



WWRP Working Group on Nowcasting & Mesoscale Research

Co-chairs: Peter Steinle & Rita Roberts

WGNMR

- Nowcasting & mesoscale processes and predictability research
- Use of nowcasting systems
- Use of NWP with very high-resolution data.
- Bridging the Nowcasting-NWP gap

Co-chairs:

- Peter Steinle (BoM)
- Rita Roberts (NCAR)

Members

- Elisabeth Bauernschubert (DWD)
- Gyu-Won Lee (Kyungpook National Uni)
- Dave Turner (NCAR)
- David Sills (Western University, ex-ECCC)
- Yong Wang (ZAMG)
- Ping-Wah (Peter) Li (HKO)
- Paola Salio (Uni Buenos Aires)
- Jason Milbrandt (ECCC)
- Rachel Albrecht (Uni Sao Paolo)
- Valery Masson (Meteo-France)

WGNMR Intro: What & How

- HIGHWAY (Lake Victoria)
- RELAMPAGO
- ICE-POP (PyeongChang, 2018)
- LAFE
- High Impact Weather
- Aviation RDP
- Paris 2024
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- Workshop on Short-range forecasting & Nowcasting
 - next in 2021
- Km-scale → 100m or lower
 - Scale of infrastructure: transport, energy, emergency services, water, ...
 - Demands of new technology
- Observation Nowcasting → NWP
- Importance of "user variables"
 - Quick decision making
- Demonstration Projects
 - User evaluation
 - Intercomparisons

Aspirations & Expectations for 2030



- Aim: Realistic looking mixed layer fields
 - Realistic distribution conditioned large & small scale forcing
 - Time & space scale of infrastructure
 - Realistic sub-global grid scale patterns
 - User info : (non-linear) weighted integral
 - Or even just scenarios
- ~100m urban models operational
 - 3rd party & unconventional observations
 - Advanced PBL remote sensing
 - Very rapid update
- Integrated/seamless & ideally coupled
 - Hydrology & inundation
 - Air quality & aerosols
 - Coastal ocean, lakes, ice & waves

Predictability

- Small scale forcing, in PBL, integrated effects
→ Aspects of these scales are predictable enough

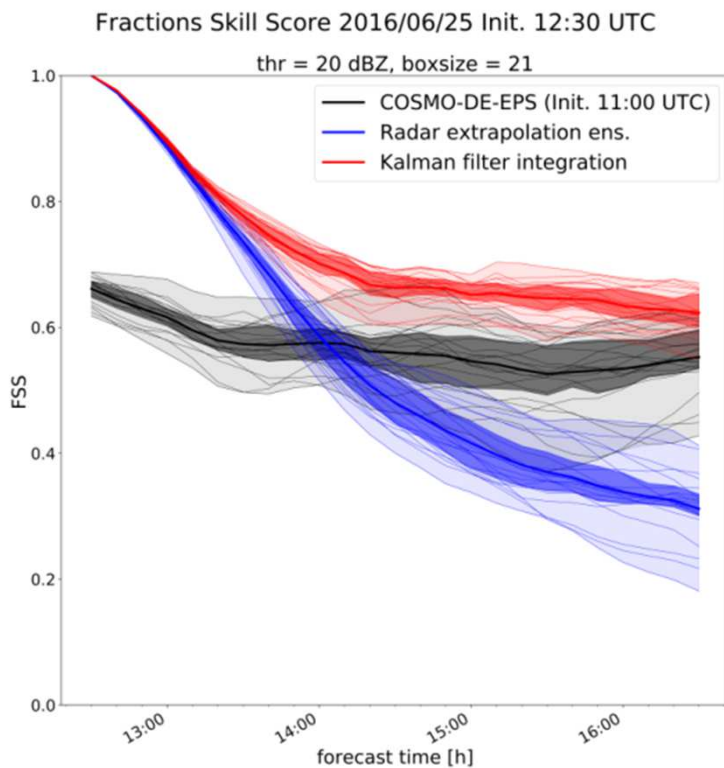
- Increased emphasis on distribution of values
- More than just random noise

- Distributed events (Multi-hazard)

- Implications for ensemble generation & assessment?

