



Norwegian
Meteorological
Institute

The Locally Processed Atmospheric Motion Vector Data at MET Norway

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Met Norway

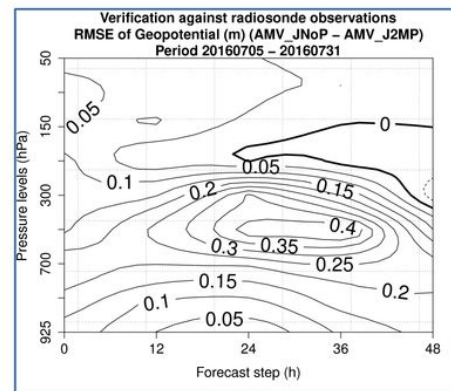
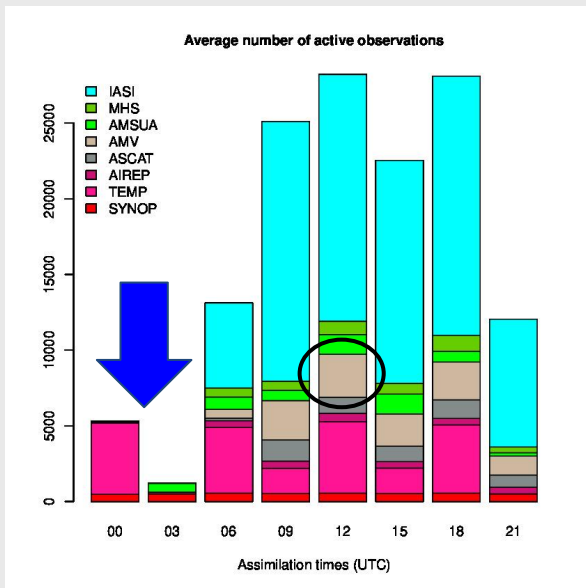
Outline

- Motivation
- AROME-Arctic model
- Impact study with locally produced winds
- Testing the Sentinel 3 (A&B) derived AMV
- Concluding remarks

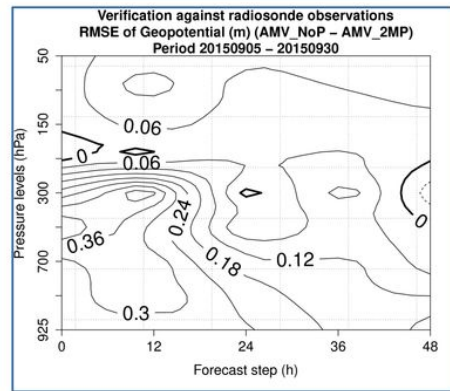
Motivation

Our Earlier study over the AROME-Arctic:

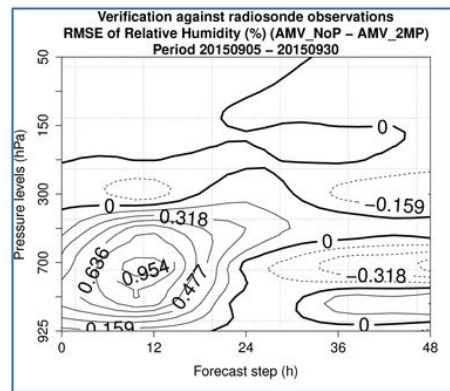
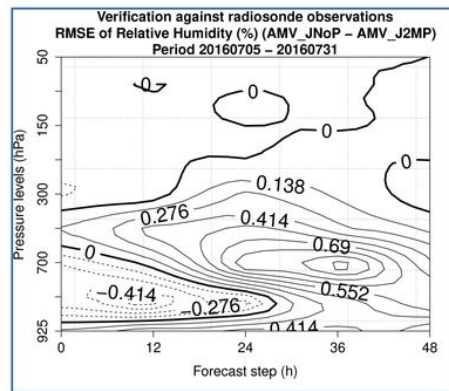
- Positive impact of dual Metop polar winds
- Issues with data timeliness
- Tried to find solution for producing locally winds from non-Metop satellite
- Possible from last year thanks to the NWC/PPS-HRW (v7.P) processing package



