

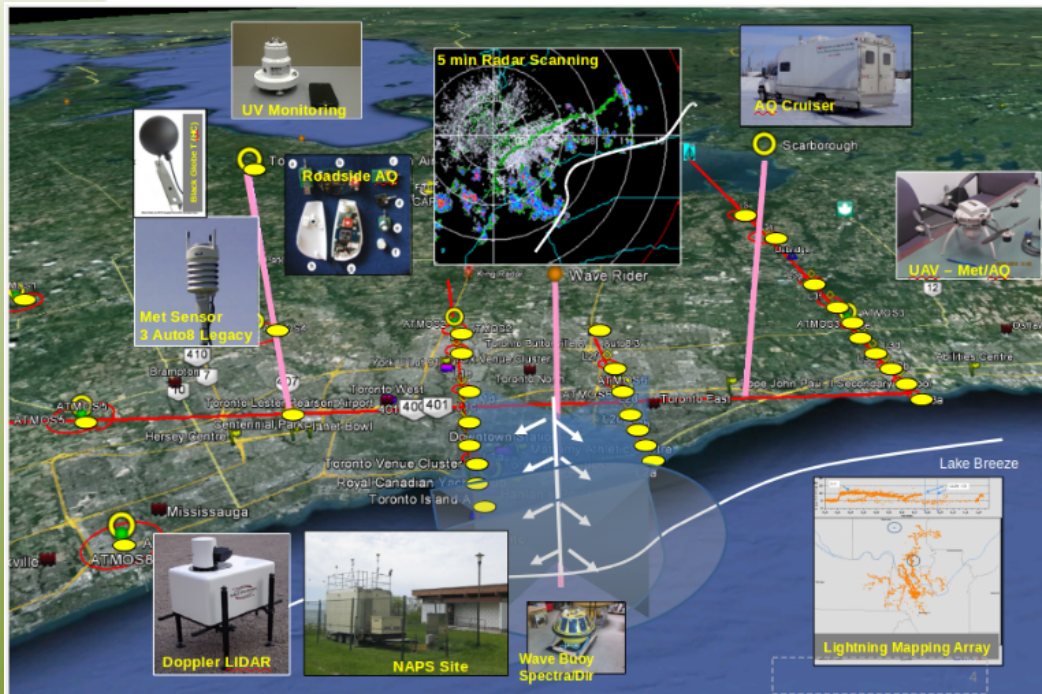


Environment
Canada

Environnement
Canada

Canada

Performance of a Subkm and Urban Version of the GEM Model for Pan Am



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Environnement
Canada

Environment
Canada

Context

NWP operational at km scale

NWP experimental at 100-300-m scale

Several case studies have been done

Pan Am... extensive surface network + long period

Objective evaluation of subkm-scale NWP

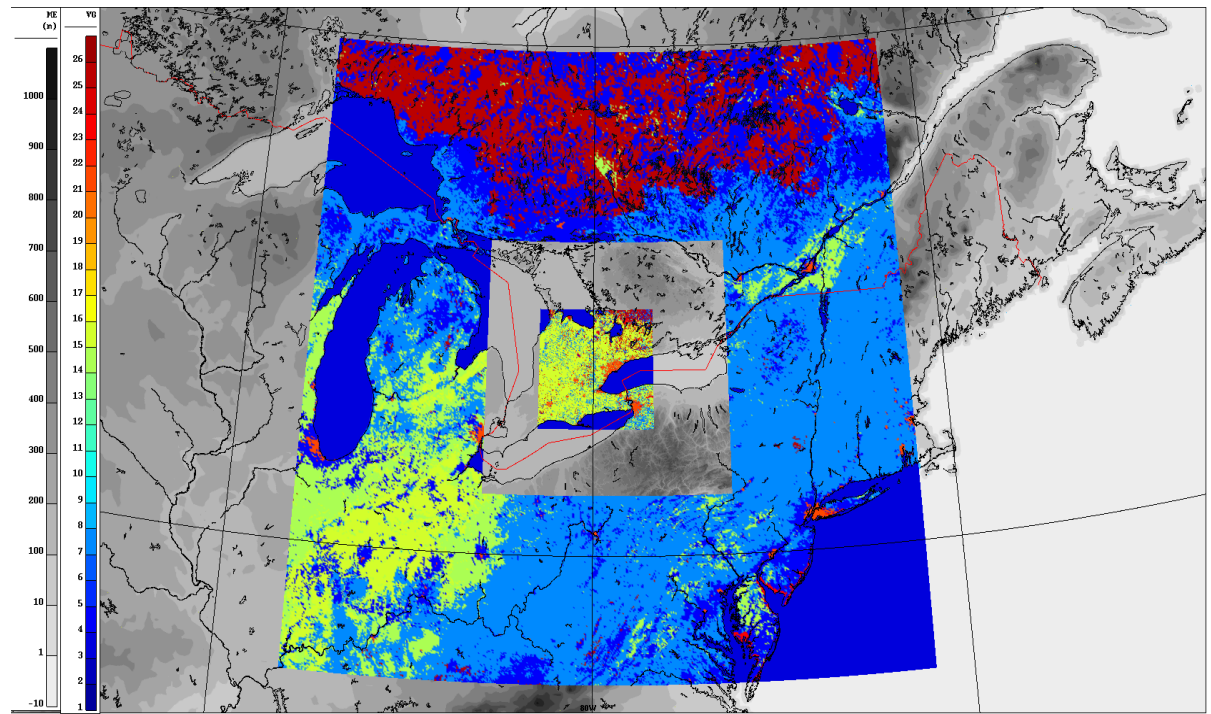
Relevant for air quality and dispersion applications

Configuration

With GEM (Global Environmental Multiscale) model

Lake temperature from NEMO

Land ICs with CaLDAS (temp., soil moisture)



10 km → 2.5 km → 1.0 km → 0.25 km

Microphysics with Milbrandt and Yau, double moment, 6 cat.

