Highlights of the past year

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EWGLAM/SRNWP meeting

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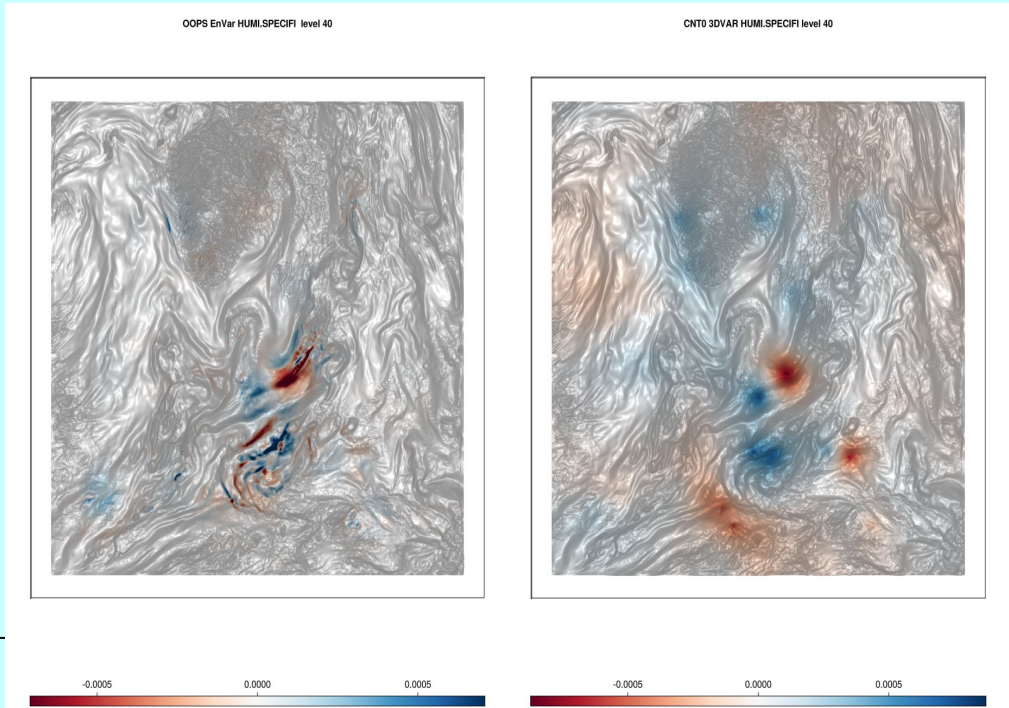
2022-2025: A transition phase for the HIRLAM (and UWC) organization

- The present HIRLAM-C programme has been extended to end 2025. After that, the coordination of how the Harmonie-Arome model configuration and system used within UWC should evolve will be incorporated in the UWC organization.
- HIRLAM management group: no changes
- Operational cooperation in United Weather Centers evolving:
  - MetCoOp gradually including Baltic members
  - UWC-West: joint HPC being installed, becoming operational early 2023 (presentation Eoin Whelan in LwA session)
  - AEMET decision to join UWC
  - strategy and roadmap 2023-2030 for UWC under development
  - process started to prepare roadmap for transition process from part of present HIRLAM tasks to UWC

Developments in data assimilation algorithms and use of high-resolution observations

- 4D-Var entering operations; implementing HIRLAM-developed flow-dependent algorithms and non-conventional observations in OOPS code framework
- Improved enhanced use of surface-sensitive radiances, gaining experience with all-sky assimilation
- Focus on nowcasting (sub-hourly cycling, observation usage, algorithms, initialization strategies, …)
- Coupled DA work gaining momentum
- Continue collection/studies of VHR obs types. E.g. SPO acquisition via met apps

See presentation by Magnus Lindskog



Forecast model developments

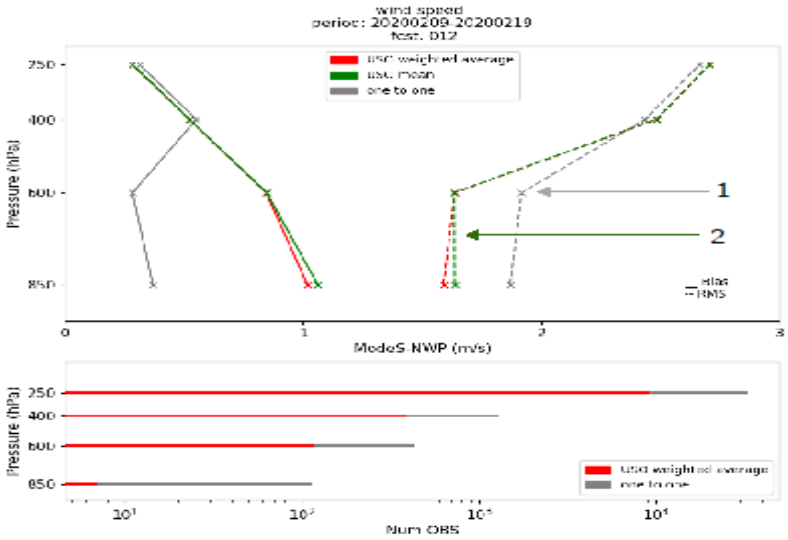
- Start with forecast model code refactoring required for adaptation to alternative architectures
- Sensitivity testing: cloud droplet NC/ size distribution, open cell convection, SBL and fog. Good collaboration with HCLIM community on model assessment, more unified Harmonie physics testing across all domains, enhanced use of “non-standard” observations for evaluation.
- Increased focus on 100m scale modelling: regular suites, developing ideas + datasets for validation, shallow convection grey zone, stochastic physics, (quasi-)3D scheme radiation, …
- Studies on extension observation sets/methods of validation/verification, e.g.
  - Exploring PWS, dual-pol radar 3D-hydrometeor info for hectometric model validation
  - Exploring how to use Mode-S EMADDC data for profile verification at hectometric scale

