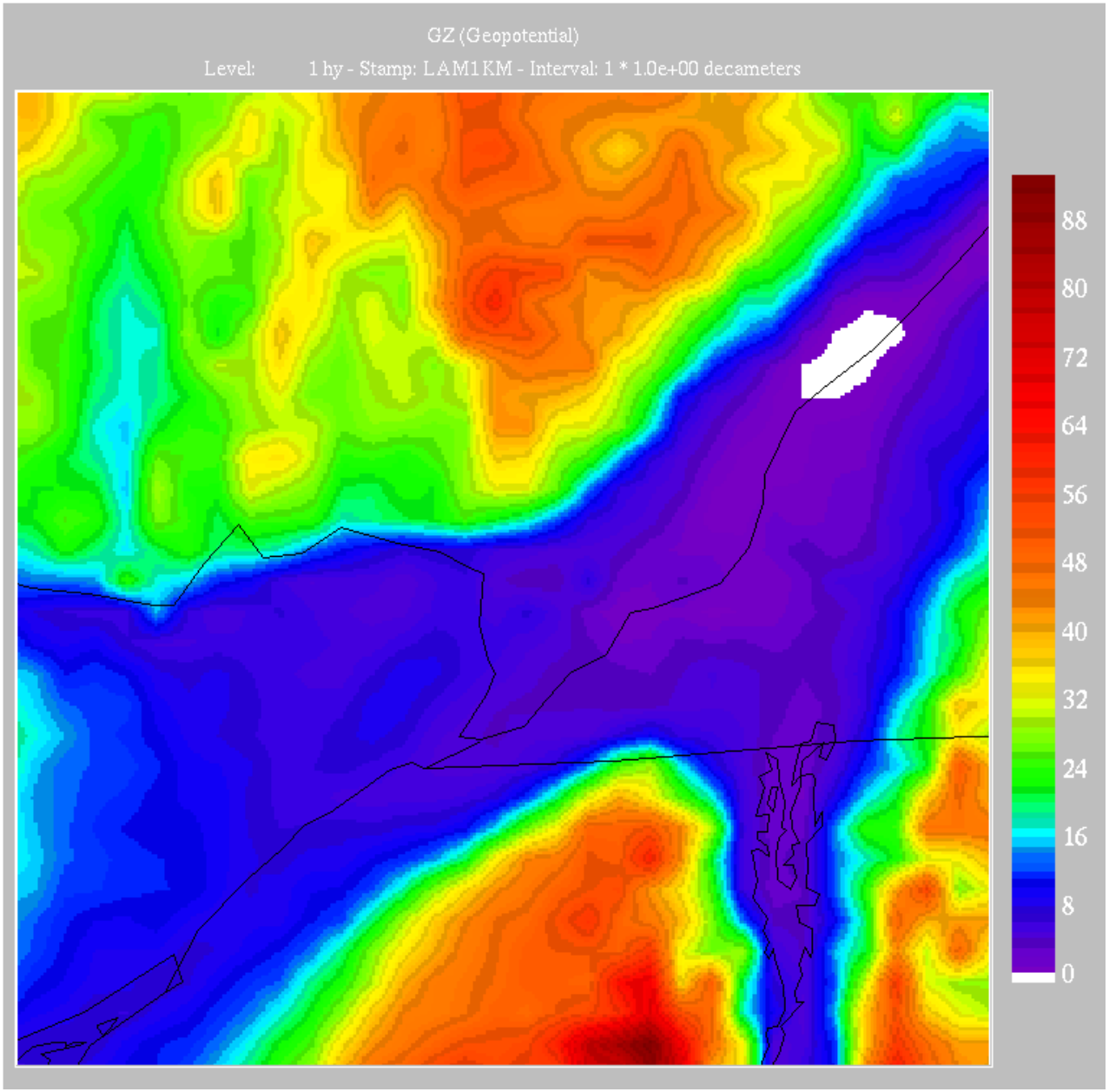
McGill





