Environnement Canada Environment Canada

Canada

EC's GEPS Current Status and Plans

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Canadian GEPS – Overview

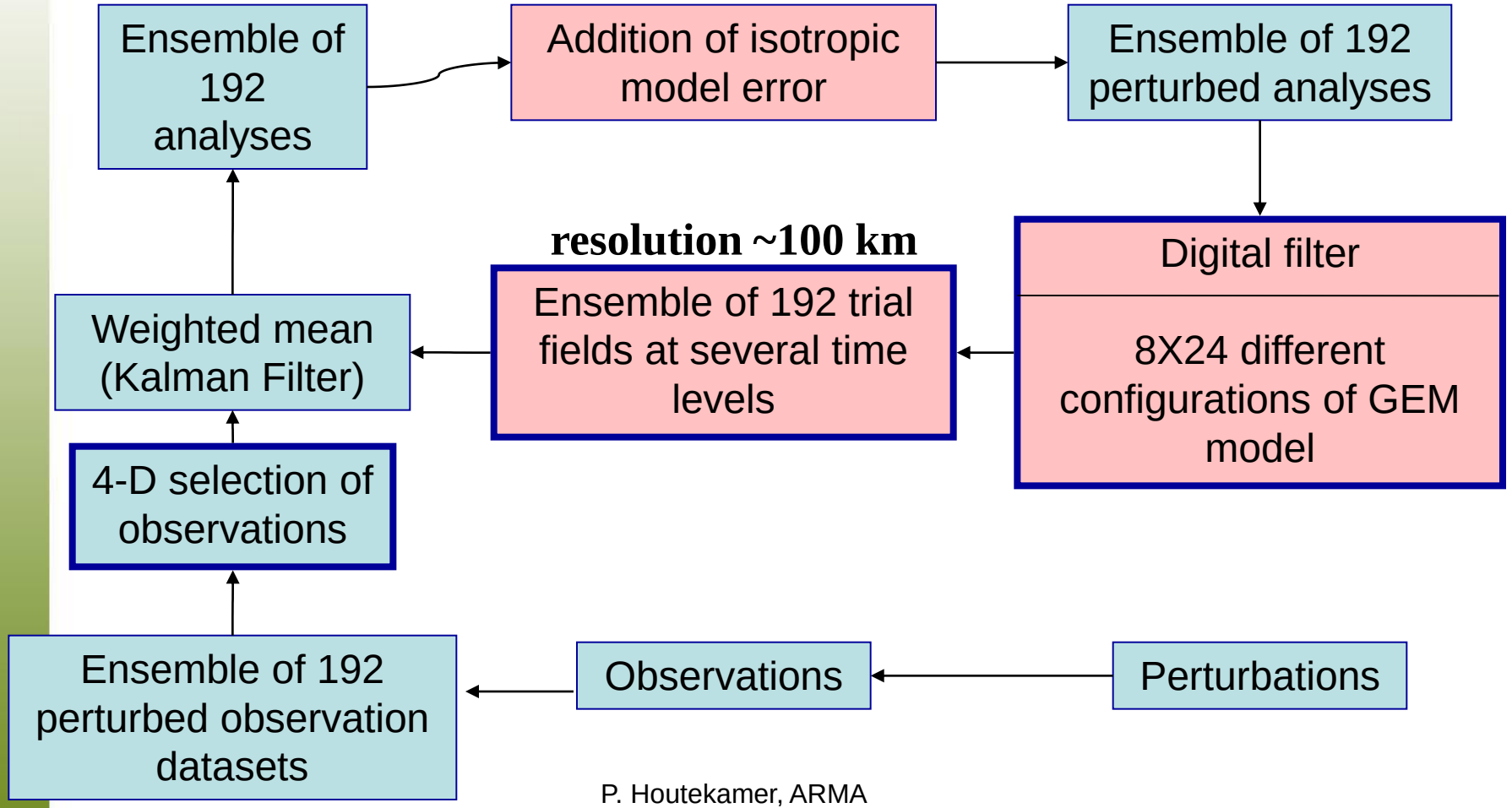
- A global ensemble Kalman filter provides initial conditions to 20 members
- Global EPS up to 16 days

  Timing: twice per day at T+5h (day 7)

- Stochastic physics with Markov chains
  - Stochastic kinetic energy backscatter
  - Physical tendency perturbations
- NAEFS (partnership with NCEP)

