ACCORD

A Consortium for COnvection-scale modelling
Research and Development

ACCORD Data Assimilation Activities

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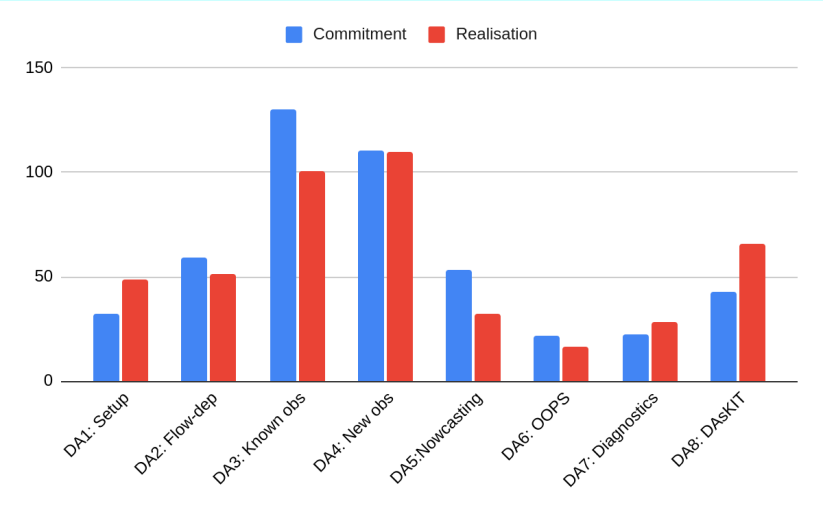
ACCORD All Staff Workshop, 4-8 April 2022, Ljubljana, Slovenia

Outline

- **The DA Research and Support Teams**
  - Few achievements
  - Some feedback about the functionality
- **Reporting practice**
  - Common document
  - Contribution to ASW and EWGLAM
- **ACCORD DA Working Weeks**
- **Side meeting**

Activity wrt the Rolling Work Plan (2021)



- Good DAsKIT contribution (DA8);
- Good contribution towards the use of new observations (DA4);
- Lot of efforts still focusing on adding remaining observations into the operational system;
- A bit more effort to work with flow-dependent DA (DA2);
- Nowcasting (DA5) is strongly connected to DA1 and DA3 so the picture might not be full;
- We really hope to be able to join the work done at Meteo France with OOPS (DA6) in the near future;
- More contribution to the development and maintenance of diagnostic tools (DA7) would be worth to have.

Organisation of work: DA Research and Support Teams

RT1 - P Brousseau; R Stappers	Var & EnVar in OOPS
RT2 - C Geijo; M Lindskog; F Meier	Initialisation/Spinup in NWC
RT3 - J Barkmeijer; J Sanchez	4D-Var & Hybrid EnVar
RT4 - A Bucanek; O Vignes	Large scale in LAM
RT5 - P Chambon; I Monteiro	Future satellites and radiance
RT6 - B Strajnar; Z Sahlaoui	Rain observation
RT7 - R Eresmaa; J Campins	VarBC for all Observations
RT8 - X Yang; E Gregow	Sub-hourly RUC
RT9 - R Stappers; E Kourzeneva	Coupled DA
RT10 - P Medeiros; E Whelan	Diagnostics
RT11 - M Mile; P Scheffknecht; F Meier	Obs at appropriate scale
RT12 - J Bojarova; L de Cruz	Machine learning
RT13 - M Martet; A Trojakova; M Ridal	Ground based remote sensing

ST1 - R Eresmaa; J Campins	VarBC implementation
ST2 - M Monteiro	DAsKIT
ST3 - E Whelan; A Trojakova	Conv Obs (fixed)
ST4 - F Meier; K Hintz	Moving platform
ST5 - M Martet; A Trojakova;M Ridal	Ground based remote sensing
ST6 - M Dahlbom; M Mile	Assimilation of retrieval
ST7 - P Chambon; I Monteiro	Rad assim (cl free & cloudy)
ST8 - M Monteiro; A. Bucanec; P Brousseau; M Lindskog	B computation
ST9 - P Medeiros; E Whelan	Diagnostics

- All Teams have started already their activity; but different at preparedness level; some even has sub-Team meetings, …
- Continuous improvement:
  - Small adjustment wrt to not covered topics/tasks: RT3 (Hybrid EnVar) and RT5 (radiance assim); RT13 added
  - Arrangement wrt to meeting organisation: ST3 and ST4 to organise the meetings together; …
- The Teams have different meeting frequency
- Use Slack as communication platform