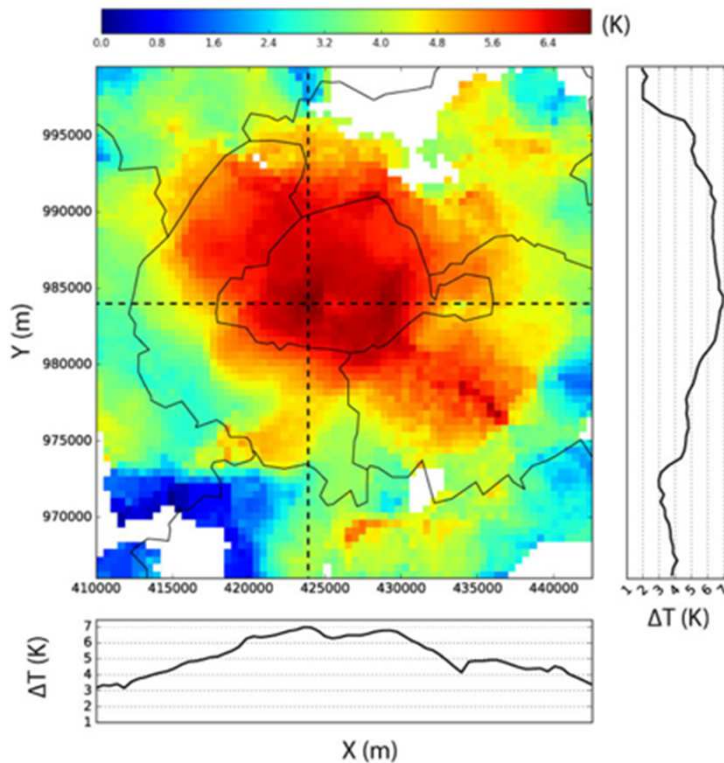
- Ensemble strategies

- Merge with observation based nowcast EPS
- Merge with global EPS



Martin Rempel : SINFONY, Blahak et al.

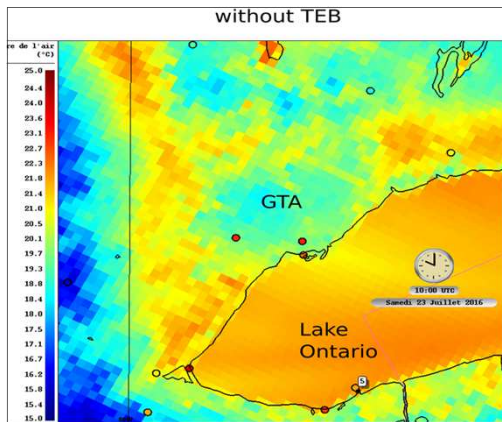
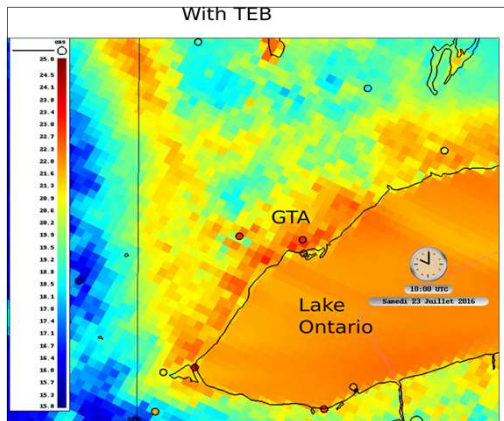
Data Assimilation



Paris UHI quantified using netatmo non-conventional stations (from Napoly et al 2018).

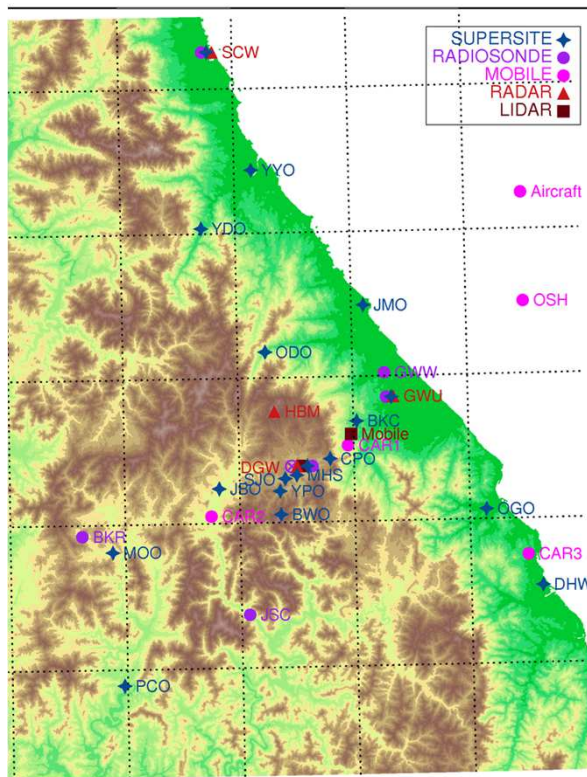
- Analysis error is a big part of forecast error
 - Large scales are a problem too!
- Non-Gaussian errors
- Unconventional observations
 - Gradient in observation network coincide with physical gradients (coast, mountains etc.)
 - Quality control?
- Resolution of satellite data
- 3d observation operators for urban

Physical modelling



- 3d radiation
- PBL – including very stable & nocturnal boundary layers
- Land surface modelling
 - Urban canopy
 - Soil & vegetation in general
- Calibration with limited area domains with less parametrization
 - ...and grey zones just keep on coming
- Hydrology, open water & ice ???
- Importance of realistic scenarios for response to climate
- Opportunity for augmentation by AI/ML at nearly every step

System & Science Development



- Methodology for model intercomparison
 - Global NWP comparisons are great: compare all weather conditions & across models
 - Same models are run in many places → different conditions
 - Across models??
 - A number of great data sets, already used by multiple models
- Verification: DA & Ensemble problems carry through
 - reference data?
 - only add value when local forcing significant
 - patterns increasing importance

Summary

- Urban scale : the value & feasibility exist
- Extending what we are looking for in model fields
 - patterns not just values
- DA, ensembles, verification & model physics
 - Global approaches not necessarily ideal
 - Km-scale models may not be a suitable reference for tuning global models
- Routine model intercomparisons
 - Some aspects in place, but can or should they happen?
 - Are there alternatives?
- Many opportunities for AI/ML augmentation