Lower level at 5m (thermo) and 10m (momentum)

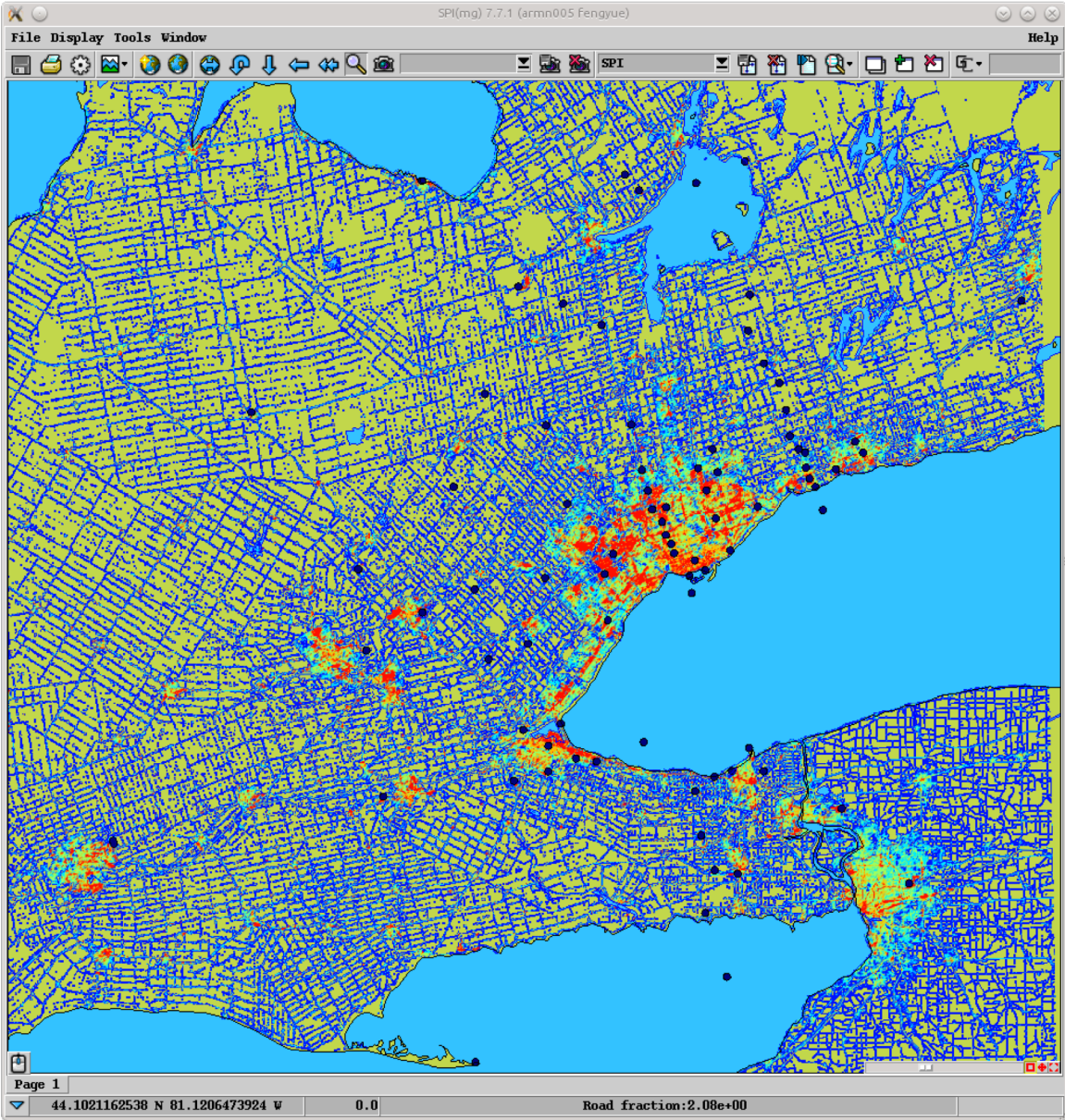
Still 1D TKE scheme, but with modified mixing lengths

Town Energy Balance (TEB) scheme active

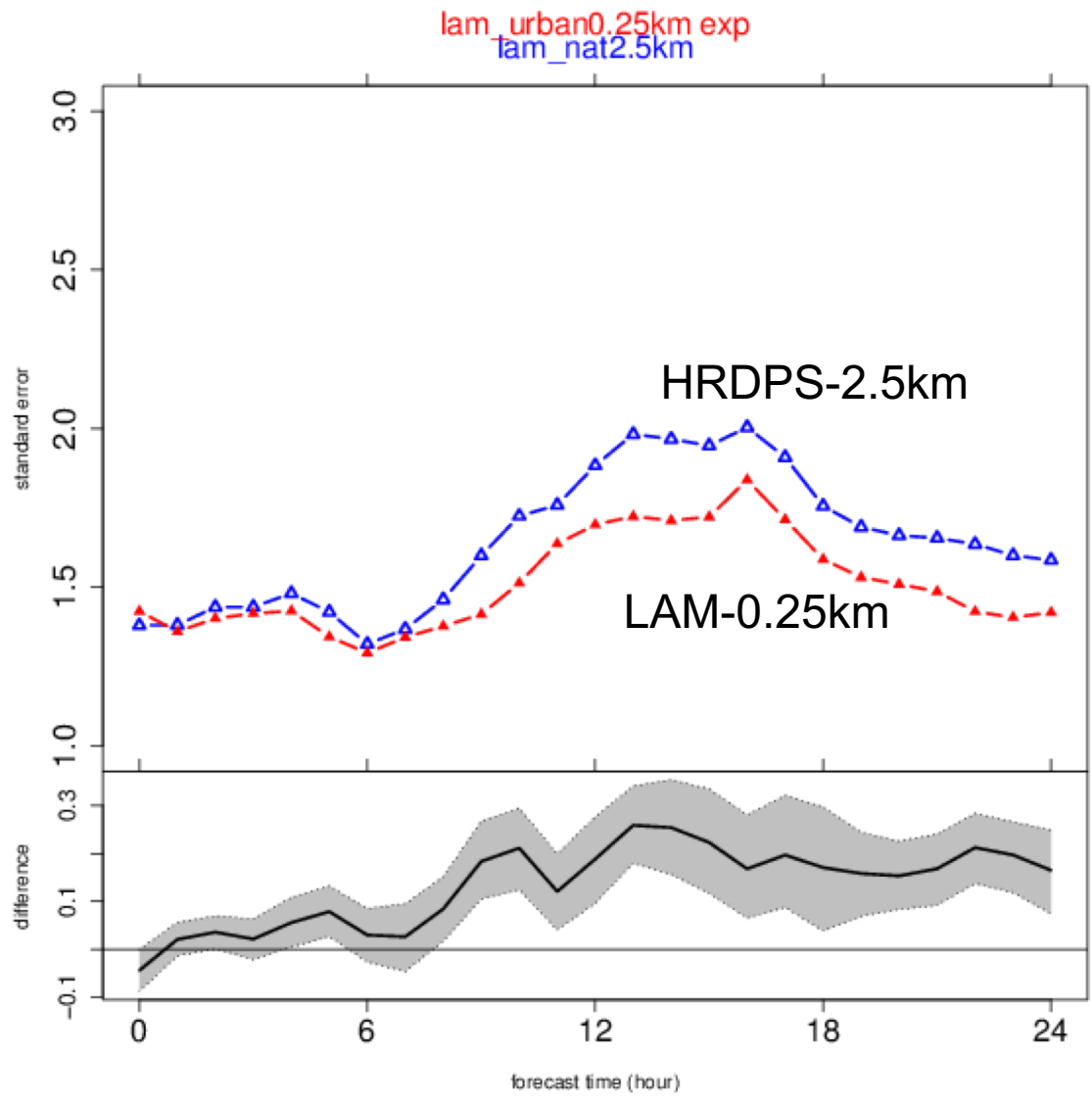
Land / urban characteristics (0.25 km)



