# Highlights of the past year
(including some issues with external data)

Jeanette Onvlee

EWGLAM/SRNWP meeting, 28/9/2020

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

- 4D-Var soon ready for operations (Cy43h2.2), testing also in nowcasting range

- Good quality/impact of data from Aeolus, scatterometers

- Mode-S: more data sharing and improved preprocessing, quality of temperature data

- Increased focus on use of crowd-sourced data

With active Aeolus DA
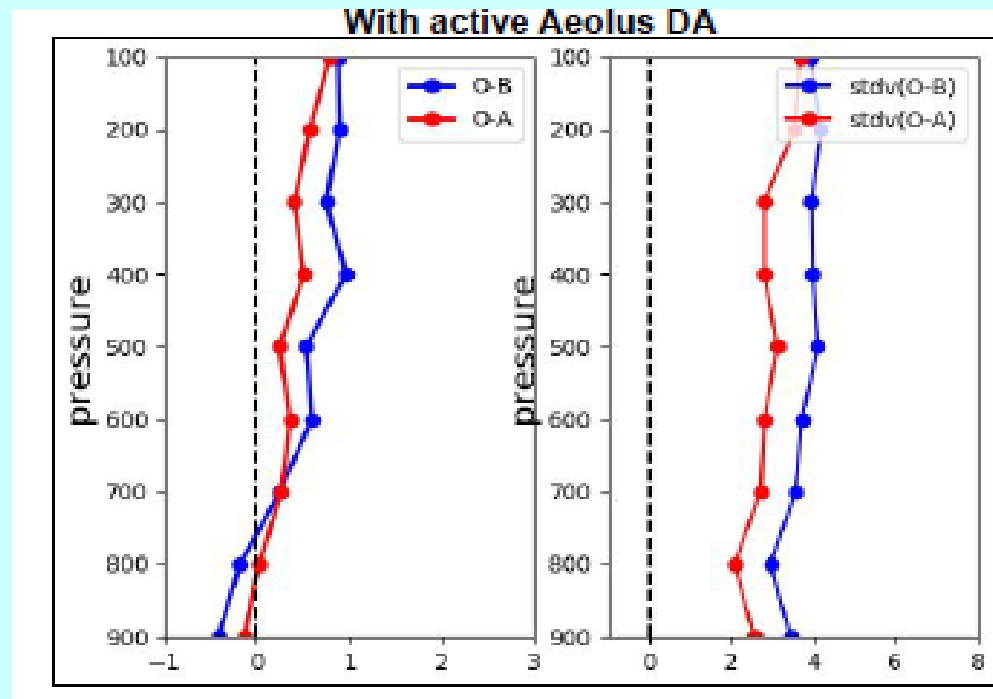
Forecast model:
Several lines of research coming together

Identifying, understanding and addressing systematic model weaknesses:

- **-** too quickly growing, persistent, cold fog over sea
- - radiation (cloudy) bias
- - precipitation behavior in coastal zones

Behaviour very sensitive to amount / evolution of CCNs!

More sophisticated radiation-clouds-microphysics-aerosol interaction:

- Introduction of aerosol parametrizations (rad/clouds) for main aerosol types
- Initialization through CAMS.
- From ICE3 to LIMA 2d moment microphysics (evolving CCN)
- Tbc: Parametrize activation of CCN in physics schemes

Significant reduction of persistent fog/radiation/precip errors possible!
See presentation Sander Tijm in Physics session

Surface analysis and modelling: The challenges of a new physiographic database

Introduction of ECOCLIMAP-SG (although better than its predecessor) was much more complicated than expected. Cause: more "binary" treatment of open land vs low/high vegetation creates problems/biases in mixed landscapes. Appears to occur also in the original ESA/CCI data! Various remedies have been explored. See presentation by Patrick Samuelsson in SU session.

Harmonie Reference System developments

Releases:
* July 2020: Cy43h2.1 (low clouds / convection improvements; ECOCLIMAP-SG and related surface changes)

* End 2020: Cy43h2.2 (4D-Var; fog/radiation/precip improvements)

* Working on Cy46h-alpha.