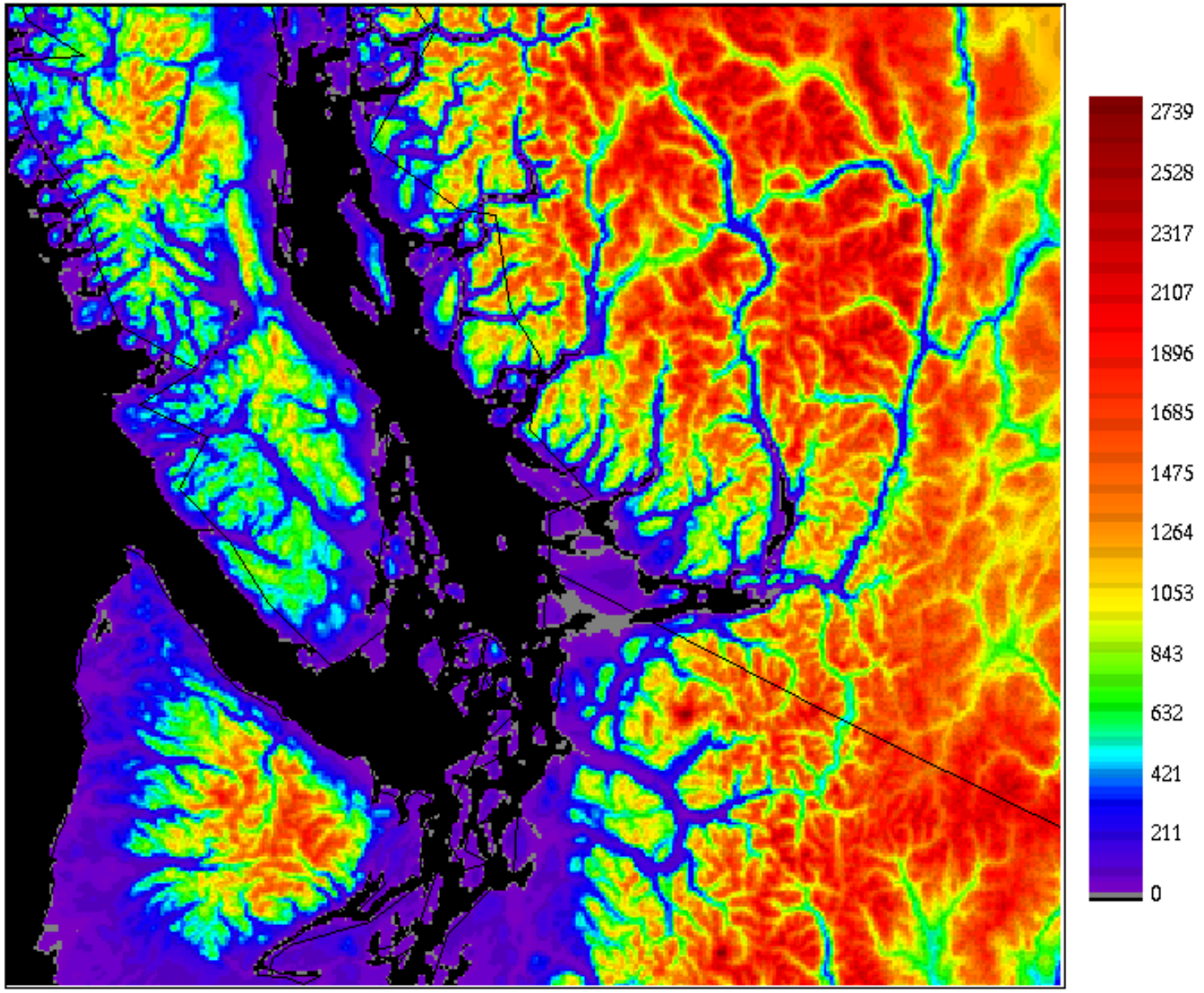
A: LAM15
B: LAM2p5
C: LAM1 300x300 (MTL region)