Surface network used for objective eval.



Objective evaluation over Pan Am 2015

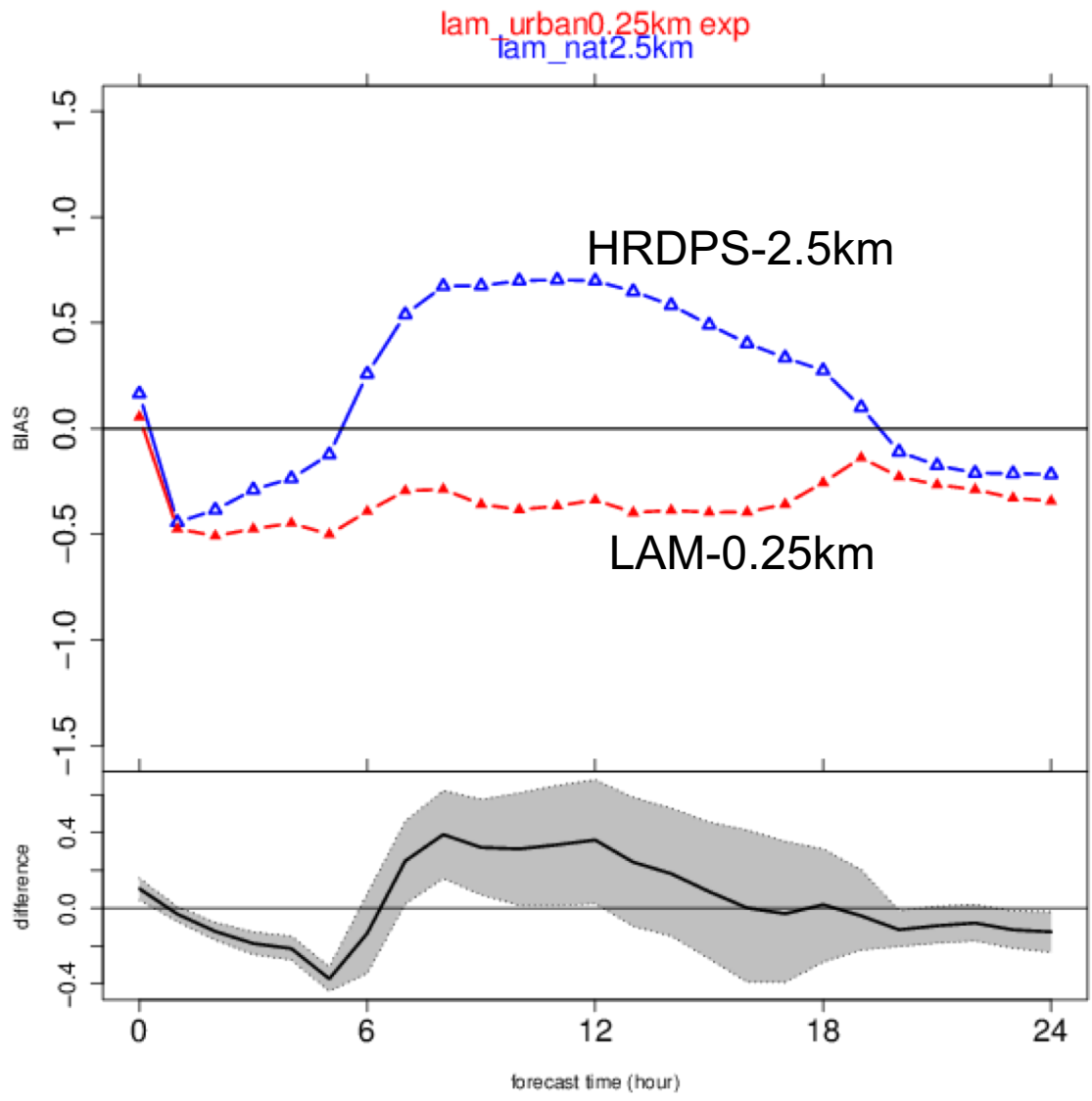


Air temperature at surface

STDE (smaller is better)

