Highlights of the past year

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EWGLAM/SRNWP meeting

Reykjavik, 25/9/2023

Data assimilation developments

- Getting the final kinks out of 4D-Var
- Starting testing/ move of Harmonie-specific algorithmic developments to OOPS code framework
- From surface-affected towards all-sky radiances
- Preparation of overall DA system tuning exercise
- Towards sub-km, sub-hourly data assimilation
- Coupled data assimilation activities gaining momentum

See presentations Magnus Lindskog, Jana Sanchez-Arriola, data assimilation parallel session

Forecast model developments

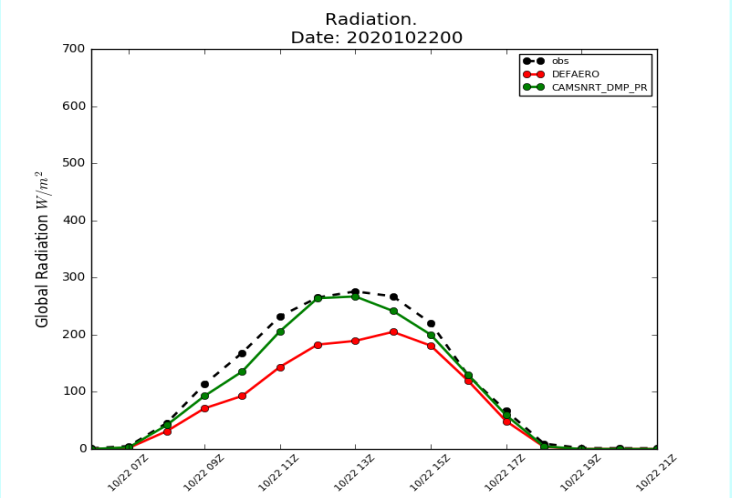
- Continuation of detailed cloud studies: open cell convection, turbulence in SBL, microphysics and parameter optimization studies for range of conditions, resolutions and domains.

- Detailed impact studies of using NRT aerosol in radiation/microphysics over various areas

- Challenges in preparing many-layer soil/snow surface schemes + more sophisticated data assimilation for operational use.

- Challenges of handling strong surface inhomogeneity: e.g. the modelling of vegetation and vegetation roughness sublayers, and high urban buildings piercing into atmospheric model layers.

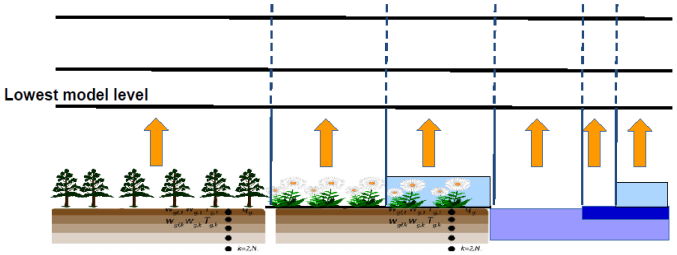
See presentations of Emily Gleeson, Patrick Samuelsson, Samuel Viana and Metodija Shapkalijevski in parallel Surface session



Concern about very low lowest model level SMHI

Maybe we should let the tile air columns extend into the atmosphere comparable to what is now developed for skyscrapers in TEB….

Using the coupled system ECHAM6/JSBACH de Vrese et al. (2016) have investigated the influence of surface heterogeneity on the turbulent mixing process using the VERTEX scheme. By taking into account horizontal heterogeneity, not only at the surface, but also at the lowest levels of the atmosphere, the scheme allows resolution of the turbulent mixing process with respect to the surface tiles.

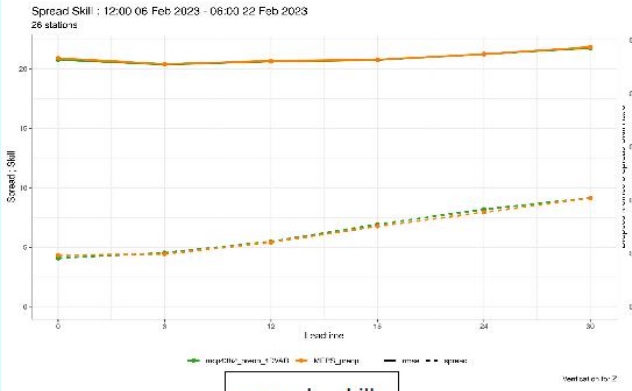


Ensemble prediction

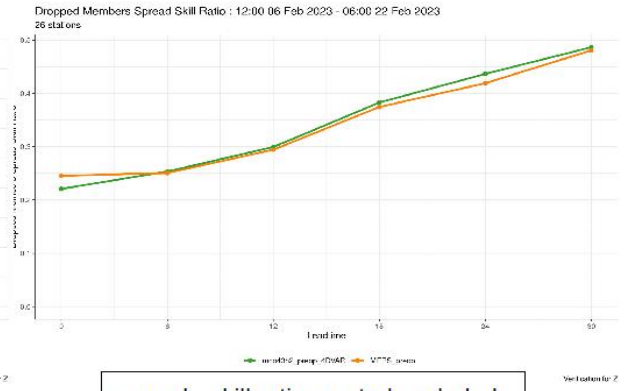
- Scientific focus on atmospheric and surface SPP model perturbations
- Investigation of sensitivity to individual parameters and more automated tuning by URANIE
- EDA working with 4D-Var
- Computational optimization: single, dual and double precision studies, esp. for SPP; SPG pattern update frequency