Topography of the Montreal region



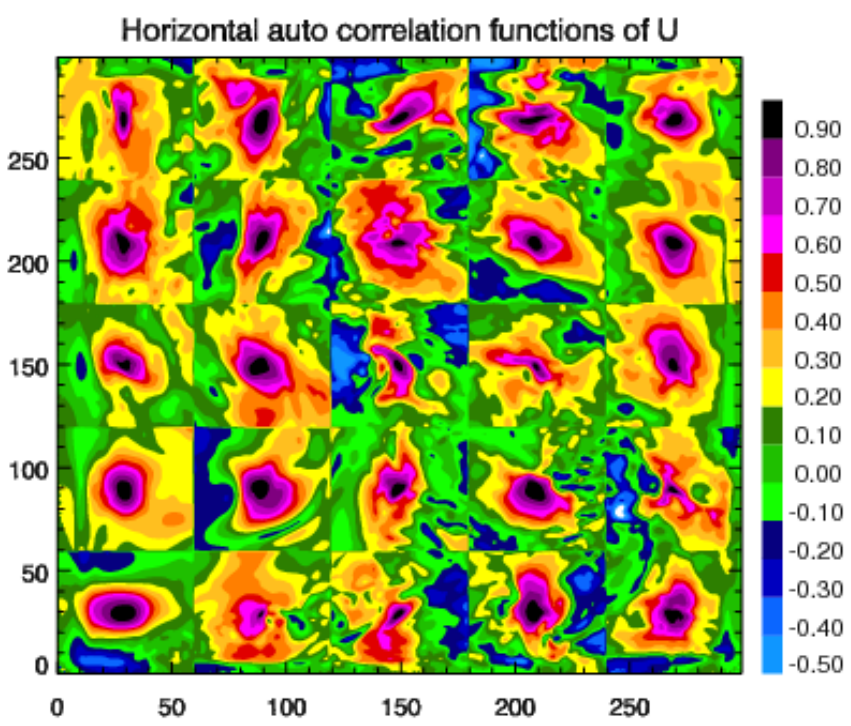
ME (Topography)

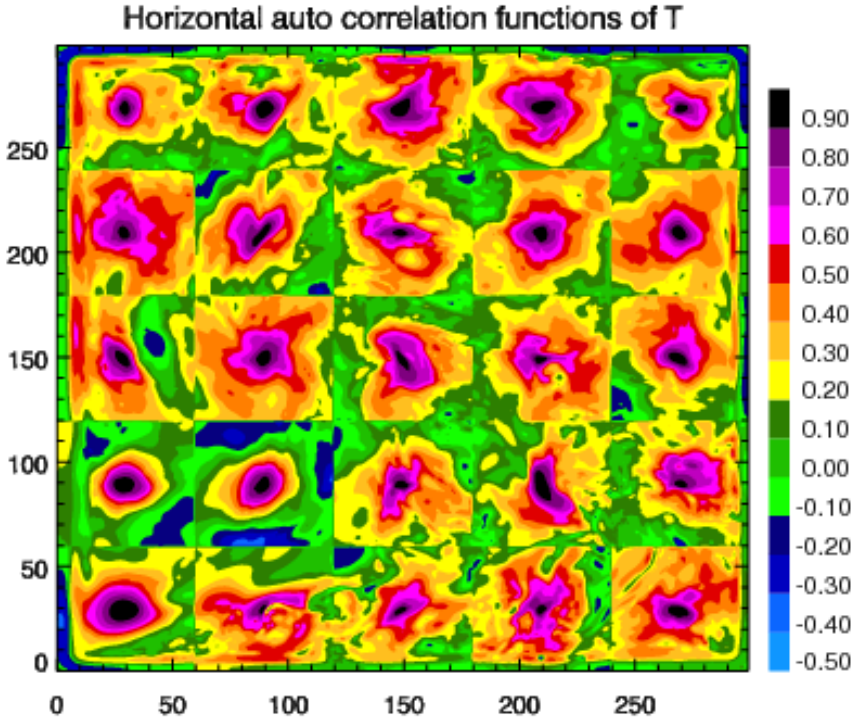
Level: 0 mb - Stamp: GENGEO - Interval: 0 * 1.0e+00 m