Compare approaches

1) One-to-one (grey curves)

2) Upscaled observations (USO) @2.5 km - green (average) and red (weighted average) curves

- Better scores;

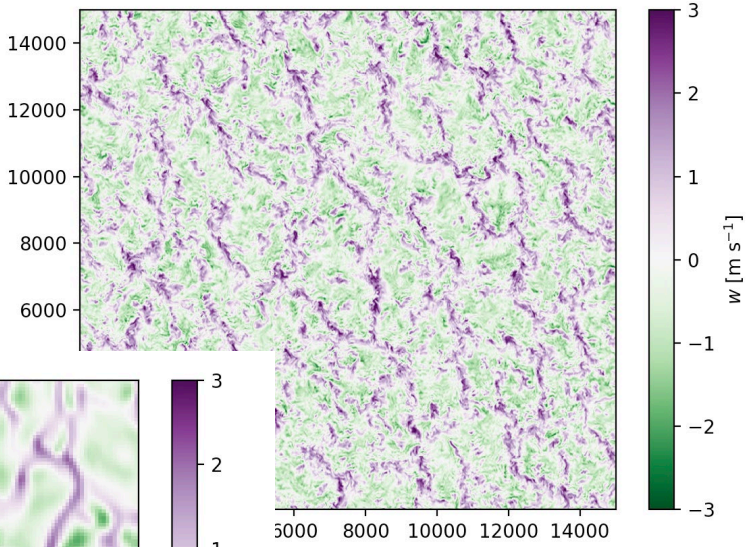


Courtesy: Fabiola da Souza Silva

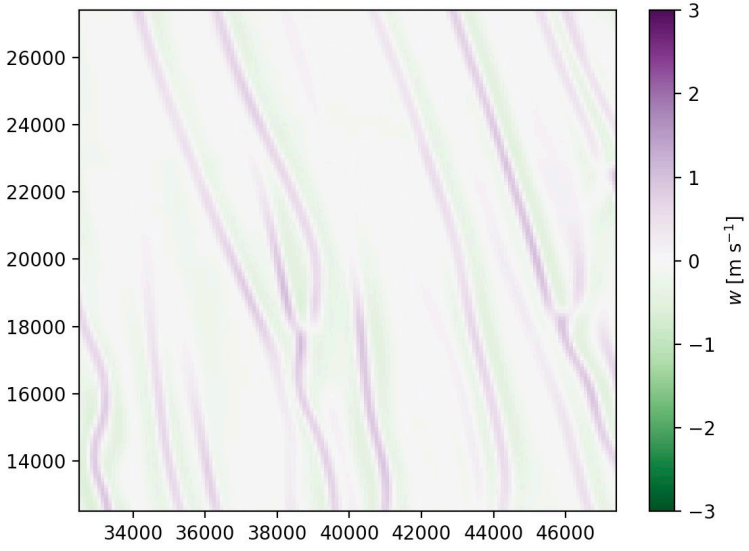
100m Harmonie vs LES

Influence of convection scheme

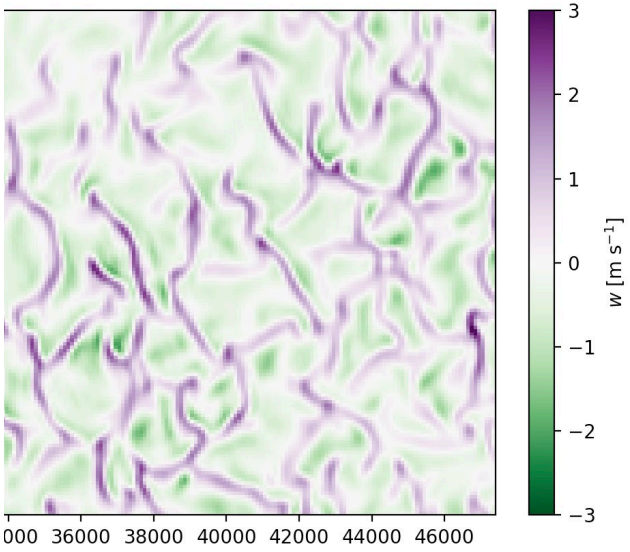
Large eddy similation (nested in HARMONIE)



