Regional Fine Resolution Model Archive in Support of Air Quality Modeling in the Pacific Northwest

Dr. Robert Nissen

Meteorological Service of Canada

What is GEM LAM

- GEM LAM = Global Environmental Multiscale Limited Area Model
- numerical model employed operationally by Environment Canada's Canadian Meteorological Centre (CMC)
- better representation of
  - *local conditions (e.g. orography, vegetation)*
  - *physical processes (e.g. cloud microphysics, radiation)*
  - *dynamical organization of weather systems from synoptic to mesoscale*
- forecast periods up to 24 hours
- initial and boundary conditions derived from CMC's operational regional GEM 15 km resolution forecast system (GEM 15).
- presently run for two configurations: SW Canada/Pacific Northwest, and southern Ontario and Quebec

Rationale for Regional GEM LAM Archive

- representation of meteorological fields with far higher resolution than with surface and upper air observation networks
- complex terrain demands modeling at high resolution to adequately simulate atmospheric processes
- more timely retrieval of select parameters than for national (CMC) full-parameter archive
- case studies for short time periods
- approximate but detailed climatology for longer time periods, e.g. derived boundary layer heights
- initially motivated by air quality studies but many other applications

Domain January 1-July 3, 2007
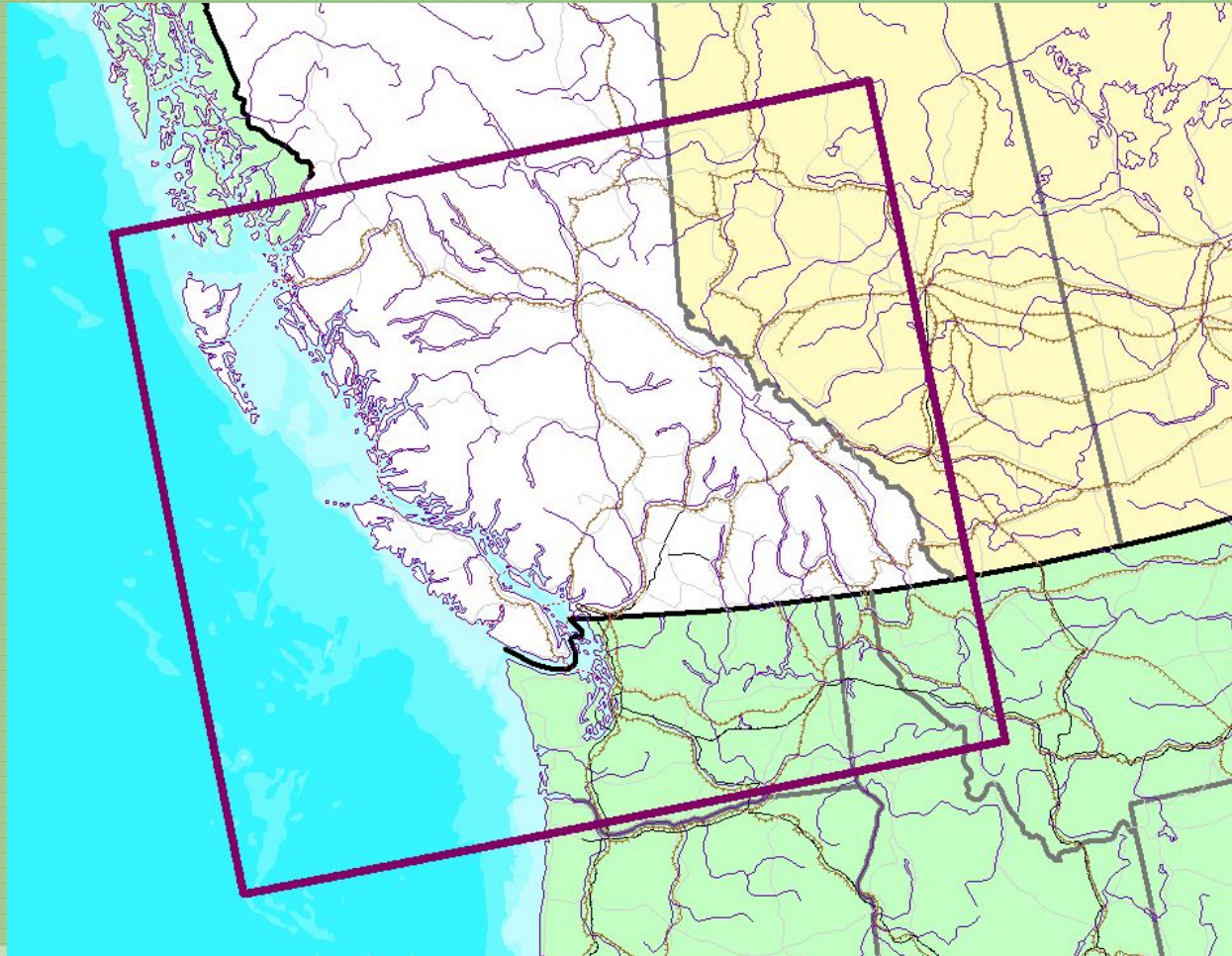
Domain since July 4, 2007
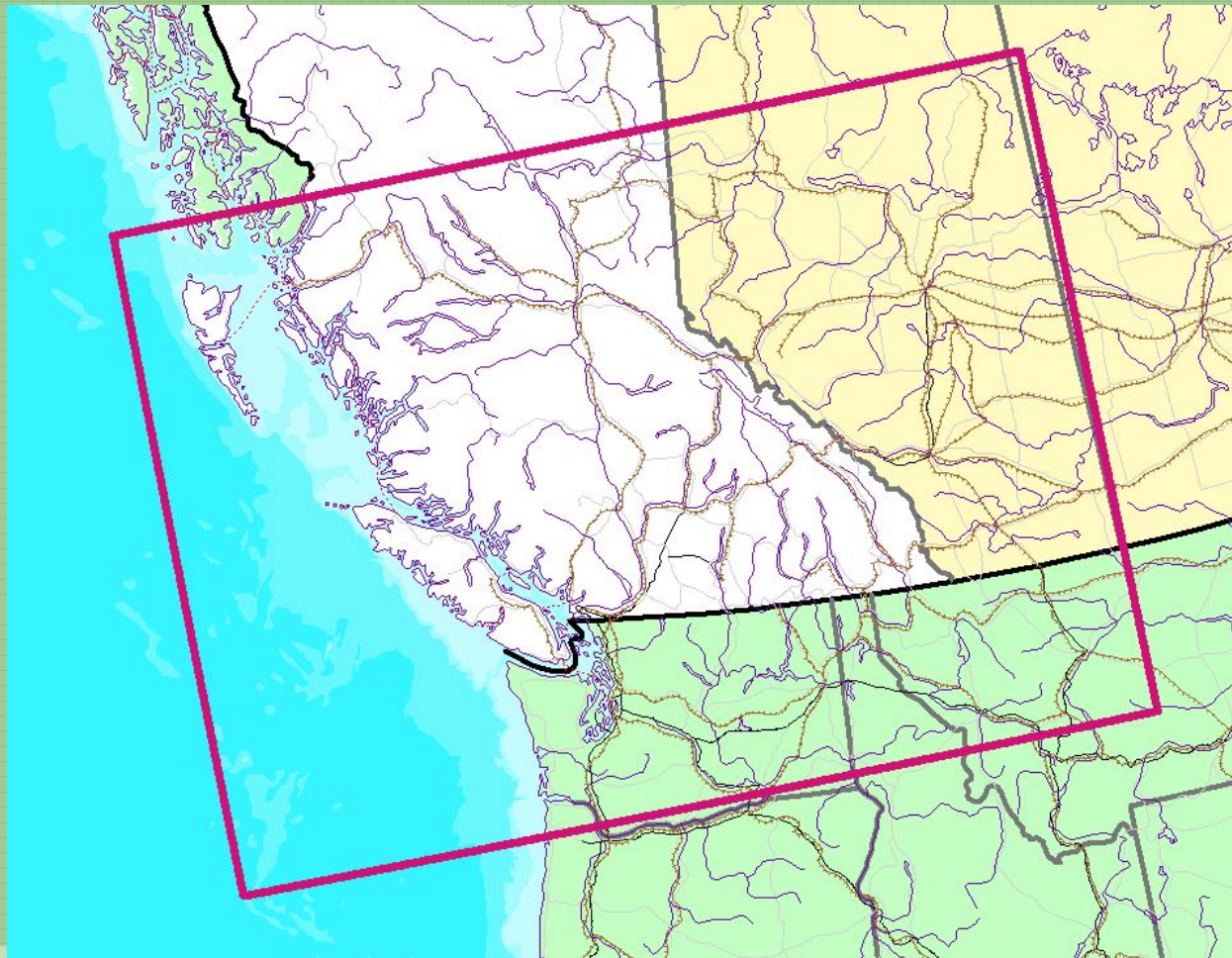
Availability

- archive is available at no cost to
  - *government agencies*
  - *educational institutions*
  - *environmental consultants*
- self-serve basis; all users to contact us
- users provide their own storage media
- no training provided, but will answer simple queries

GEM LAM Archive Specifications

- archive began January 1, 2007
- daily run with 25 files at hourly intervals (00-24Z inclusive); typically 3.2 GB bzip2'ed
- Recherche Prévision Numérique (RPN) Standard File (FST) format developed by CMC
- 2.5-km grid in horizontal; presently 648X470 grid points
- lowest 23 σ levels from σ=1.000 to σ=0516 (full model has 58 levels)
- some variables available at 15 pressure levels (1000 mb to 250 mb)