Sept. 2015 ==>

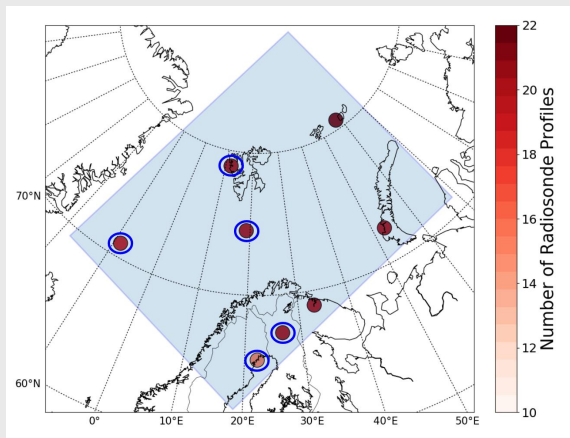


<== July 2016



The AROME-Arctic model & the experiments

- Model upper-air physics: HARMONIE-AROME
- Model surface physics: SURFEX
- Upper-air assimilation: 3D-Var
- Surface assimilation: Optimum interpolation (OI)
- Update strategy: 3 hourly cycling (00, 03, 06, 09, 12, 15, 18, 21 UTC)
- Lateral boundary condition: ECMWF (hourly)
- Used model version: 43h1.2
- Forecast lengths: Long forecast (48 hours) twice a day (00, 12 UTC) for verification purposes
- Experiments: Winter period: Warming: 20 – 30 November; Verif: 1 – 31 December
Summer period: Warming: 20 – 31 July; Verif: 1 – 31 August



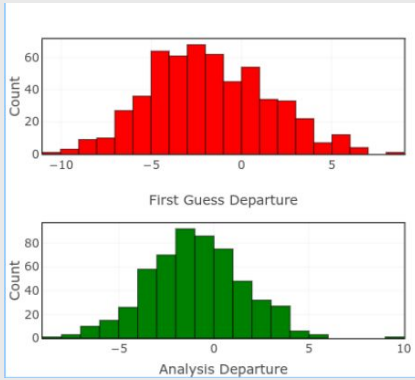
Observations: Conv: Synop, Buoy, aircraft, radiosonde
Sat: ASCAT, AMSU-A, MHS, MWHS-2, ATMS, IASI



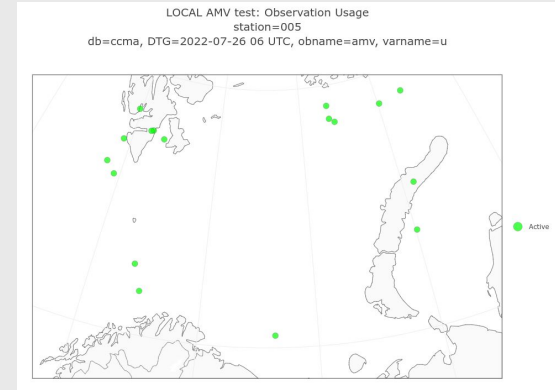
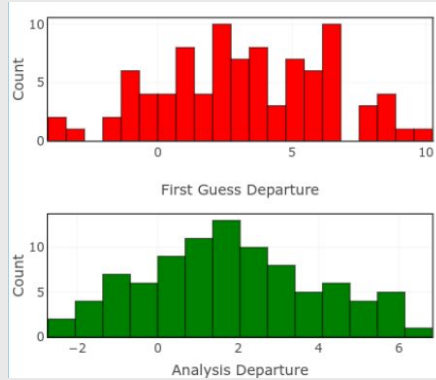
The AROME-Arctic model domain with the available radiosonde stations.

Data availability & diagnostics(1)

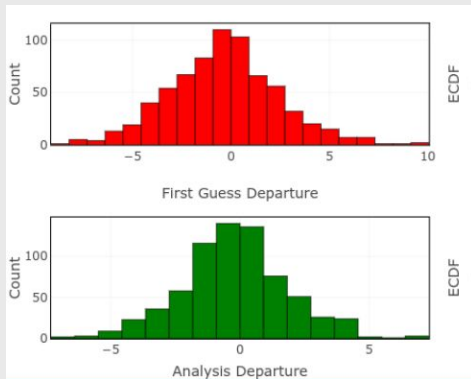
Metop C wind at 06 UTC



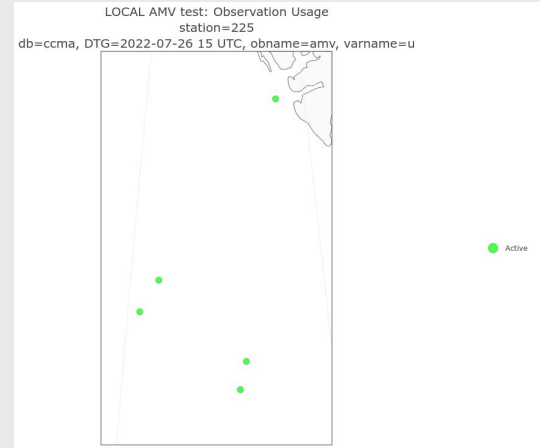
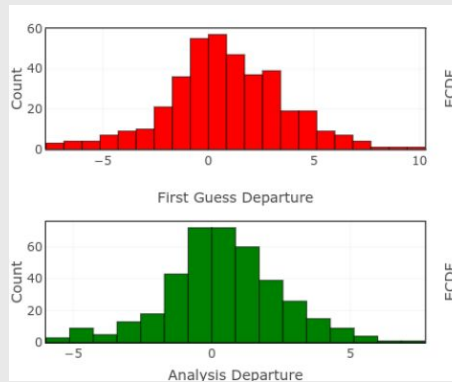
NOAA-20 wind at 15 UTC