Our opinion about the functionality of the Teams

- Working well and providing a useful exchange of information
- Fruitful and interesting
- Meaningful and helps in stimulating more progress
- Good for discussing a lot of issues
- Improve communication and awareness of needs in gaps
- Useful in specifying the work to be done and getting hands dirty
- Not only presentations but also a lot of discussions
- Interaction in groups works well

- Observe silence after the meetings
- The Slack is not used by all Teams and ACCORD family as we would expect it to be
- There is a need for a meeting in some smaller groups to have better focus
- Some tasks seem to survive being organised outside the created Teams
- There are few connected Teams, rearranging the attributed tasks is needed for some of them (ex. RT13 & RT6, …)
- Need to focus on tasks: not enough to have good objectives. We need regular presentations to promote the ongoing works

- Purposes of the Teams: communication, reporting and planning. These are all needed.

Highlight of progress

- Succeeded to explore a) increase of resolution; b) B matrices computed in different ways (downsc, EDA, Brand); c) Initialisation procedures (IAU, DFI, cloud initialisation) (*see Erik's presentation*);
- Accounting the large scale information (Jk or pre-mixed penalty free Jk) was explored with promising results;
- Multi-resolution incremental 4D-Var was further developed and now under test for operational implementation (*see Jana's presentation*);
- The Harmonie version of the hybridEnVar was further developed and tested with Brand initial perturbation and compared with different ensemble assimilation techniques (EDA, BRAND, BREND);
- Using the OOPS framework, 3DEnVar and 4DEnVar have been successfully developed and evaluated at Météo France (*see Loïk's presentation*);
- Settings appropriate for nowcasting under investigation in MetCoOp, DMI and ARSO. Frequent observations appropriate for nowcasting (radar, GNSS-ZTD, Mode-S, AMV, T2m, Hu2m from Netatmo) were tested;
- The variational constraint (VA) and field alignment were ported to CY43;
- Radiance data assimilation is being improved through 1) appropriate update of the coefficients used in the variational bias correction scheme; 2) improved assimilation of low peaking channels from microwave instruments; 3) corrected (by adding more passively assimilated important channels) cloud detection scheme for IASI; 4) accounting for the footprint of each instrument; and 5) assimilation of in all-sky conditions.

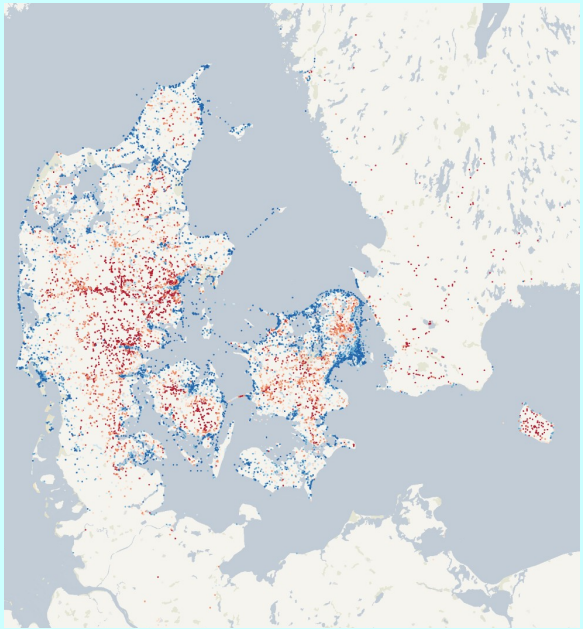
Highlight of progress, continued

- Radar data assimilation was further improved at AEMET (Doppler wind) and Meteo France (French and OPERA radars: doppler wind and reflectivity data). Radar reflectivity operator in combination with ALARO physics was evaluated through impact study at ARSO and CHMI (*see Benedikt's presentation*).
- Appropriate assimilation of low resolution observations with footprint and supermodding observation operator was developed for scatterometer and Aeolus L2 HLOS winds data. Extension of this technique to radiance observations is ongoing (*see Magnus' presentation*).
- Many operational assimilation systems were enhanced through augmented use of different observations (increased use of radiance data (ATMS, IASI, MWHS-2, SEVIRI), Scatterometer, GNSS-RO, AMV, high-resolution BUFR-formatted radiosonde, …) (*see Magnus' and Benedikt's presentations*).
- DAsKIT members progressed very well with the implementation of the surface DA, computation of the background error statistics for the variational upper-air system, and more observation types handling, as well as building of new modules in ecflow-driven NodeRunner system (*see presentations by Maria and Mohand Ouali*)
- Very good progress in implementing new types observations, including relevant quality control also involving machine learning techniques (all-sky radiance, Scatterometer data from new satellite, Aeolus L2 HLOS winds, GNSS slant delay, high resolution surface pressure from private stations (Netatmo) and smartphones, observation from attenuation in telecommunication microwave links due to rain, and radar polarimetric data) in our assimilation systems (*see Magnus' and Benedikt's presentations*).