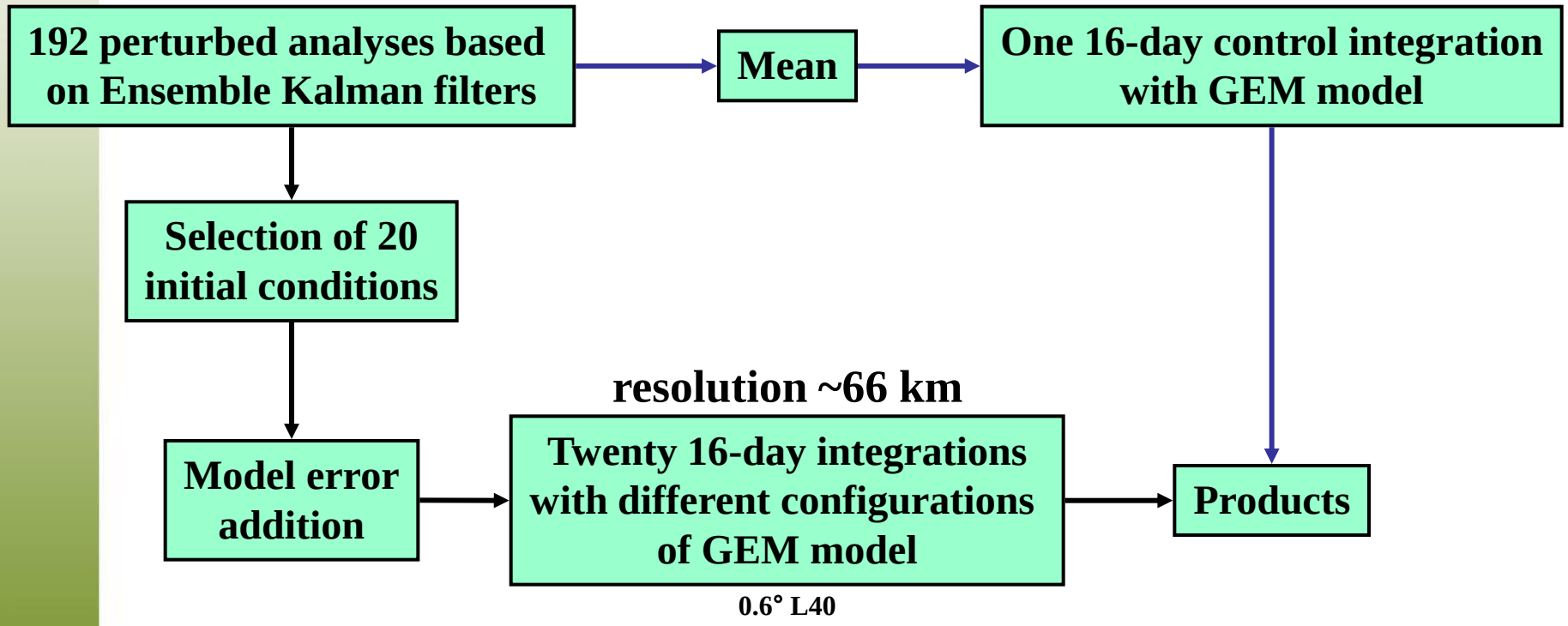
  Timing: twice per day at T+5.5h (day 7)

Canadian GEPS – Data Assimilation



P. Houtekamer, ARMA

Canadian GEPS – Forecasts



Integration done twice a day (00 and 12 UTC)

Canadian GEPS – Parameterizations

TABLE 1b. Parameterizations/parameters for the updated EPS. All members employ GEM.

Mem.	Deep conv.	PBL clouds	Shallow conv.	Condens.	Surface scheme	Turb. bound. layer	β	$E\mu_e/2$ $(10^{-5}\mathrm{m}^{-1})$
1	K.-F.	Conres	Kuo trans.	Sundq.	ISBA	B.-L.	1.00	0.4
2	Kuo	Conres	None	Mod. Sundq.	ISBA	Blackadar	0.85	1.2
3	R. A.-S.	Conres	None	Sundq.	F.-rest.	B.-L.	0.85	0.4
4	Kuo sym.	Turwet	Kuo trans.	Sundq.	F.-rest.	Blackadar	1.00	1.2
5	Kuo	Conres	None	Mod. Sundq.	F.-rest.	B.-L.	1.00	0.4
6	K.-F.	Conres	Kuo trans.	Sundq,	F.-rest.	Blackadar	0.85	1.2
7	Kuo sym.	Turwet	Kuo trans.	Sundq.	ISBA	B.-L.	0.85	0.4
8	R. A.-S.	Conres	None	Sundq.	ISBA	Blackadar	1.00	1.2
9	K.-F.	Conres	Kuo trans.	Sundq.	ISBA	Blackadar	0.85	0.4
10	Kuo	Conres	None	Mod. Sundq.	ISBA	B.-L.	1.00	1.2
11	R. A.-S.	Conres	None	Sundq.	F.-rest.	Blackadar	1.00	0.4
12	Kuo sym.	Turwet	Kuo trans.	Sundq.	F.-rest.	B.-L.	0.85	1.2
13	Kuo	Conres	None	Mod. Sundq.	F.-rest.	Blackadar	0.85	0.4
14	K.-F.	Conres	Kuo trans.	Sundq.	F.-rest.	B.-L.	1.00	1.2
15	Kuo sym.	Turwet	Kuo trans.	Sundq.	ISBA	Blackadar	1.00	0.4
16	R. A.-S.	Conres	None	Sundq.	ISBA	B.-L.	0.85	1.2
17	Kuo sym.	Turwet	Kuo trans.	Sundq.	F.-rest.	B.-L.	1.00	0.4
18	K.-F.	Conres	Kuo trans.	Sundq.	ISBA	Blackadar	0.85	1.2
19	Kuo	Conres	None	Mod. Sundq.	ISBA	B.-L.	0.85	0.4
20	R. A.-S.	Conres	None	Sundq.	F.-rest.	Blackadar	1.00	1.2