Metop C wind at 09 UTC

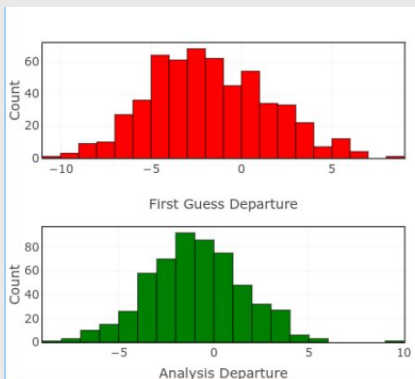


S-NPP wind at 00 UTC

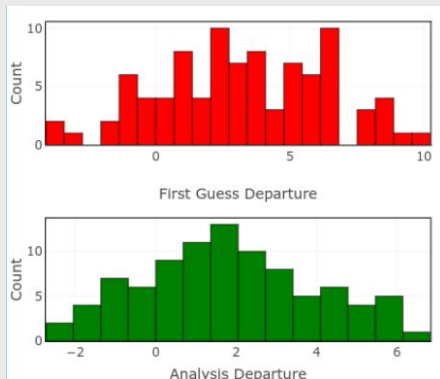


Data availability & diagnostics(1)

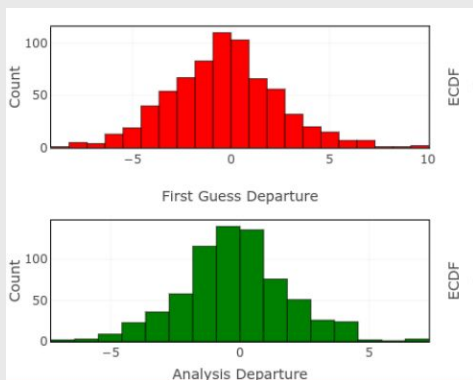
Metop C wind at 06 UTC



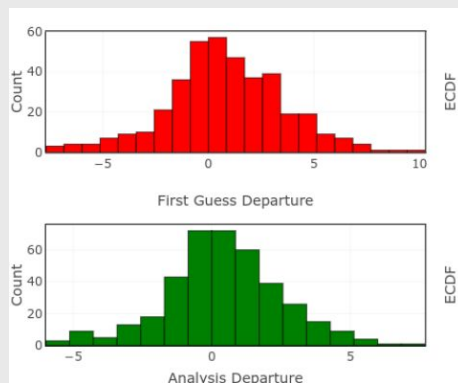
NOAA-20 wind at 15 UTC



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S-NPP wind at 00 UTC

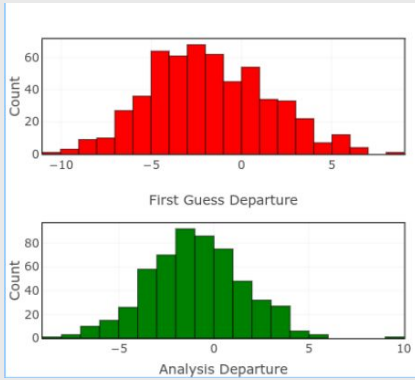


Assim times	Satellite			
	Metop B	Metop C	S-NPP	NOAA-20
00 UTC	X	X		
03 UTC	X	X		
06 UTC		X		
09 UTC				
12 UTC				
15 UTC			X	X
18 UTC			X	X
21 UTC	X	X	X	X

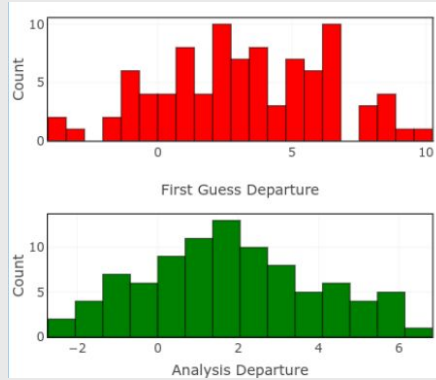
Blacklisting (x) small paths. Green active winds

Data availability & diagnostics(1)