Pressure observations from Smartphones (SPOs) (Hintz et al., 2019, Hintz, 2021)

How does data look?

Surface pressure during one hour
20th of June 2020, 5 - 6 UTC



Issues and solutions:

-- Data not just ready for download as other types of crowdsourced data
  => Had to write a software for collecting the data
  => A short spin-up time of 5s was found on average during which the pressure should not be logged

-- General Data Protection Regulation (GDPR)
  => Had to remove the unique identifier (UID) and blur the location of the device
  => Data is no longer considered personal!

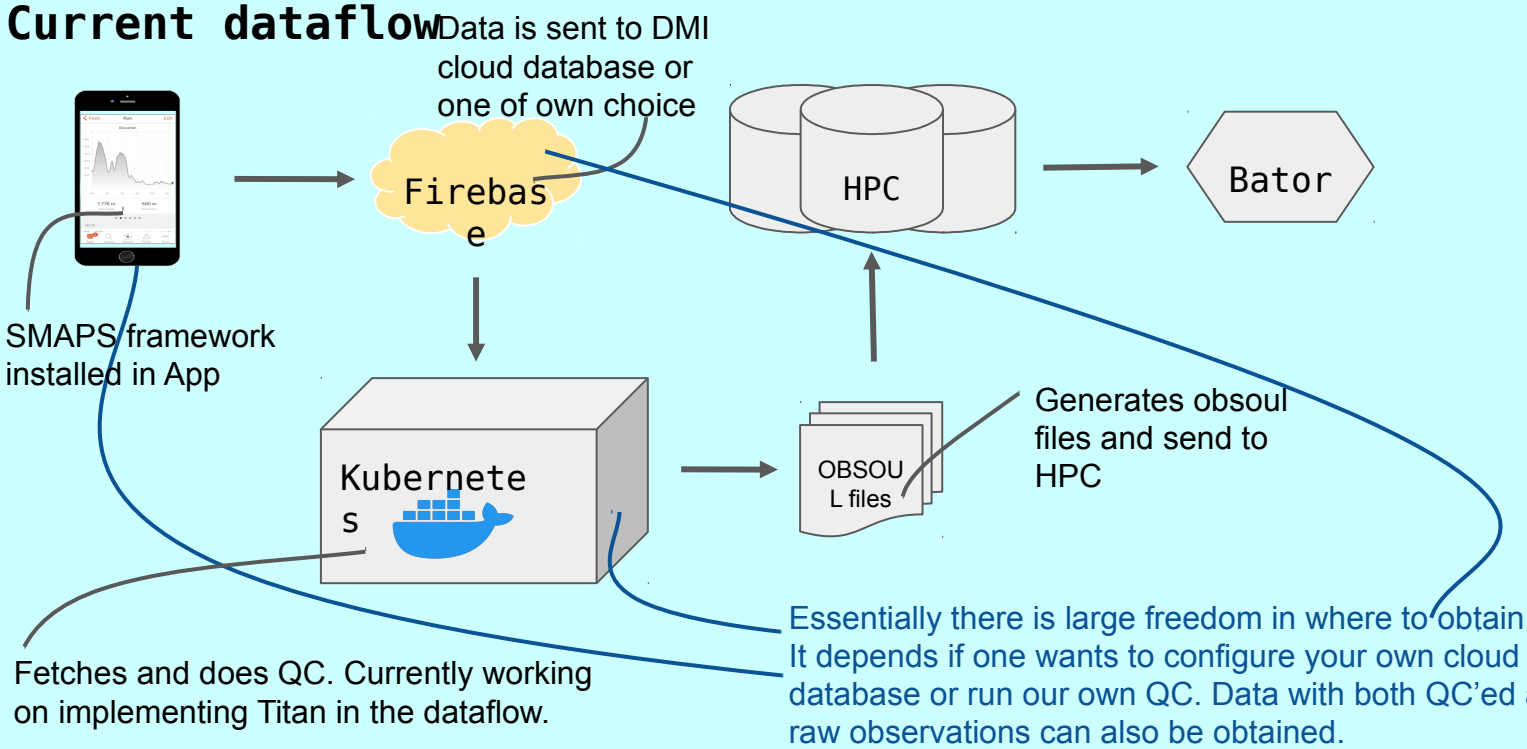
-- Data processing:
  => Observation correction and quality control (QC) using Titan

Current status:

-- Tuning TITAN lib for QC
-- Assimilating in Harmonie-AROME 750 m resolution and testing configurations
-- Refactoring data collection software (SMAPS) for easier integration into native software development kits (SDKs)
  -- iOS: Completed
  -- Android: In progress
– Receiving 250.000 observations per day.