May to August 2015

Objective evaluation over Pan Am 2015

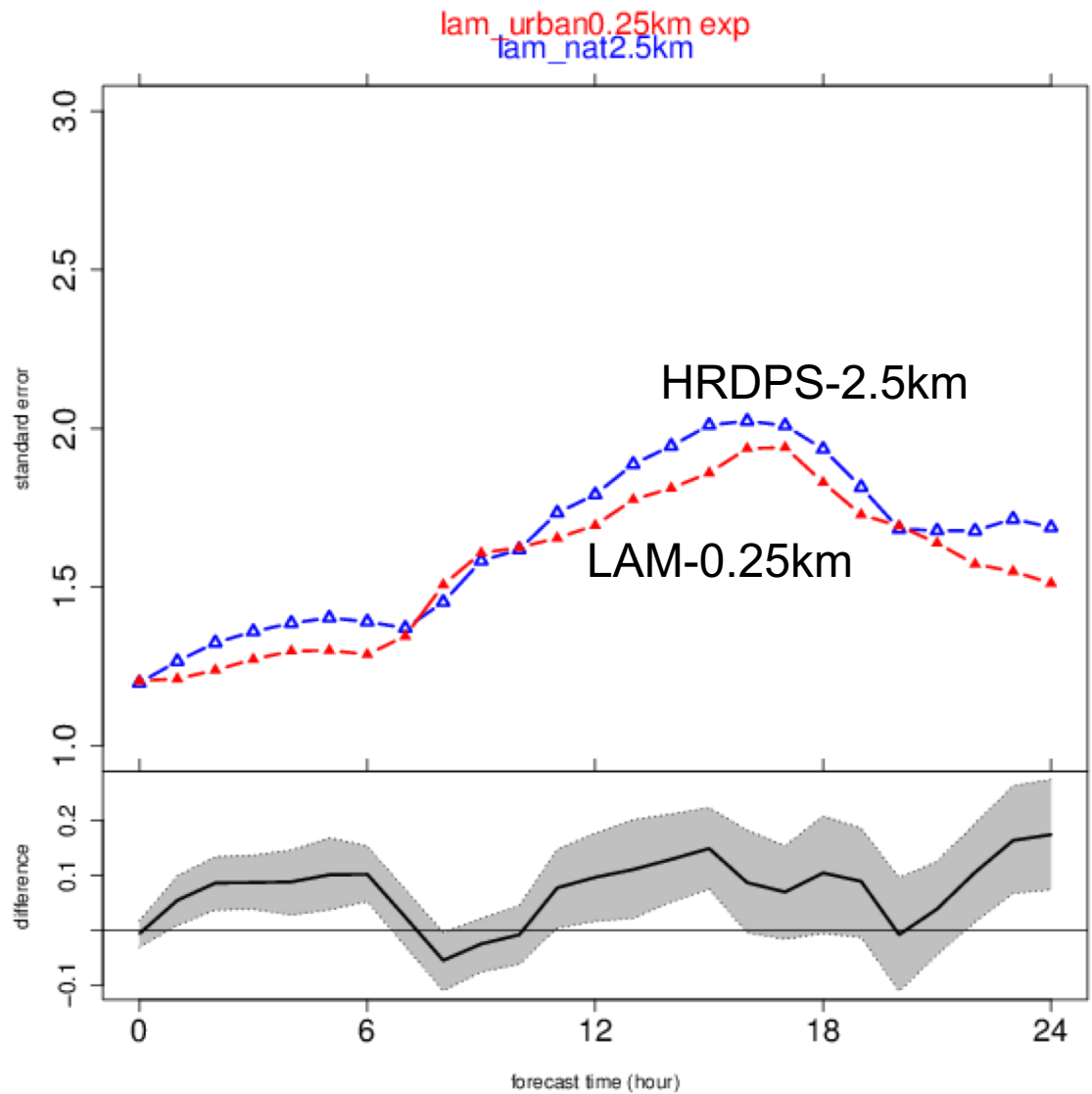


Air temperature at surface

BIAS (near "0" is better)