Climatological field valid 10:00Z October 10 1910

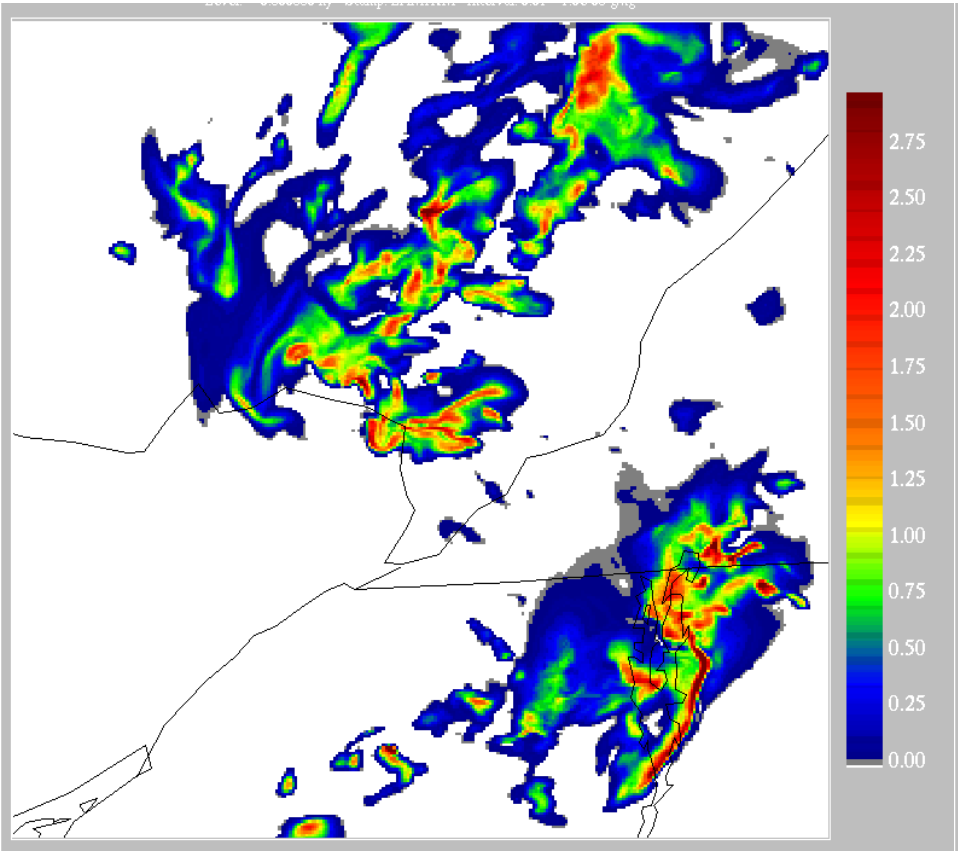
Error correlation of 15-min GEM-1 km Forecast at 800 hPa