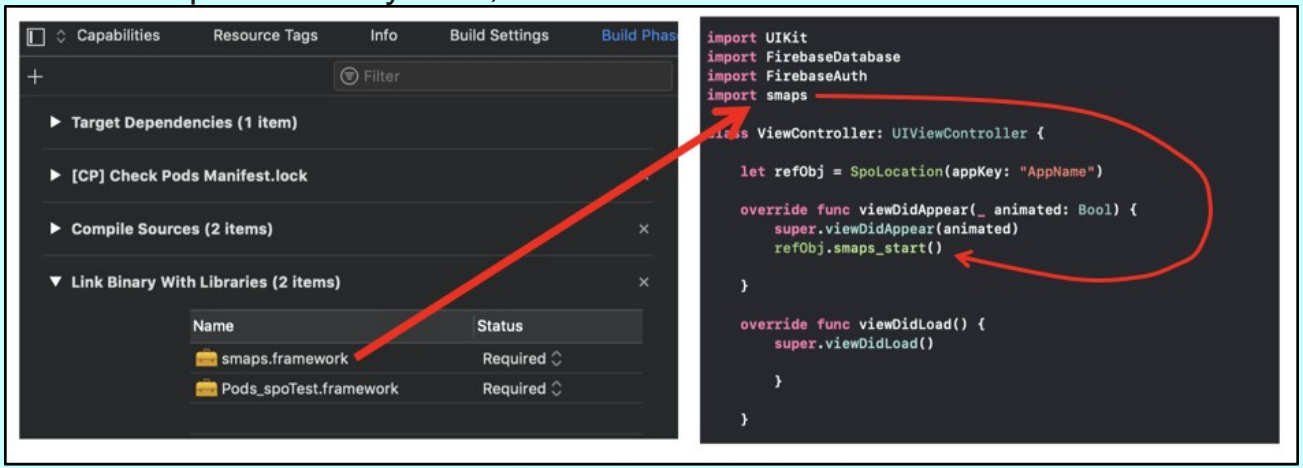
Current Smartphones (SPOs) data flow

Current dataflow



Getting SPOs accessible for NWP applications in Europe

The SMAPS framework can be included as a module.
The module is being used in the DMI app operationally.
Data is not personal anymore, thus we can share data across borders.



Task for All:
⇒ Get the **smaps add** package, add it **into your institute's weather app** to help us in getting observations over our service area.

https://github.com/Hirlam/smaps (Contact HIRLAM Management Group for access)
https://github.com/dmidk/smaps (Currently working on open-source version)

Elaborating a reporting practice

At the EWGLAM meeting:

- Show unity: Common consortium reports per topical subjects (algorithmic, observation handling, other highlighted topics), but allow separate experts highlight of important results

At ACCORD All Staff Workshop:

- Start with short Teams reports.
- Separate family reports
- Experts highlights of important results

Rolling reports:

- Common rolling report with conventions
  - Refers to all tasks defined in the rolling work plan
  - Offers more transparency of performed works
  - Each file will be kept at least until April/May the following year
  - Useful for Hirlam, LACE and ACCORD reporting

ACCORD DA Working Weeks

1rst WW: Research Team meeting:

- High resolution data assimilation, nowcasting and 4D-Var; Budapest, OMSZ
- 25 - 29 April 2022

2nd WW:Support Team Meeting:

- Data assimilation diagnostic and (OOPS and EnVar ?); Barcelona, AEMET
- 20 - 24 June 2022

3rd WW: Support Team – LACE WD – meeting:

- 19 - 23 September; Bucharest, Meteo Romania

4th WW: Research Team meeting:

- New observations, machine learning, flow-dependent schemes
- date (TBD), Copenhagen (?)

ACCORD DA side meeting

– **Thursday 16:00 - 18:00 CET**

– **ACCORD DA activities**
  – Are you able to find (what)/(the help) you need for both planning and problem solving?

– **Common ACCORD solution for operational radiance data selection (Magnus)**

– **Your suggestion <-** Let me know about it

Thank you for your attention