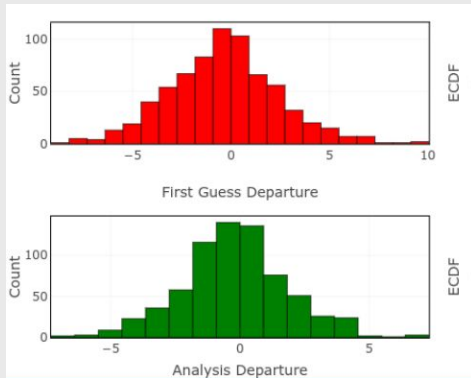
Metop C wind at 06 UTC



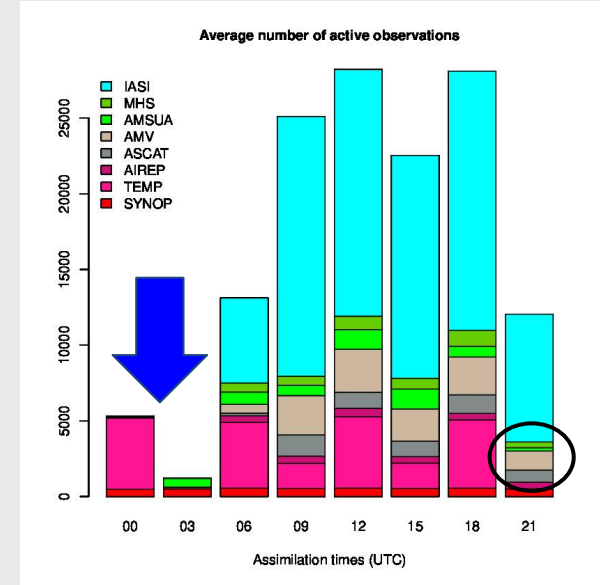
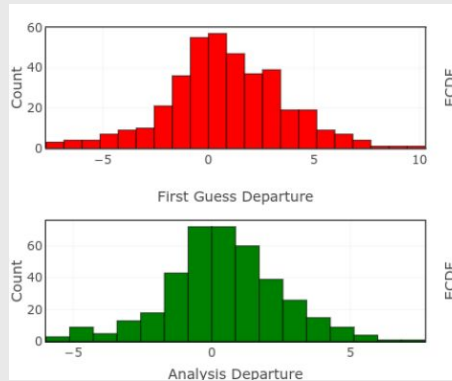
NOAA-20 wind at 15 UTC



Metop C wind at 09 UTC



S-NPP wind at 00 UTC



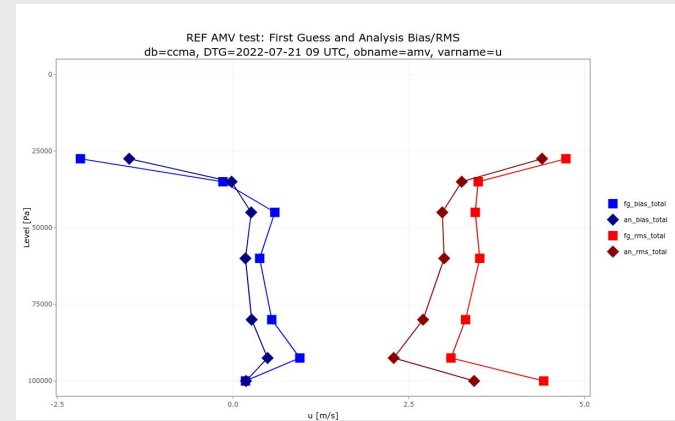
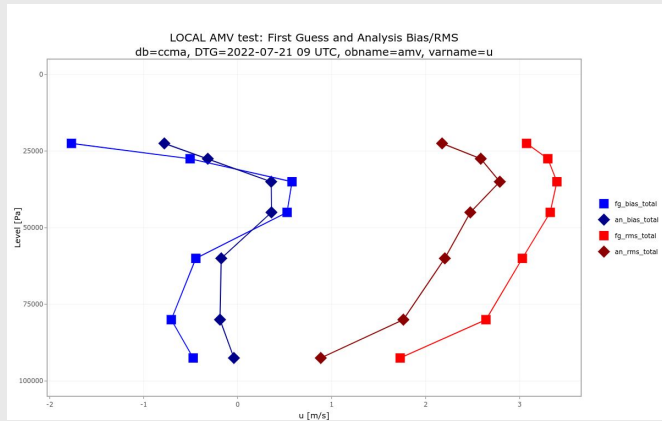
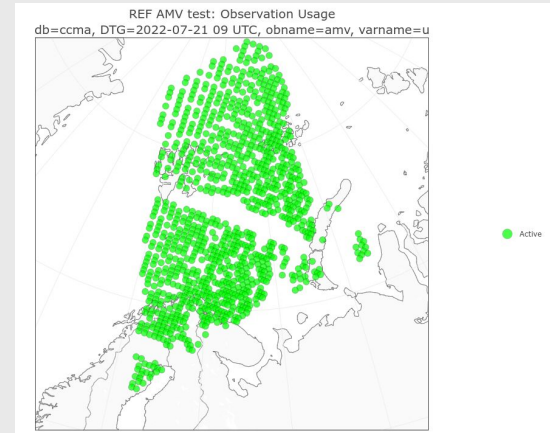
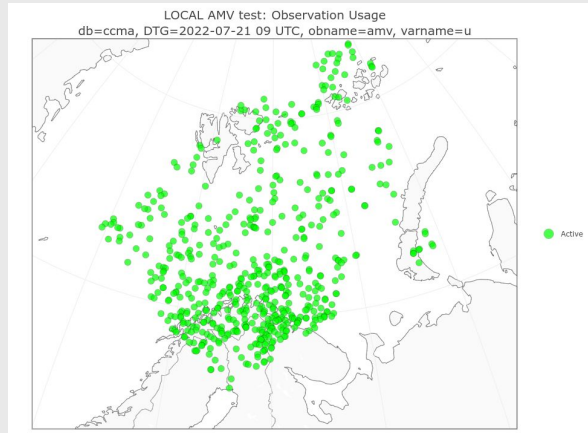
Data availability & diagnostics(2)