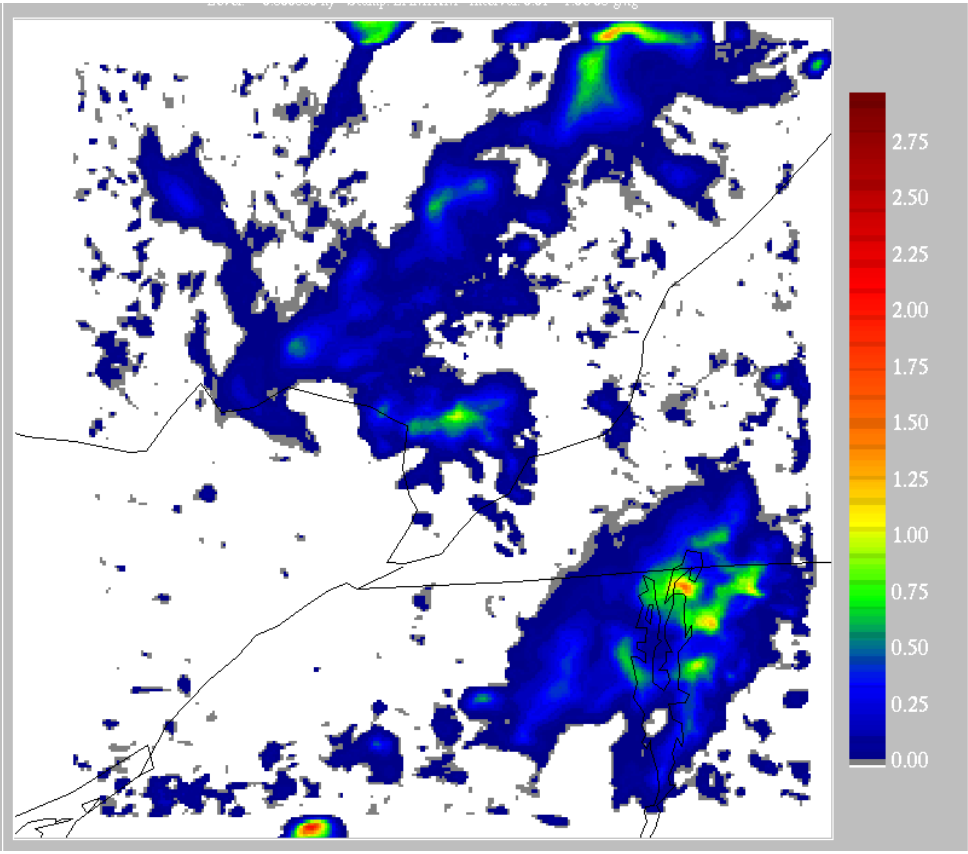


Analysis rain mixing ratio at 2-km height

Control run (no radar assimilation)