See presentation by
Inger-Lise Frogner

Z 850 MEPS preop MEPS 4DVar https://shiny.hirlam.org/harpVis/ select 4DVAR



spread - skill



spread - skill ratio, control excluded

MEPS 4DVar slightly better after +6h (seen mainly from the spread-skill ratio plott)

Technical and system developments

A LOT of work in 2023 and 2024:

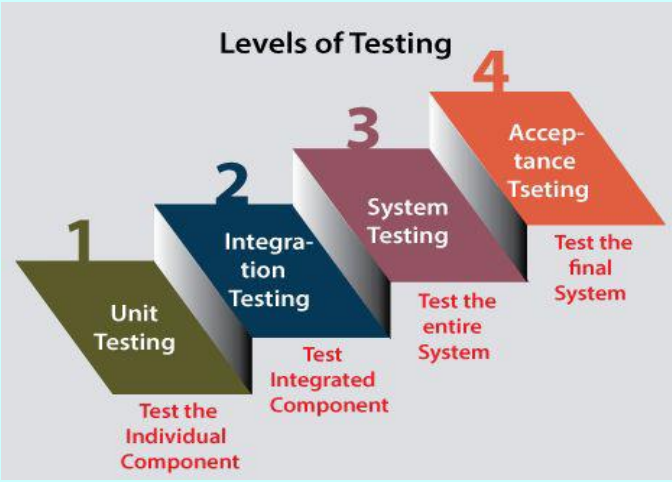
- Code refactoring of Harmonie forecast model for efficient use on mixed/GPU architectures; Transition to OOPS framework for DA codes, transfer of Harmonie-specific DA code developments into OOPS.

- Realizing the ACCORD move towards a CI/CD process, a single code repository for IAL codes, multiple repositories for (shared) tools, creation of more extensive Harmonie-specific technical unit and block tests within DAVAI.

- Code optimization: esp. SP vs DP and dual precision

- Pre-operational testing of Cy46h1 ongoing this summer/fall.

- Preparing for next research release: Cy49Th1



Towards hectometric scales

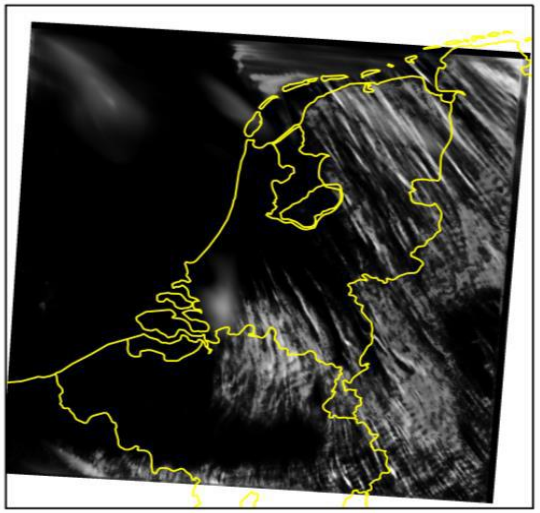
- Crossing grey zones: sensitivity studies, development/validation of scale-aware turbulence and shallow convection schemes and quasi-3D (radiation) approaches, …

- Hectometric scale NRT suites and optimization experiments: 500, 750m/90L, including 3/4DVar

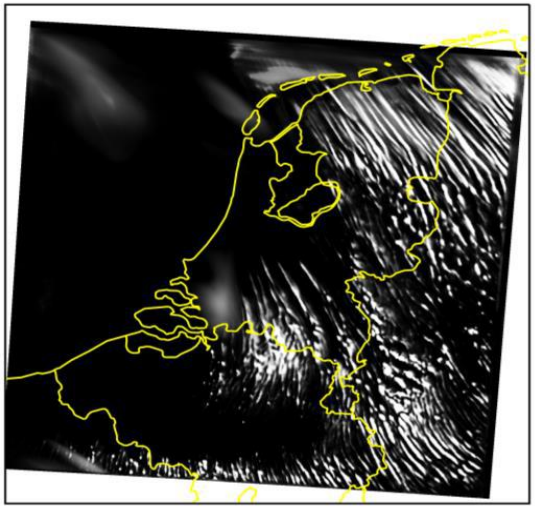
- Validation of BL behaviour at 100-200m scales