Ongoing:
* Modularization/modernization of
        scripting system

The hunt for better time/energy-to-solution
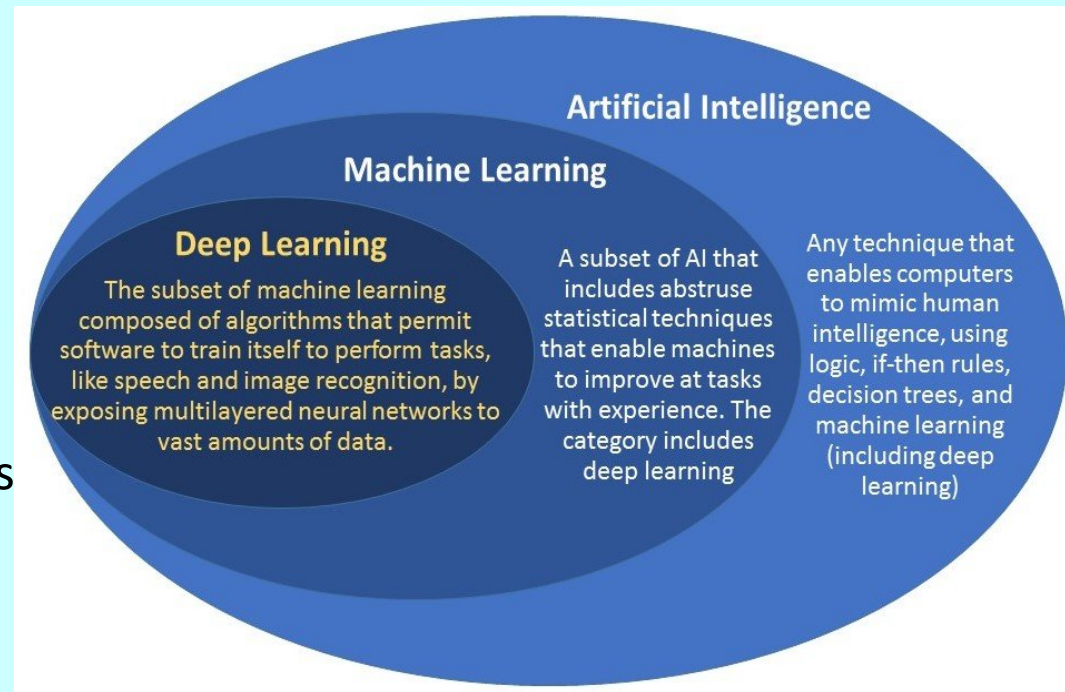
Experimenting with:

- Continuous assimilation enables timely yet large nowcasting ensembles
- Quadratic/cubic spectral grids
- Double, single and mixed precision
- Code optimization icw BSC
- Testing code performance on other architectures (e.g. ARM, GPUs)
- Etc ...
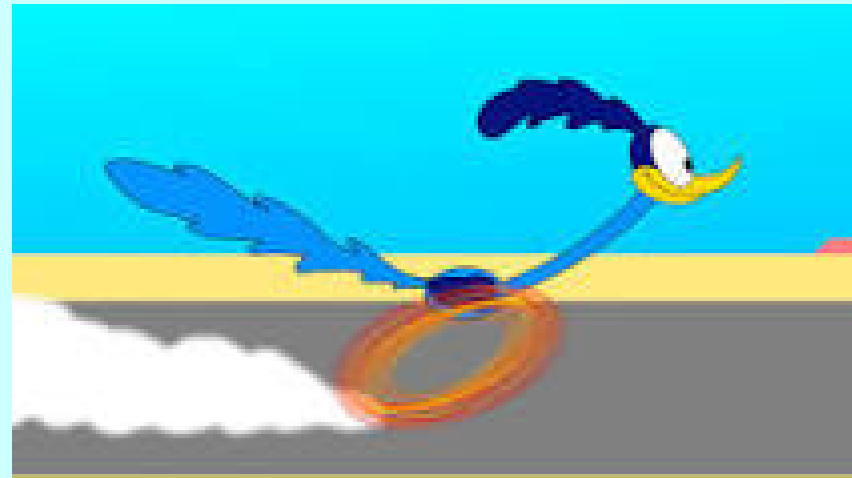
Exploring options for machine learning:
both wider and deeper

Experimentation on the use of
machine (deep) learning for:

- Quality control of crowd-
  sourced observations
- Post-processing of model
  forecasts (improve quality,
  localization)
- Optimization of surface
  physiography, roughness lengths
- Emulation of (computationally
  costly) parametrizations

- … ultimately, the entire model??
  If not by us, then by others!

Artificial Intelligence

Machine Learning

Deep Learning
The subset of machine learning
composed of algorithms that permit
software to train itself to perform tasks,
like speech and image recognition, by
exposing multilayered neural networks to
vast amounts of data.

A subset of AI that
includes abstruse
statistical techniques
that enable machines
to improve at tasks
with experience. The
category includes
deep learning

Any technique that
enables computers
to mimic human
intelligence, using
logic, if-then rules,
decision trees, and
machine learning
(including deep
learning)

… Towards joint operational production in United Weather Centers context…

UWC-East=MetCoOp: Extension of Met Norway-SMHI-FMI cooperation with ESTEA in Jan 2020.

UWC-West (Dk, Ic, Ir, Nl): Preparing for take-off
- Joint NWP production on shared machine to start in Jan 2023
- Legal/financial agreement on HPC infrastructure and funding
- Preparing future working organization, operational procedures, NWP configuration, data architecture, etc; building on MetCoOp experiences
- HPC tender process started

See presentation in App session

Towards a single ALH consortium…

This year:

- A new joint R&D strategy 2021-2025
  (scientific and technical)

- An agreed ALH MoU

- An accepted ALH working organization
  (recruitment started)

So in December:

So… will HIRLAM disappear after 35 years?

Celebrating 35th anniversary of HIRLAM this year! Of course, in Corona times, throwing a party like the 25-yr one --➔ may be hard to organize…

No, not yet. For reasons of continuity and to facilitate the growing operational cooperation within HIRLAM, the HIRLAM research collaboration will likely continue to exist until ~2025.

Pre-print No. 1

LIMITED AREA MODELLING BY
THE HIRLAM PROJECT GROUP

Bennert Machenhauer

Copenhagen, November 1986

Report to the European Working Group on Limited Area Models (EWGLAM) to be published in EWGLAM NEWSLETTER Number 13

Thank you for your attention!

Any questions?

Hir**lam**
High Resolution Limited Area Model