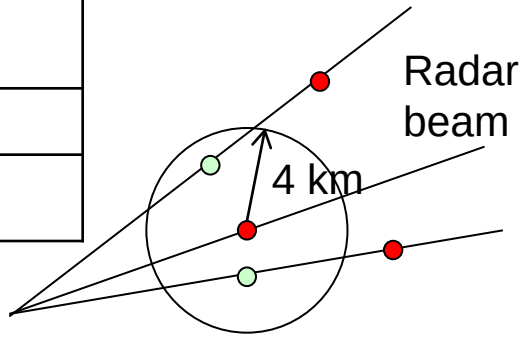
EnKF (6 cycles) mean analysis



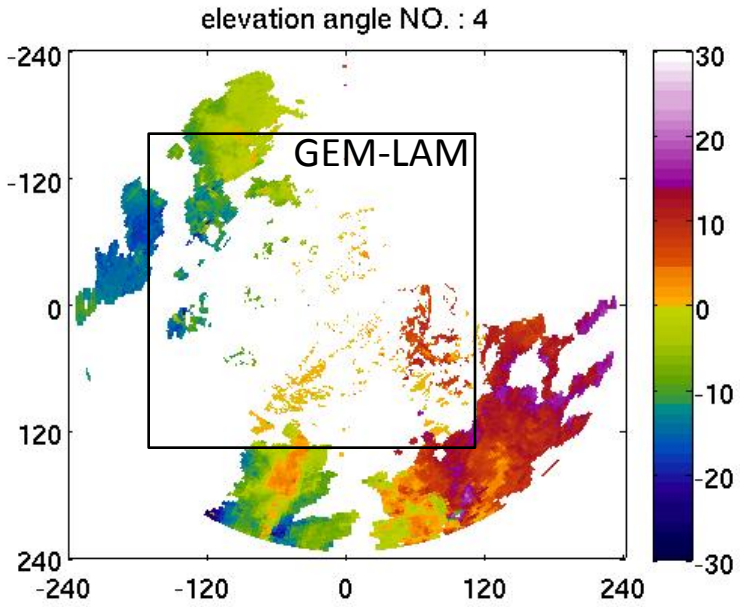
0030 UTC

HRENKF Radar Data Assimilation

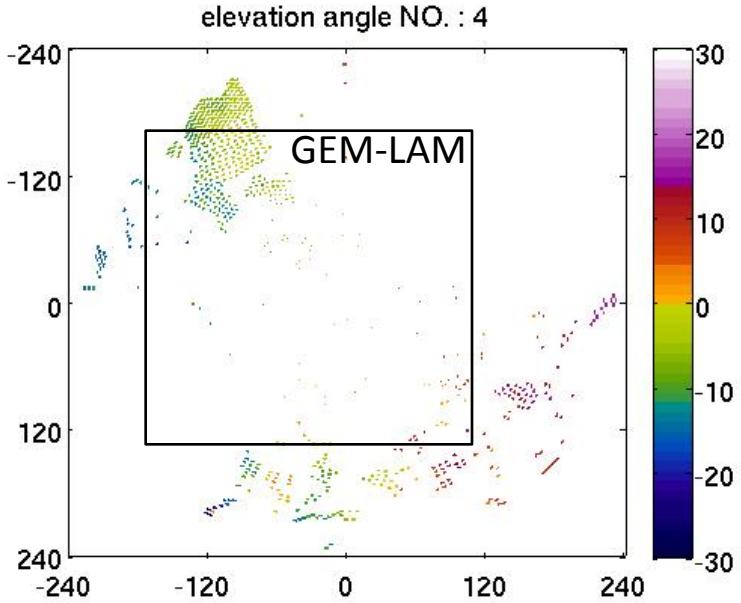
Radial wind (VR)	Total number of observations	Percentage
All data	~15000	100%
4 km Data thinning	~5000	~30%