Using shallow convection scheme



No shallow convection scheme



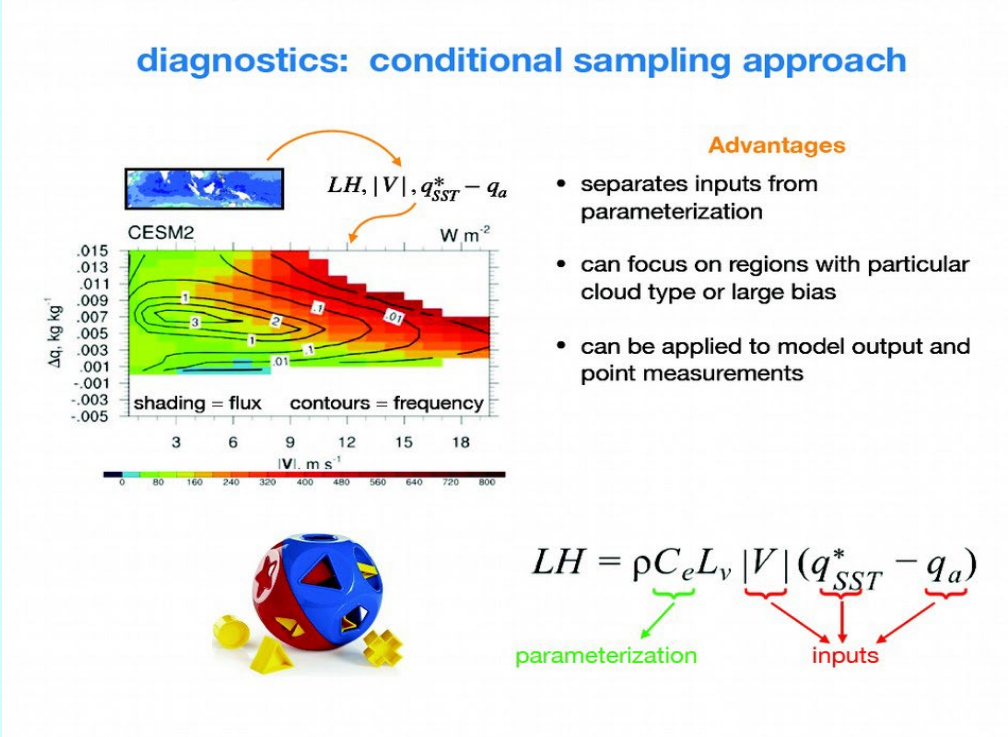
HARMONIE-AROME
- Δx=Δy=100m
- L90
- Nested in 500m HARMONIE -> nested in UWC-West

Courtesy: Natalie Theeuwes

Surface analysis and modelling

- Pre-oper testing of SEKF and many-layer surface schemes: progress, but still problems over some domains
- Continuing testing and improvements for canopy roughness sublayer (RSL) scheme
- Stable boundary layer studies and options
- Fluxes over sea: testing ECUME with EUREC4A, satellite data and conditional sampling approach (DeMott)
- Deriving surface physiography for hectometric-scale modelling based on regularly updated Eur O(10m) maps and ML: included in DEODE project.

See presentation by Katya Kurzeneva



Courtesy: W. de Rooij, P. Siebesma

Ensemble forecasting

- Model perturbations: SPP setup performing well, first operational implementation (Frogner et al. 2022, MWR).
- Work done on reduce SPP computational cost (only 0.3% increase when calling pattern less frequently), handling of correlated parameters, alternative pdf's.
- Extending SPP to surface parameters.
- Drying of perturbed members wrt control due to perturbations of soil moisture and their cycling => a long-lasting problem now solved ☺.
- Further investigations of optimizing ensemble approach for DA purposes
- SP vs DP in EPS: some issues detected and fixed, still needs more testing

Harmonie Reference System developments

Releases:

* July 2022: Full release Cy43h2.2 (4D-Var; fog/ radiation/ precip improvements)

* Next operational release: Cy46h: pre-operational testing of new surface modules and SEKF; cmake; optional new modules for use of NRT aerosol from CAMS, wind farm parametrization
  Aim to have release candidate end 2022.

* Next research release (probably): Cy48, to permit researchers to make use of latest developments in ECRAD, LIMA, code refactoring, all-sky radiances, OOPS, DAVAI,…

Other near-future developments:

* Expand documentation in Harmonie github repository
* Develop more Harmonie-specific tests for technical validation of forecast model and of DA components in OOPS framework
* Gain experience with tools for bundling multiple repositories
* SP vs DP testing: share experiences within IFS/Arpege/ACCORD?

Thank you for your attention!

Any questions?