First-guess and analysis departures

Relatively low resolution

Dual Metop

Local wind



The performed experiments

Summer period 2022: Warming: 20 – 31 July; **Verif: 1 – 31 August**

LAMVREFS – All observations with the dual polar winds (operational option)

LAMVBLKS – All observations with the locally processed polar winds (blacklist applied, see prev. slide)

LAMVALLS – All observations with the locally processed polar winds (all avail. AMV)

LAMVRNOS – Run without polar winds

Winter period 2022: Warming: 20 – 30 November; **Verif: 1 – 31 December**

LAMVREFW – All observations with the dual polar winds (operational option)

LAMVBLKW – All observations with the locally processed polar winds (blacklist applied, see prev. slide)

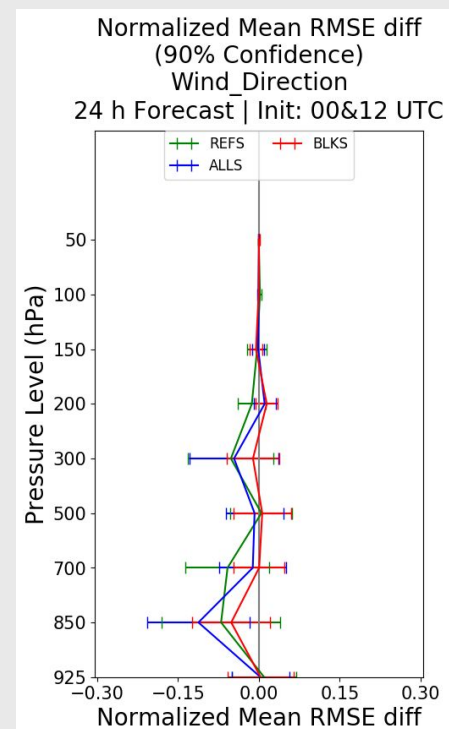
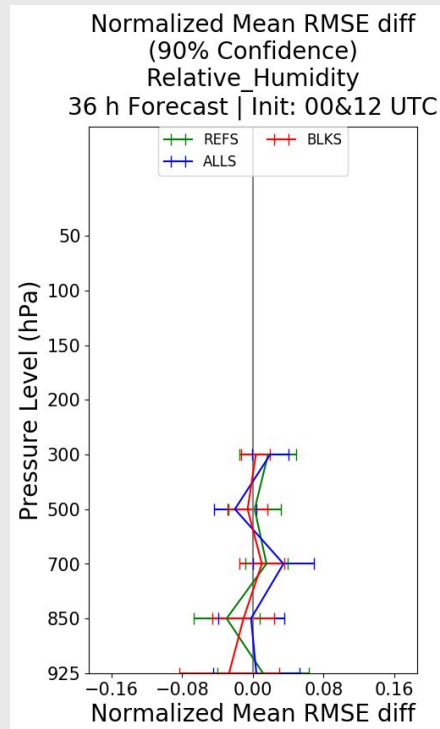
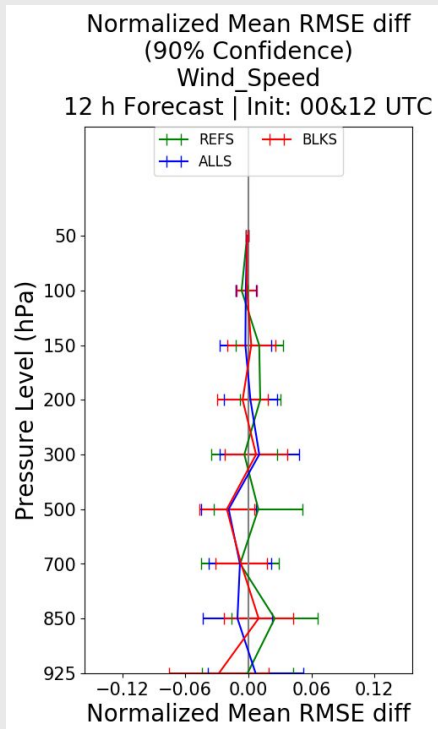
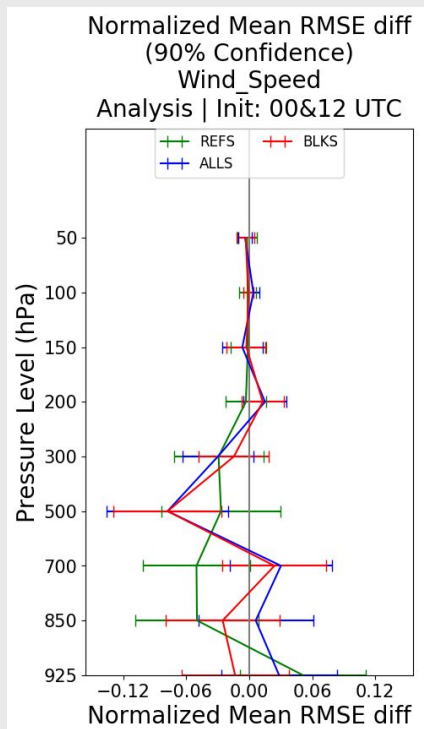
LAMVALLW – All observations with the locally processed polar winds (all avail. AMV)