May to August 2015

Objective evaluation over Pan Am 2015

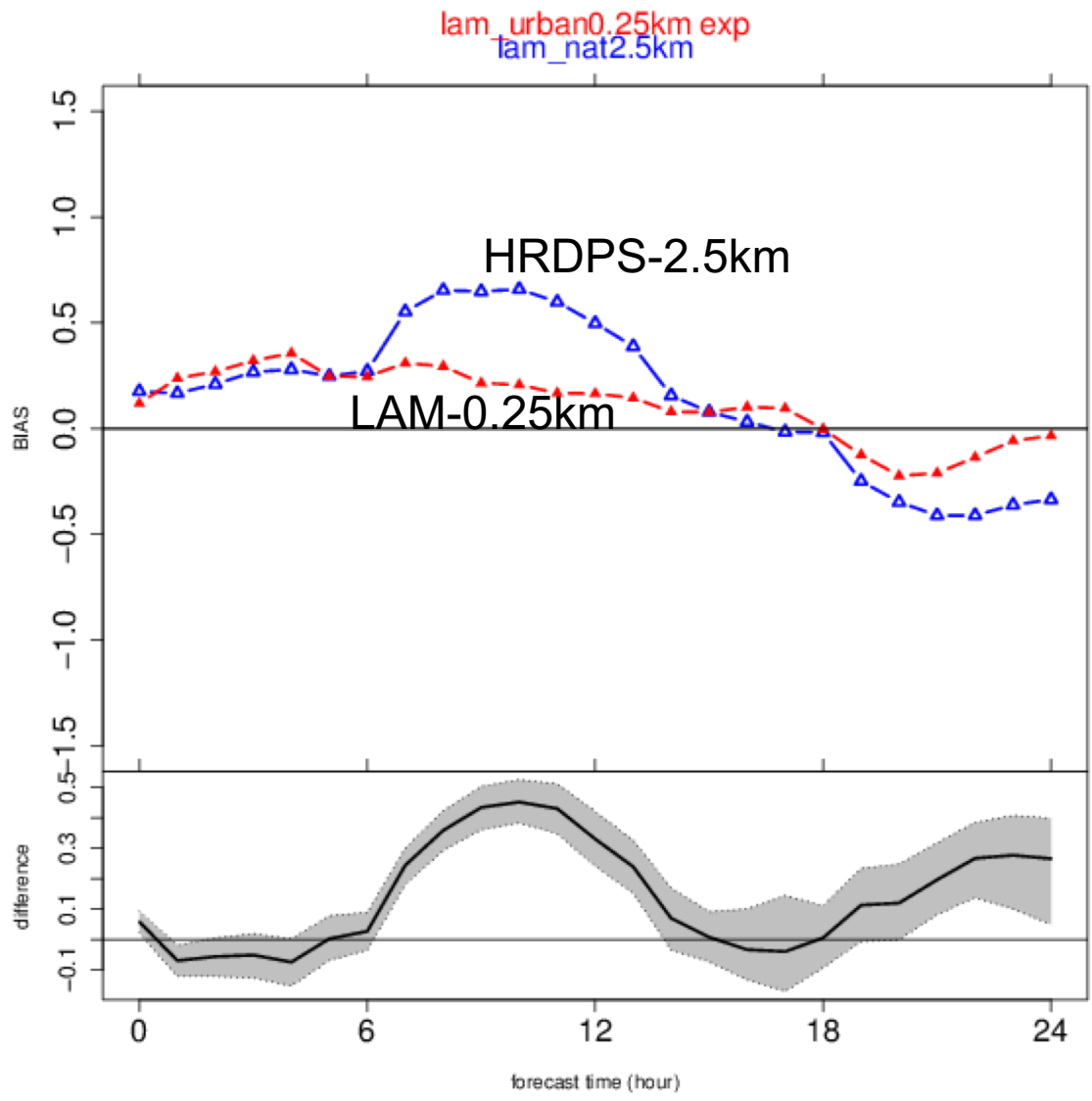


Dew point temperature at surface

STDE (smaller is better)

May to August 2015

Objective evaluation over Pan Am 2015

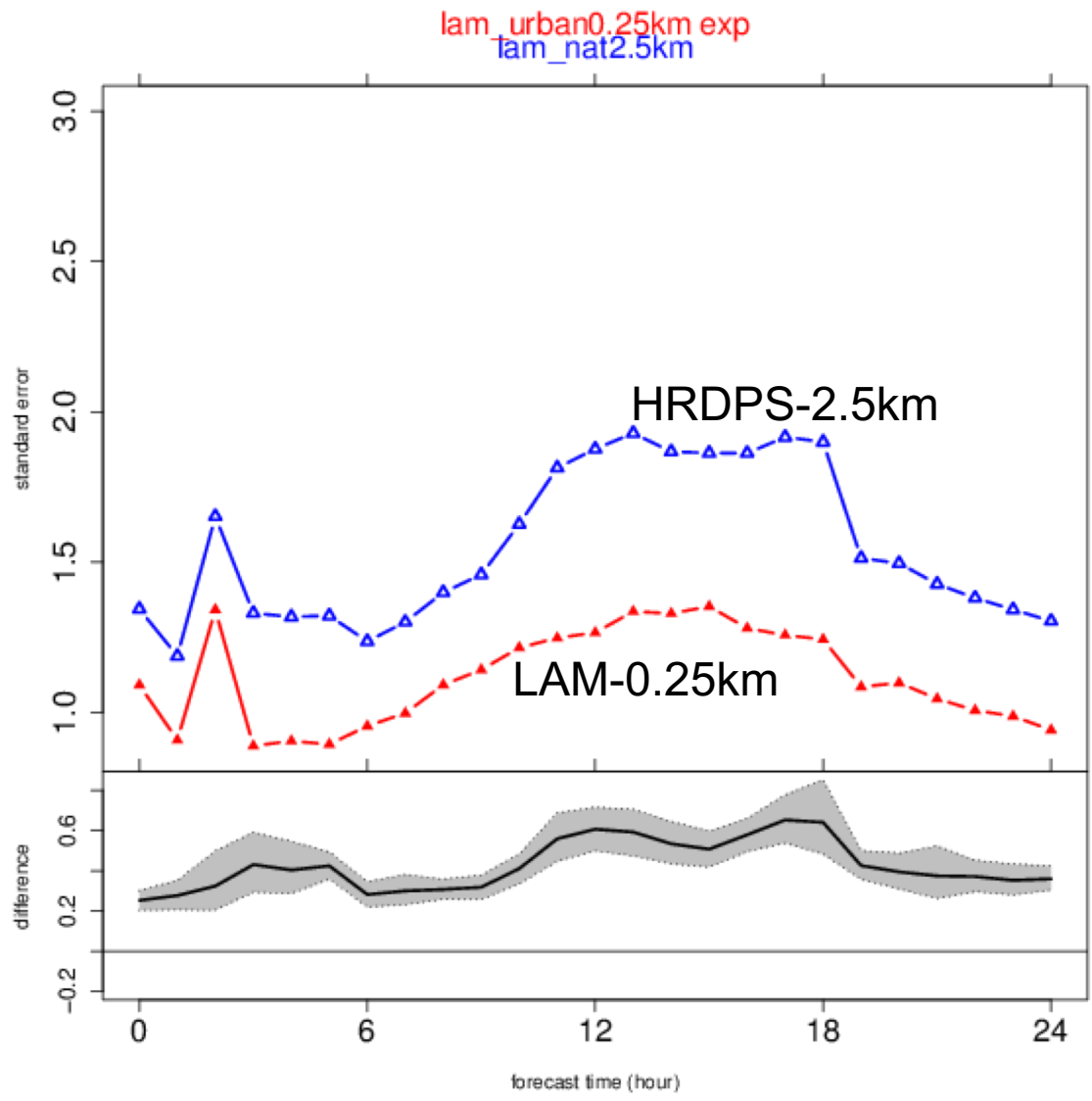


Dew point temperature at surface

BIAS (near "0" is better)