Variables Available

Variable	Dim	Levels
Dry Bulb Temperature	3D	sigma
Dew Point Temperature	3D	pres., sigma
Horizontal wind components	3D	sigma
Vertical wind	3D	pres., sigma
Geopotential Height	3D	pres., sigma
Station Pressure	2D	surface
Mean Sea Level Pressure	2D	surface
Boundary Layer Height	2D	
Downward Solar Flux	2D	surface

Variables Available (Con't)

Variable	Dim	Levels
Specific Humidity	3D	pres., sigma
Cloud Water Fraction	3D	pres., sigma
Graupel, Rain Fraction	3D	pres., sigma
Ice Fraction	3D	pres.
Total Cloud Cover	2D	
Rain, Snow, Ice Pellets Accumulation	3D	Surface
Freezing and Total Precipitation Accumulation	2D	Surface
Instantaneous Precipitation Rate	2D	Surface

Sample Field: Boundary Layer Height

Sample Field: Boundary Layer Height

Environment Canada
www.ec.gc.ca
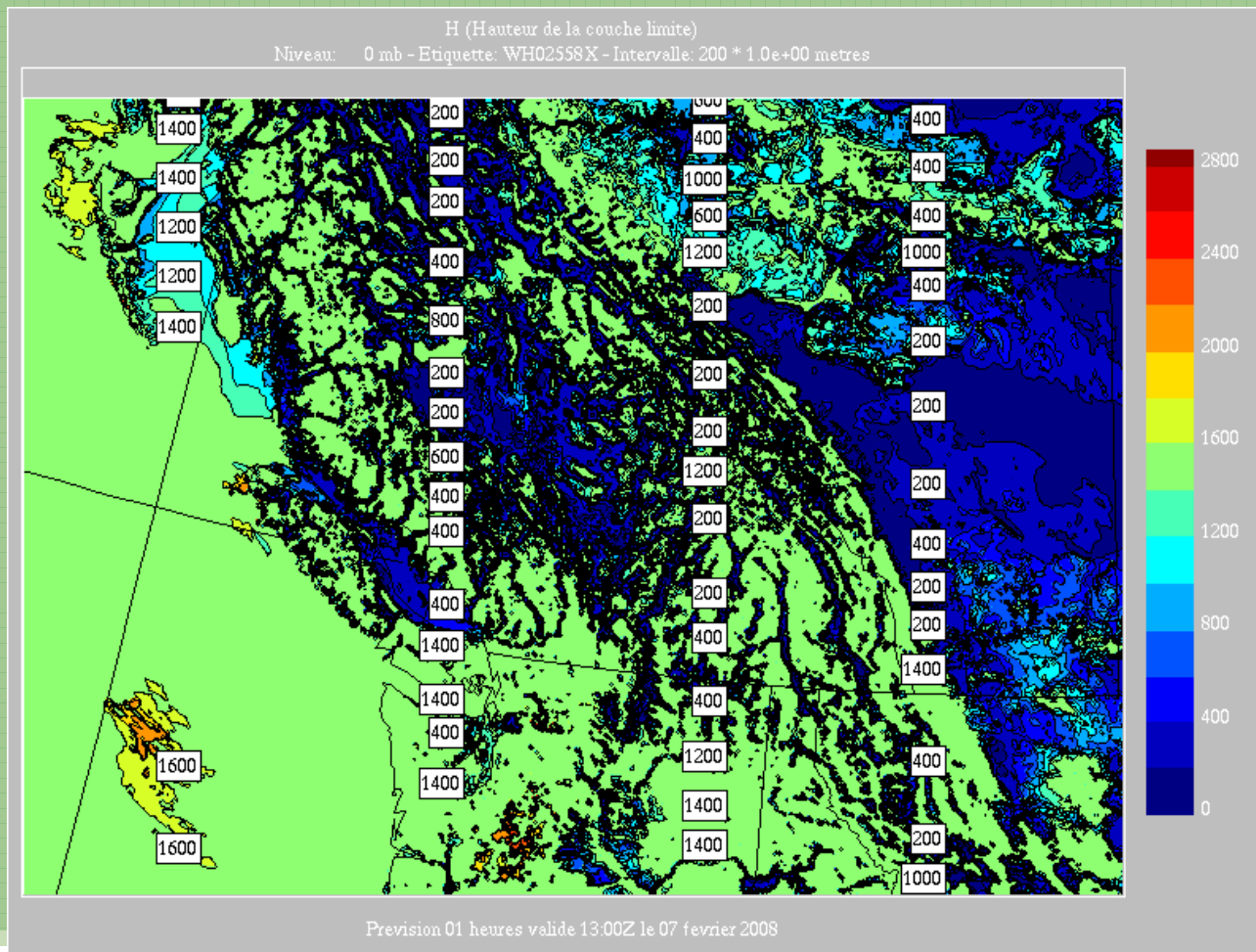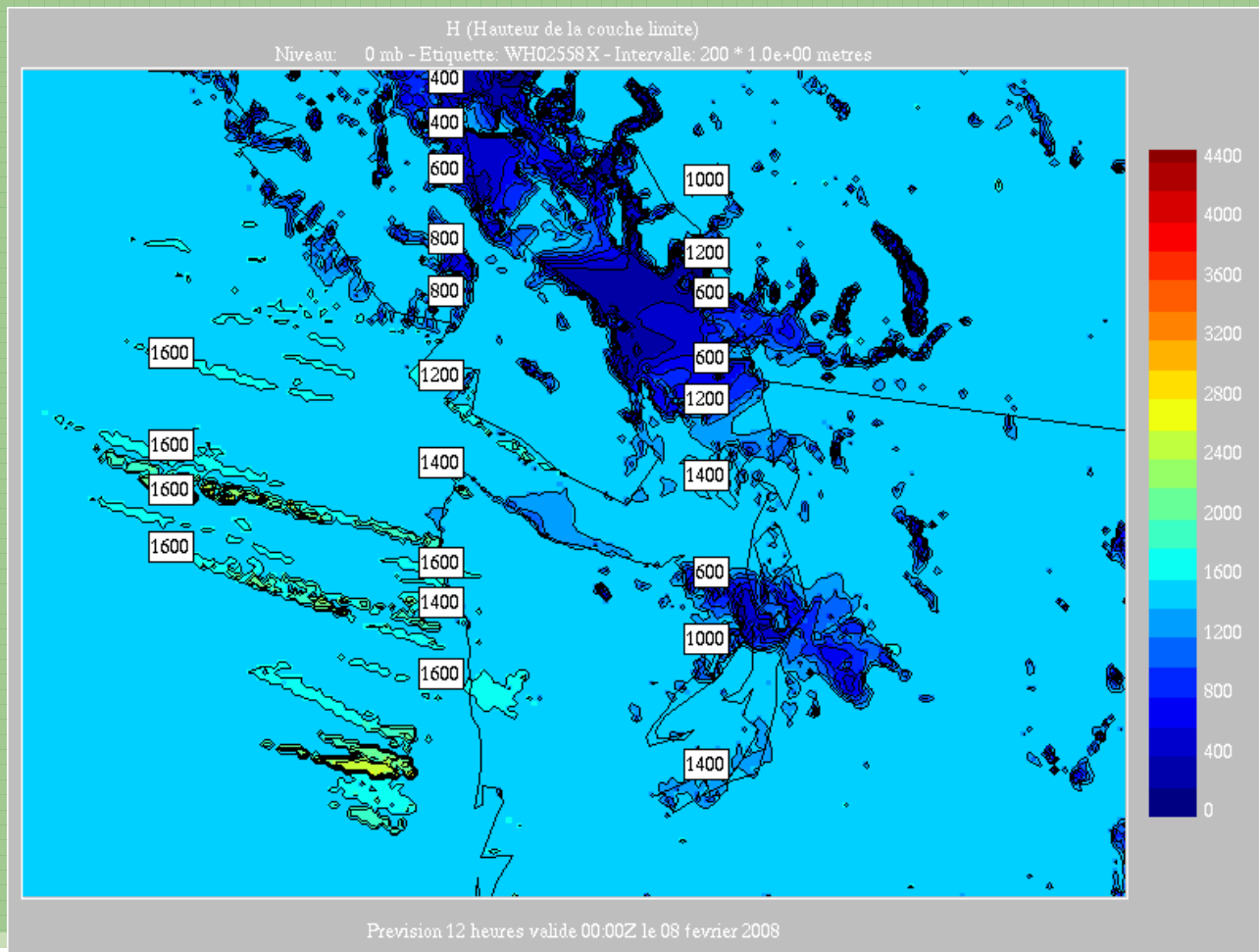
Some Future Plans

- marine emissions modeling

- agricultural emissions modeling

- boundary layer height climatology

- collaborations with Metro Vancouver, BC Environment, other agencies

Contact Information

- Dr. Robert Nissen
- Atmospheric Scientist - Air Quality Modelling
- Science Division
- Meteorological Service of Canada
- 201 - 401 Burrard Street
- Vancouver, BC V6C 3S5
- 604-664-9069 (voice)
- 604-664-9126 (fax)
- Robert.Nissen@ec.gc.ca

Environment Canada
www.ec.gc.ca