LAMVRNOW – Run without polar winds

The performed experiments(1)

Summer case results

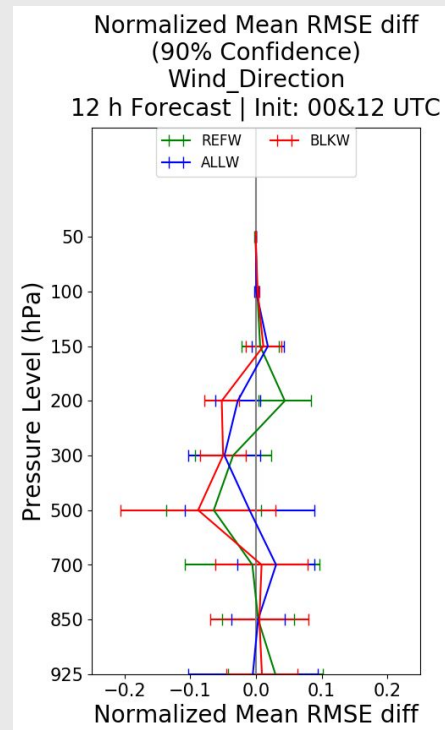
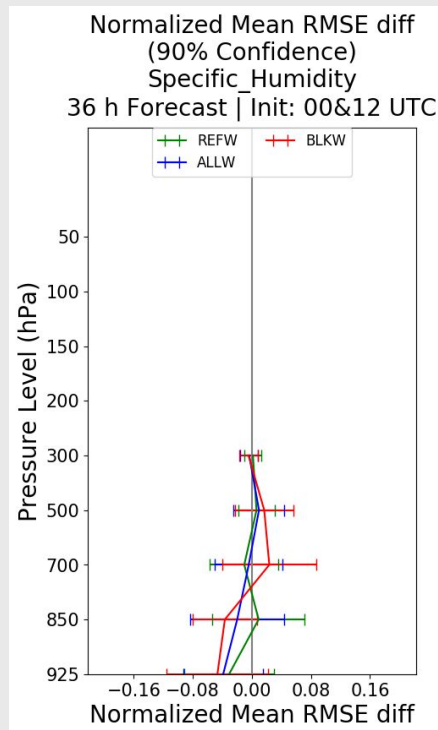
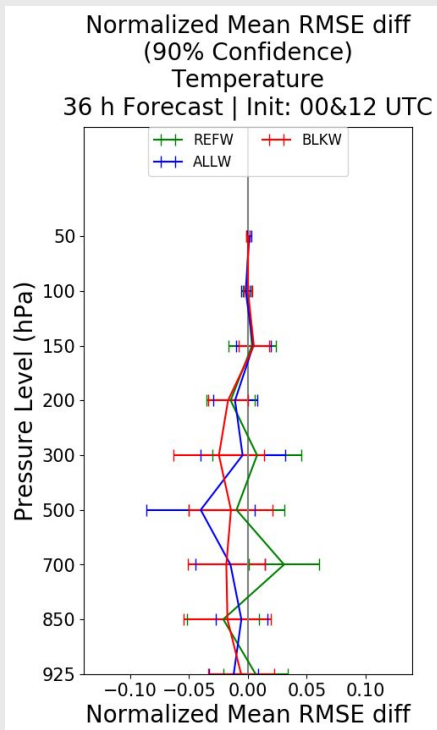
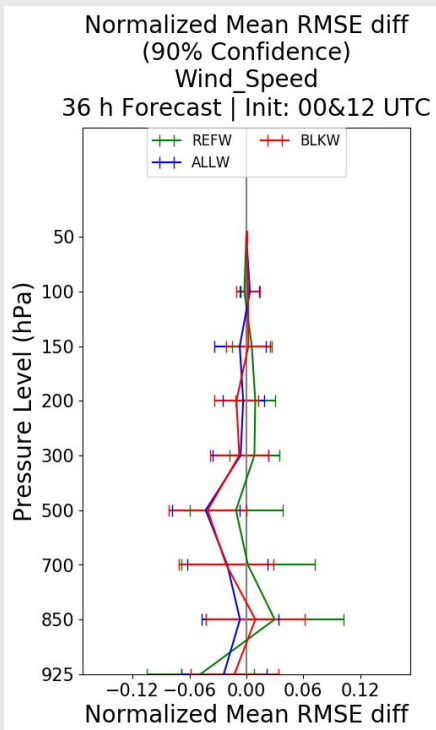
Green – Polar wind; Blue – All local wind; Red – Local with blacklist