May to August 2015

Objective evaluation over Pan Am 2015

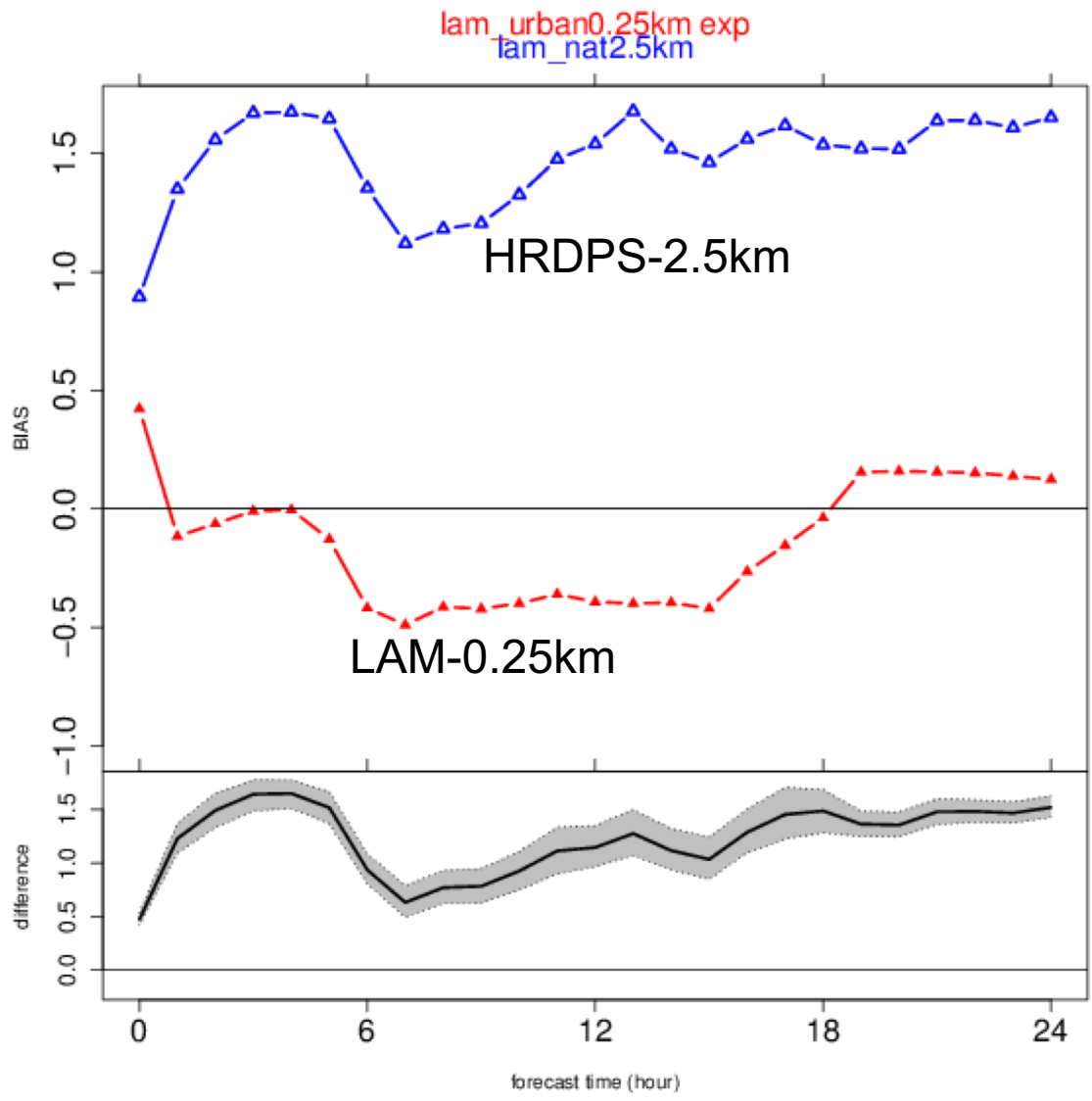


**Surface winds
(module)**

STDE (smaller is better)