- **Doppler winds from McGill Radar**



Thinning

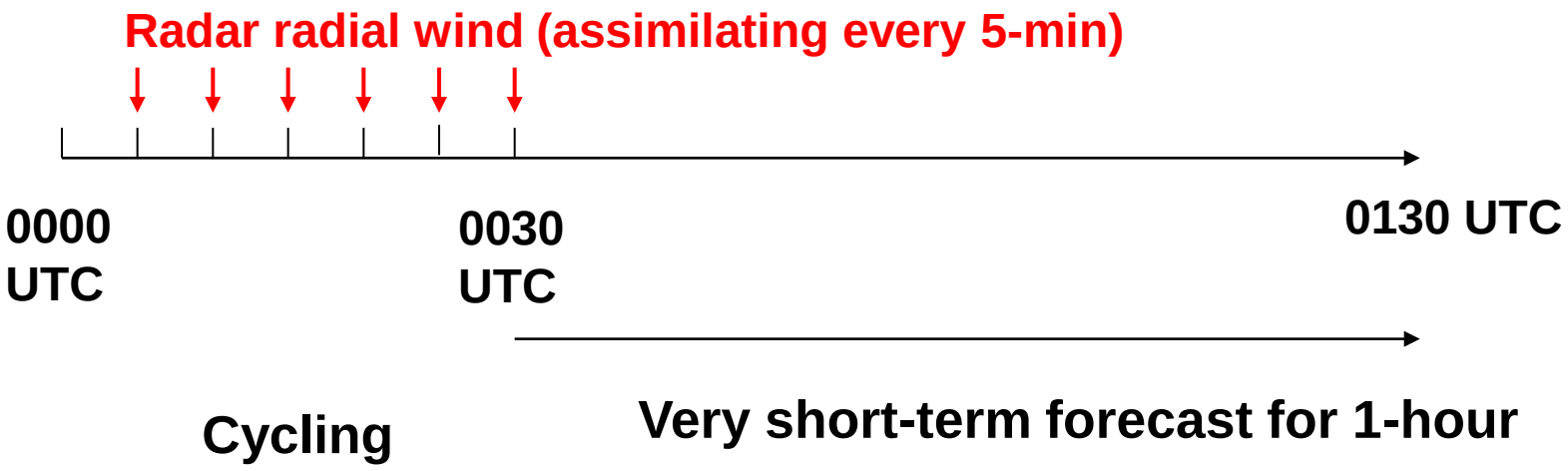


2010 July 22, 0000 UTC

Cycling procedure in HRENKF

Control run: no radar data assimilation at all

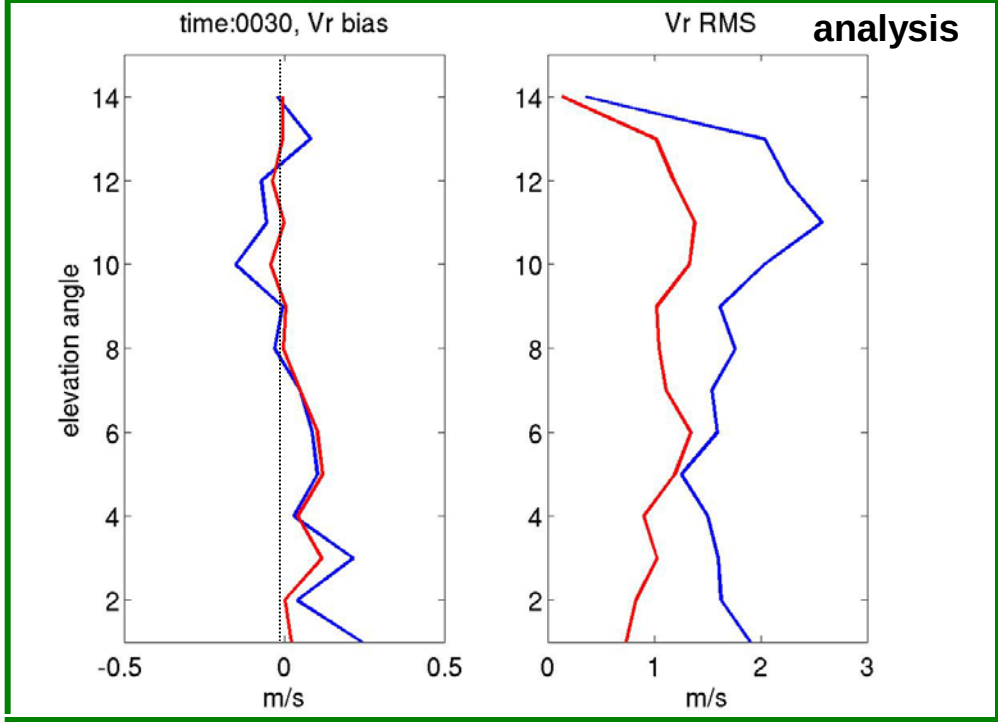
HR_EnKF: cycling for 30-min and launch the short-term forecast