The performed experiments(2)

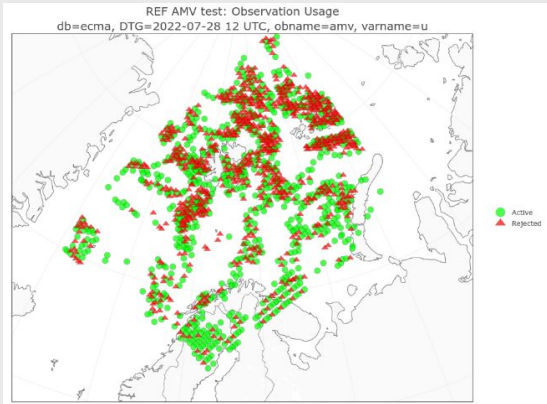
Winter case results

Green – Polar wind; Blue – All local wind; Red – Local with blacklist

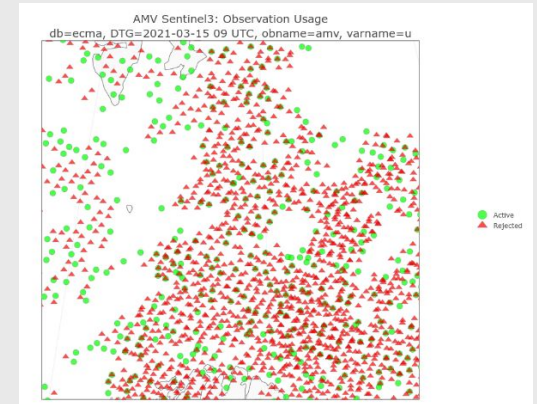


Sentinel 3 A&B AMV data

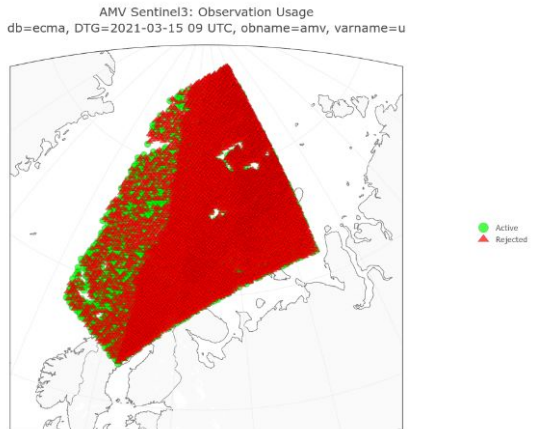
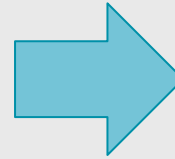
- We downloaded data for roughly more than one year (Dec. 2020 – Jan. 2022)
- The resolution of these is amazingly good