May to August 2015

Objective evaluation over Pan Am 2015

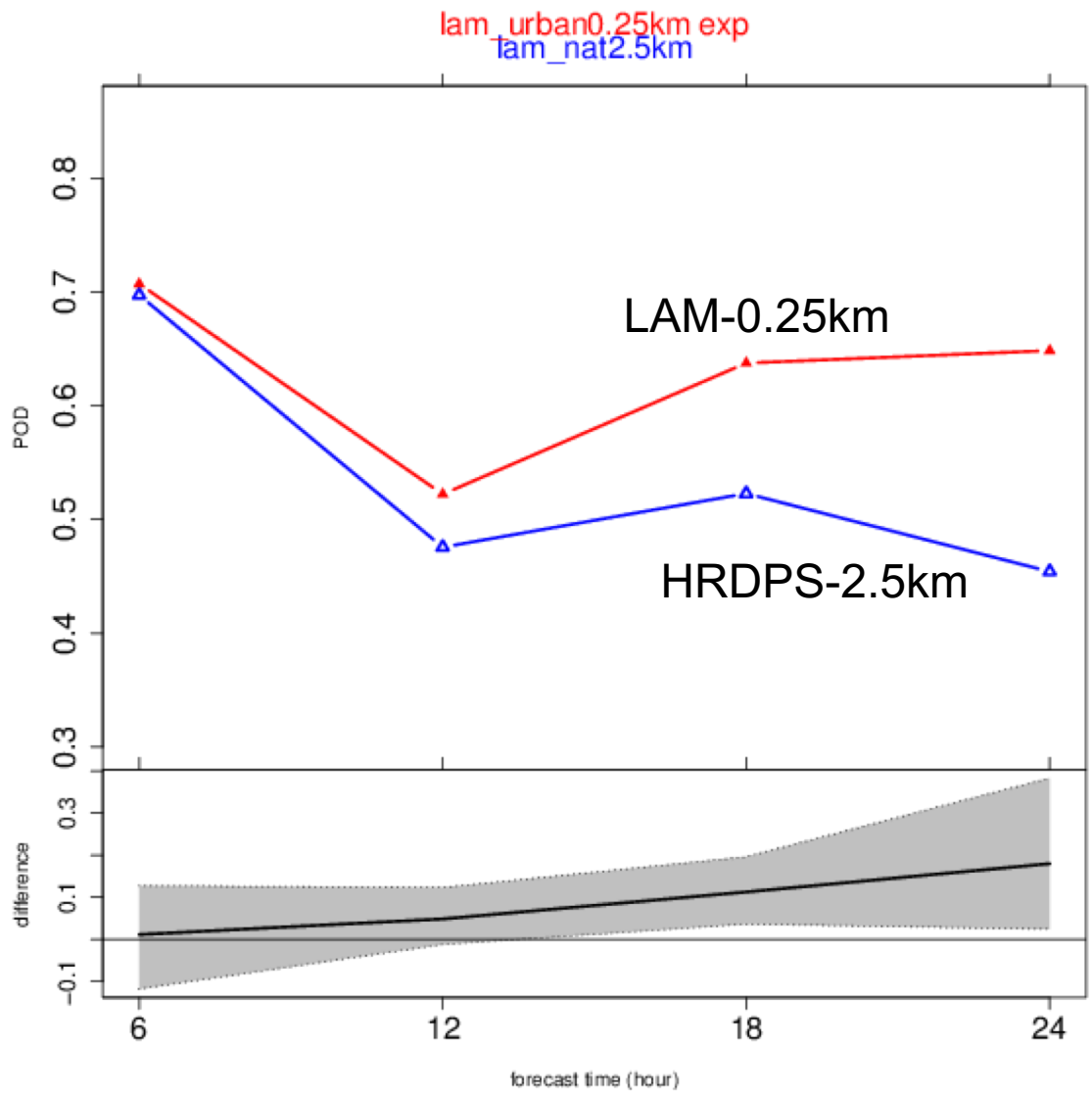


**Surface winds
(module)**

BIAS (near "0" is better)

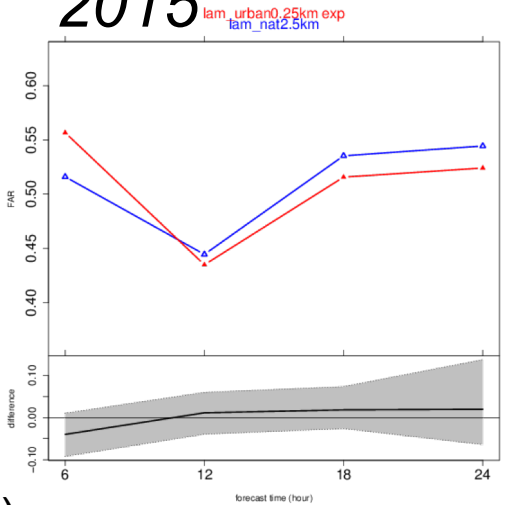
May to August 2015

Objective evaluation over Pan Am 2015



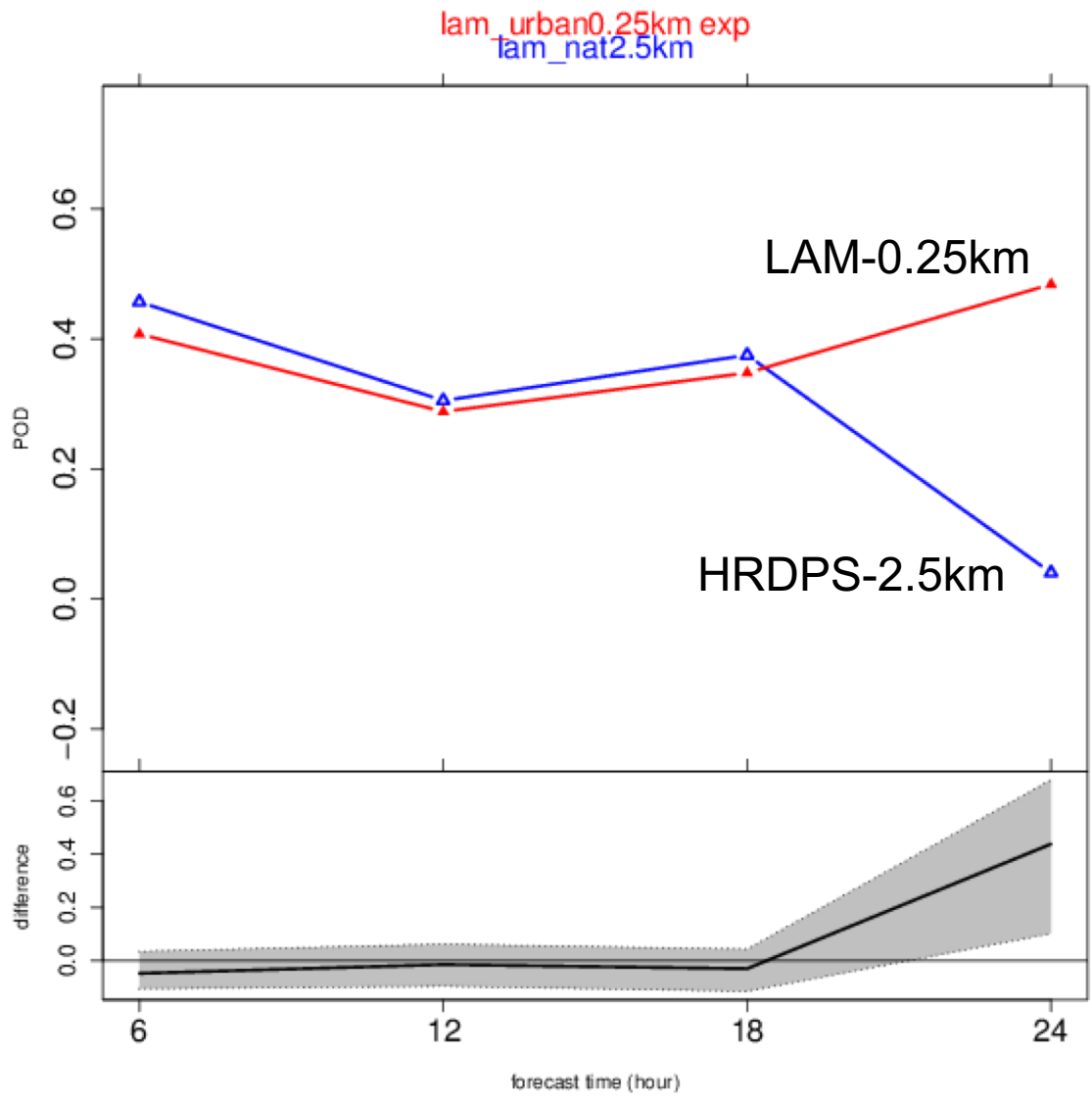
Probability of Detection for **precipitation** (2mm / 6hr) (higher is better)