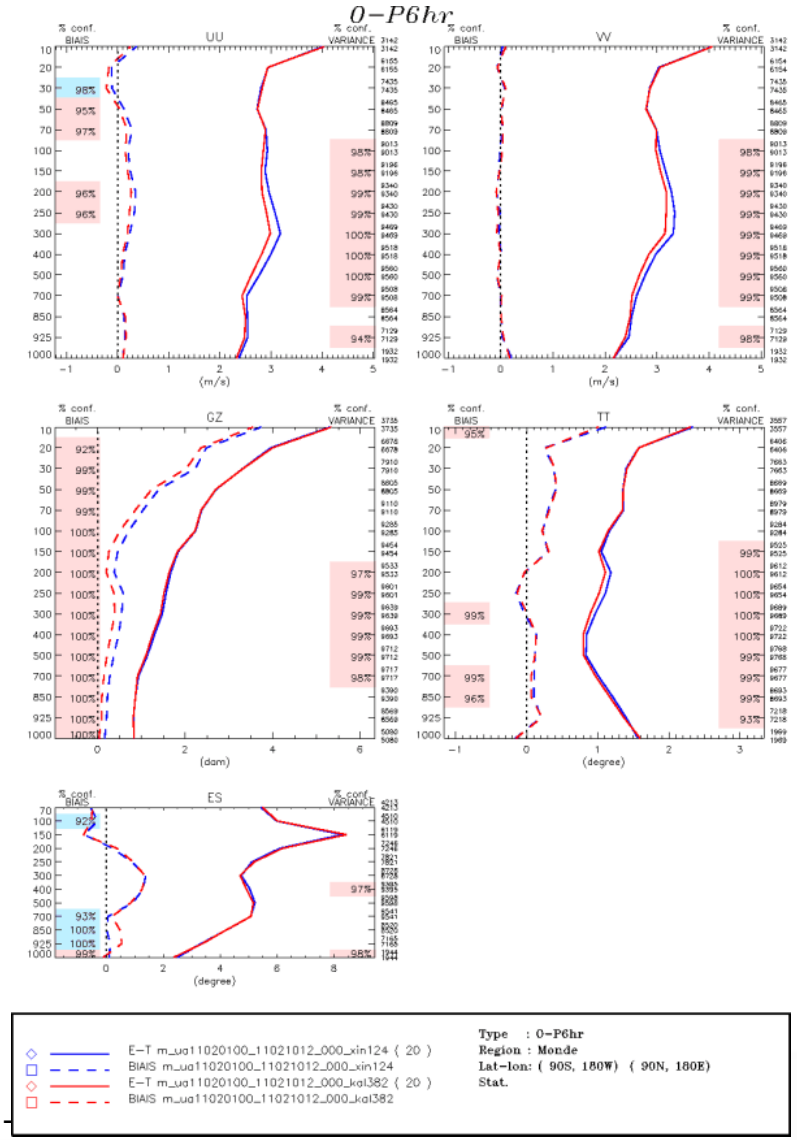
The Global EPS in 2012...

- The Canadian global EPS will consist of
  - Assimilation component (ensemble Kalman filter)
    - Background with 600x300 grid points (~66 km grid spacing at mid-latitude)
    - GEM 4.4
    - Lid at 2 hPa with ~75 levels
    - Multi-scale approach (more assimilated data)
    - Toward a single set of parameterizations (get rid of Force-restore, keep ISBA only for surface parameterization)
  - Forecast component
    - GEM 4.4 at 600x300 grid points
    - Lid at 2 hPa
    - No Force-restore scheme (ISBA only)
    - Once a week, 35-day forecasts

The Global EPS in 2012...