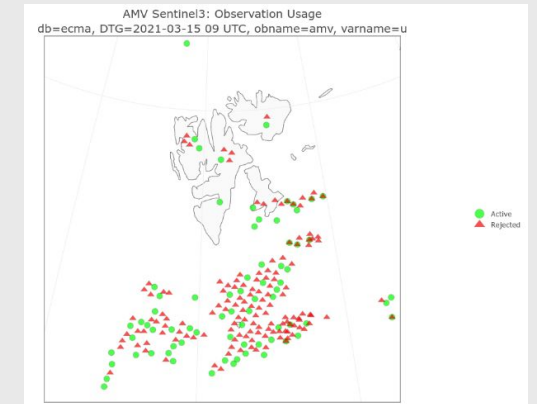
Oper wind



Zoom in Sentinel 3 wind

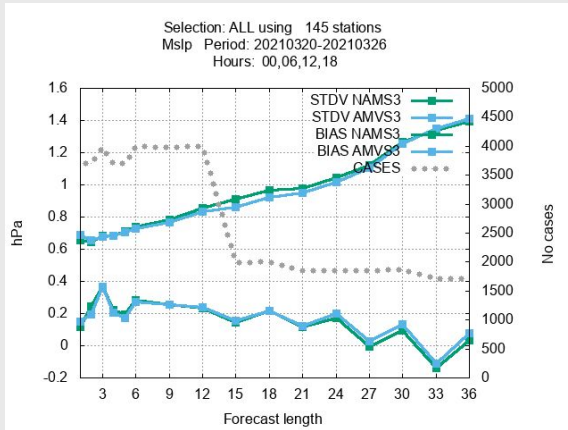


Sentinel 3 wind



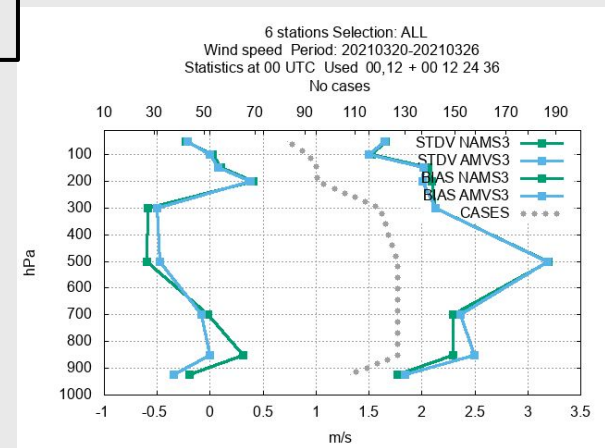
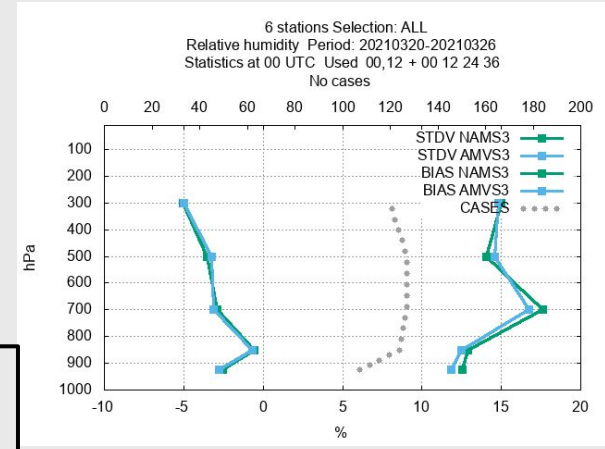
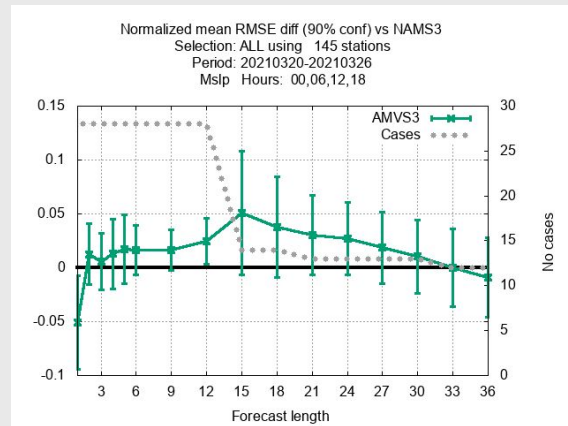
Sentinel 3 A&B AMV data

- Test run: Case in March 2021: Warming: 10 - 20 March; Verif: 20 - 26 March 2021
- Note: no tuning of DA was done!



➤ All in all, it's a very promising data

➤ Our DA system needs to be tuned



Concluding remarks

Locally produced winds:

- A solution was found to process locally more polar winds.
- HRW version v7.Q, inside PPS software package v2021.3 was suggested by Javier G Pereda to produce higher resolution winds.
- Blacklisting of small paths provides accurate analyses and forecasts.
- The locally produced winds provide similar impact to those produced by EUMETSAT.
- Not yet tested, but for operational application, adding the locally produced winds on top of the dual winds can further improve the positive impacts.

Sentinel 3 (A&B) AMV:

- Very high resolution winds.
- Promising observations for hectometric NWP models.
- Our DA system needs to be tuned to properly assimilate these data.

Thank you for your attention