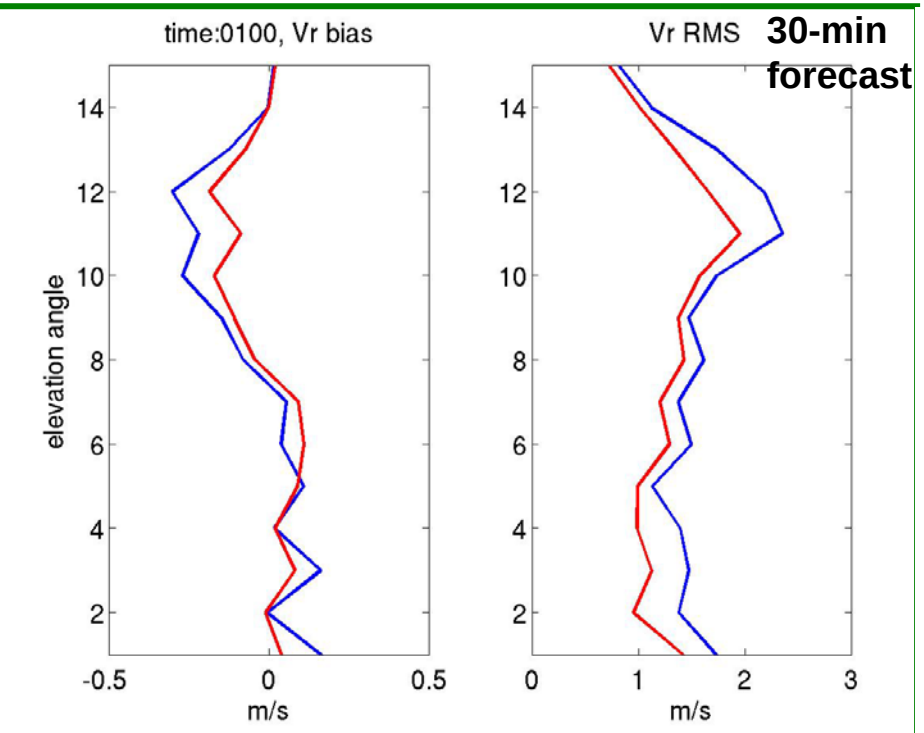


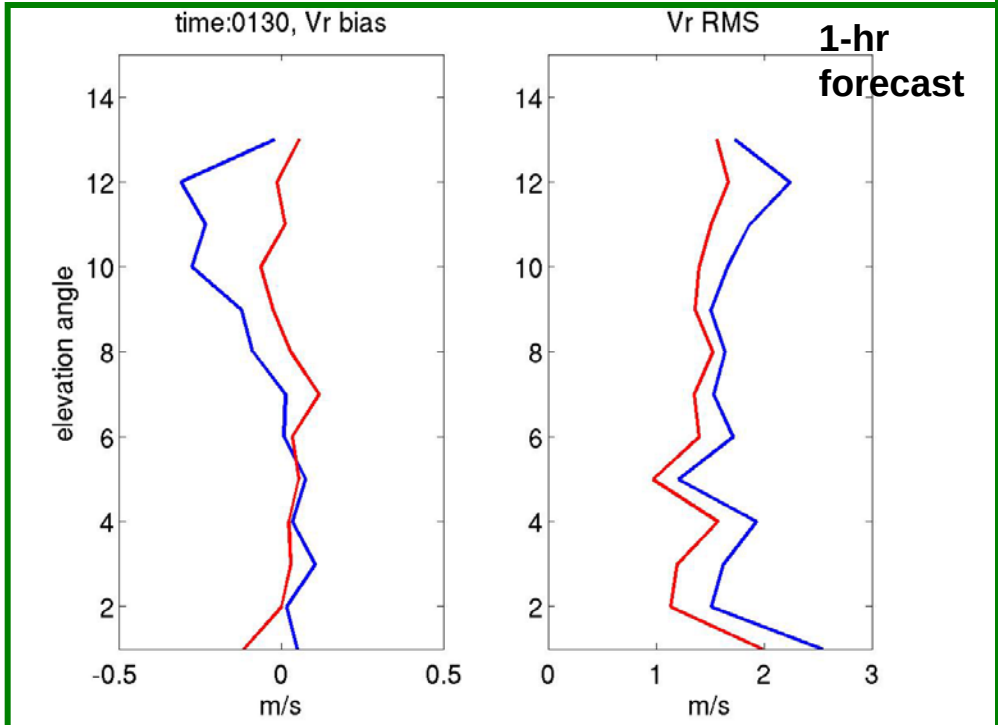
Average and RMS of (O-P) in observation space

Forecast after EnKF

Forecast without EnKF







- HRENKF-MEOPAR Development Plan