May to August 2015



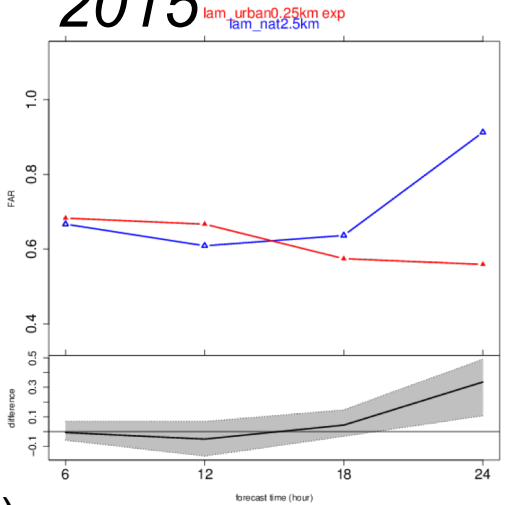
False Alarm Rate (lower is better)

Objective evaluation over Pan Am 2015



Probability of Detection for precipitation (10mm / 6hr) (higher is better)

May to August 2015



False Alarm Rate (lower is better)

Not forgetting the subjective aspects

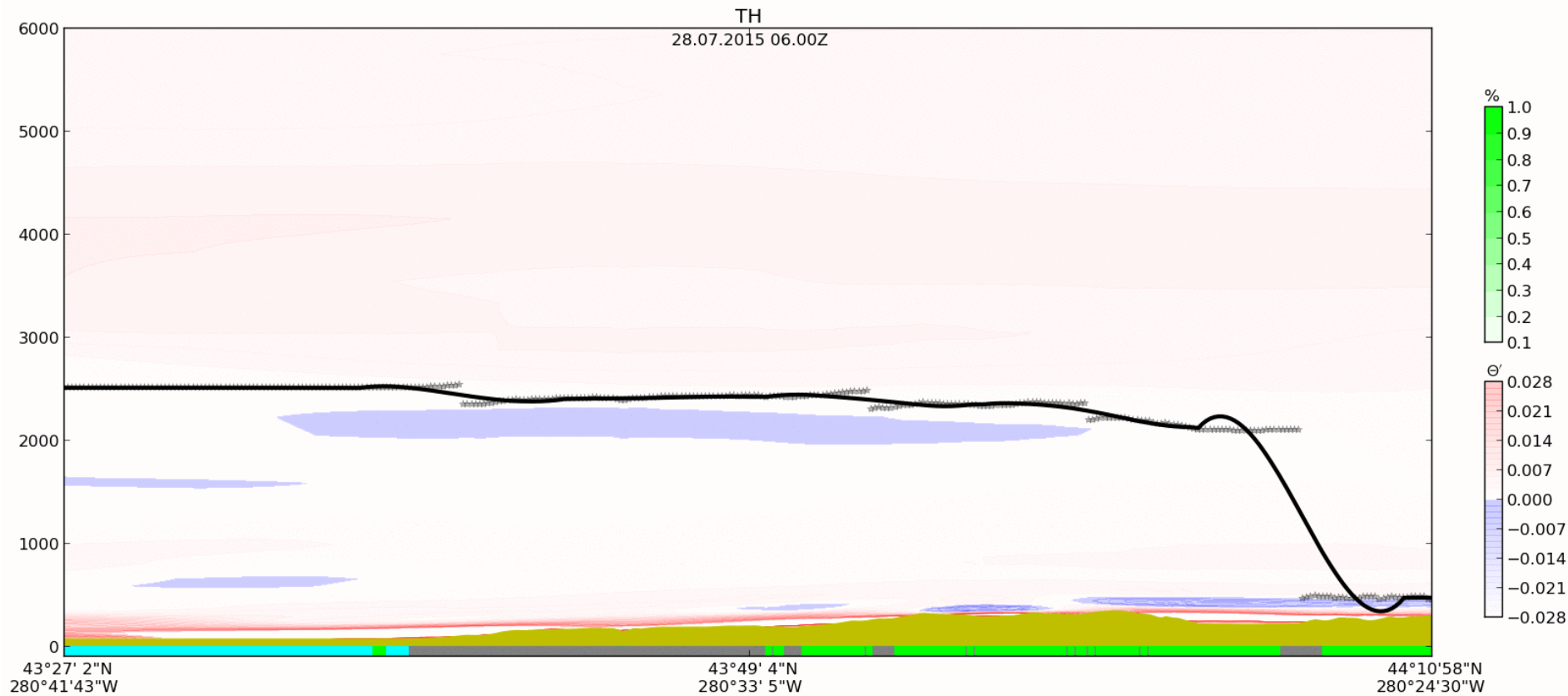
Interacting lake breezes

(18 July 2014)



Relevant for AQ and dispersion applications

BOUNDARY LAYER HEIGHT



**LAKE
ONTARIO**

**CITY of
TORONTO**

**NORTHERN
SUBURBS**

Perspectives...

Now pushing to have the 0.25km system used as an experimental system

Objective evaluation of thermal comfort indices (UTCI, WBGT) on the way

Not clear what the impact of 0.25km meteorological model on air quality and dispersion applications