- Develop/locally improve a high-resolution physiography for Europe (DE-330MF)

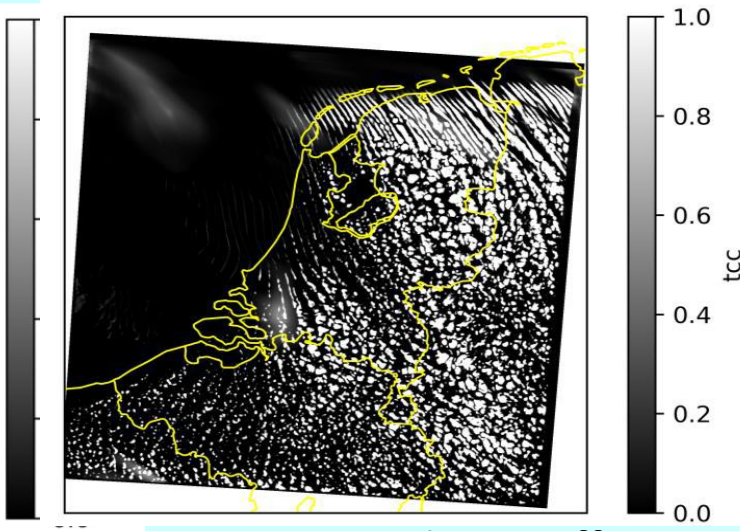
- Assessing urban model (TEB) options and configurations



convection scheme on



scale-aware convection



convection scheme off

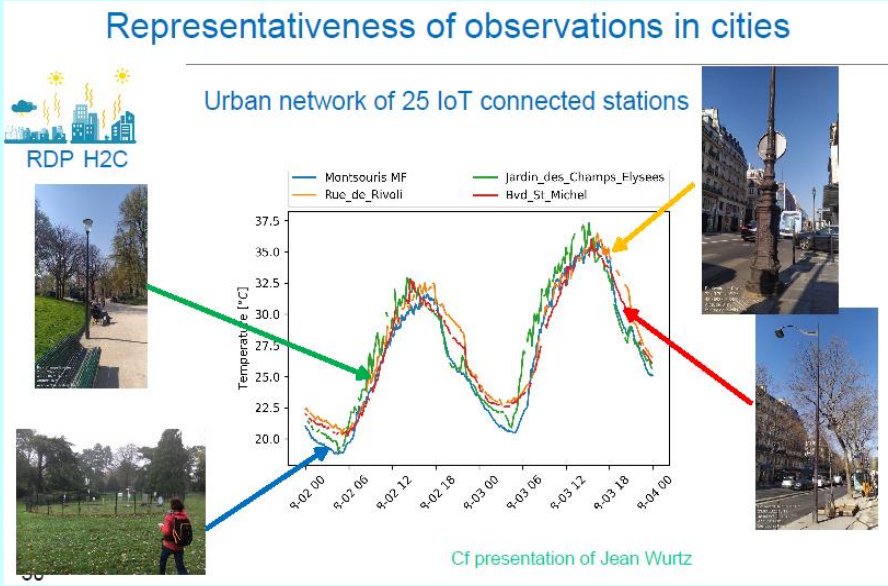
This all looks very nice, but what about observations on the hectometric scale???

Our NMS surface observations do NOT cover the heterogeneity of the surface which we are trying to capture correctly in our (near-)surface modelling. This is especially true for **urban** areas, which our NMS surface networks do not cover, but which are the places where most people live…

…BUT there is a growing number of urban networks, and crowd-sourced moving platform observations…

...so do we need to spend seriously more efforts on actually getting and assessing those data and their use for hectometric model evaluation???

For discussion: should we make a European effort on (1) **structural acquisition, QC, exchange of urban observation data** and on (2) **considering how to best use such data** (i.e. tackle the challenge of surface inhomogeneity) in validation / verification over urban areas? How to organize? If we NWP people don't push this, no one else will do it for us!



The swift rise of machine learning…

- Strong increase of machine learning emulation and model enhancement efforts: in pre-processing, postprocessing, DA, forecast model, surface physiography, EPS, nowcasting, seamless prediction, … High potential and high ambitions, but so far mostly undertaken as national activities.

- ACCORD formulation of ML portfolio

- Within HIRLAM/UWC: assessment ongoing of common activities on existing/future datasets, the desirability of a common ML working environment, consider prioritizing shared efforts on a few key areas of applying ML in SR NWP?

- Coordinating efforts within Europe initiated at director level (Eumetnet optional programme)

For discussion: Should we consider to organize exchange and cooperation on ML in SR NWP at SRNWP level? On what exactly? New ML expert team? Common efforts on defining/sharing datasets? …???

Thank you for your attention!

Any questions?