- In 2012, we mainly improve the EnKF through the use of higher resolution (horizontal, vertical, temporal) and more observations. This is possible thanks to the P7 computer upgrade.

  Preliminary global results at 6h in February 2011 (10 days).



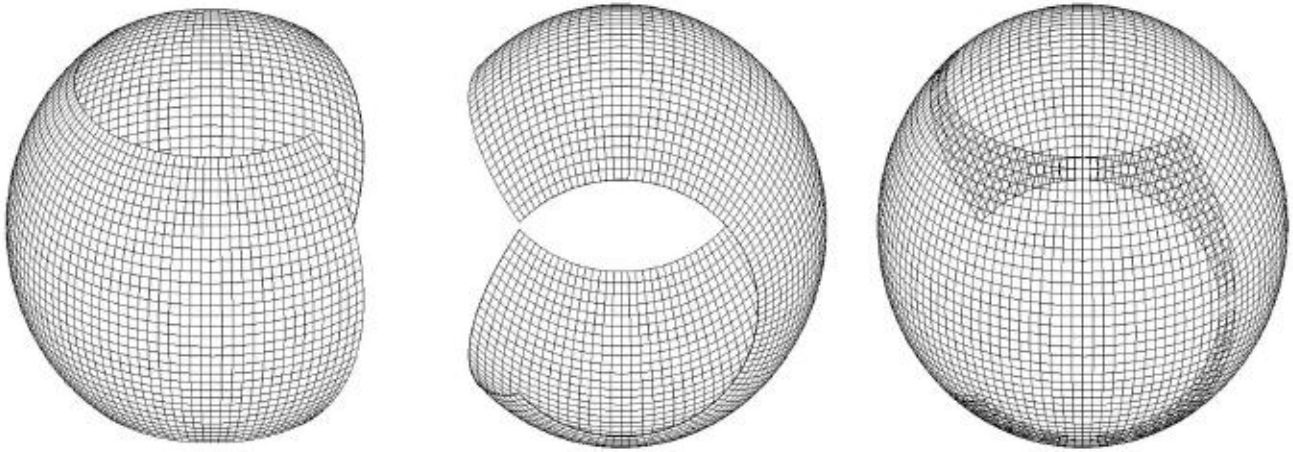
Improvements to the Monthly Forecasting System

Table 2: Correlation skill for 10-day mean SAT over different regions by different model configurations. Numbers listed are the percentage of area that is signicifant at the 0.05 level. Shown in parentheses are average correlations. The numbers in bold font are the maximum value in the group.

	global	North of 30°N	Tropics	South of 30°S
Operational days 1-10	54%(0.40)	53%(0.31)	47%(0.36)	69%(0.49)
EPS-based days 1-10	**89%(0.66)**	**95%(0.70)**	**82%(0.59)**	**99%(0.76)**
60-member day1 1-10	74%(0.53)	75%(0.48)	65%(0.47)	91%(0.65)
Operational days 11-20	27%(0.21)	23%(0.12)	29%(0.22)	26%(0.19)
EPS-based days 11-20	**42%(0.32)**	**39%(0.22)**	**41%(0.32)**	**46%(0.36)**
60-member day1 11-20	34%(0.27)	31%(0.17)	34%(0.27)	35%(0.27)
Operational days 21-30	23%(0.17)	17%(0.09)	25%(0.18)	24%(0.19)
EPS-based days 21-30	**29%(0.21)**	**24%(0.14)**	**31%(0.23)**	**28%**(0.20)
60-member day1 21-30	27%(0.20)	21%(0.12)	29%(0.21)	27%(**0.21**)

The Global EPS in 2013...

- The Canadian global EPS will consist of
  - Assimilation and forecast components
    - Background at 0.45° grid spacing
    - GEM 4.5 with the Yin-Yang grid
    - Toward a single set of parameterizations
  - Canadian Land Data Assimilation System (CaLDAS)



Work on the Global EPS/EnKF in the next 5 years

- A shorter assimilation window
  - Need a better spin-up / initialization / start-up procedure
- External surface model at high resolution
- Better stochastic parameterizations
  - In particular, convection
- Convergence of the EPS physical parameterizations toward a single stochastic package
  - Avoid artificial multi-modality in forecasts
- It is hoped that « lack of spread » will not be a general problem any more
  - Smaller mean error will be the focus
- Horizontal grid spacing will be in the range 0.2° - 0.3°