

Use of locally processed polar winds in Arome-Arctic

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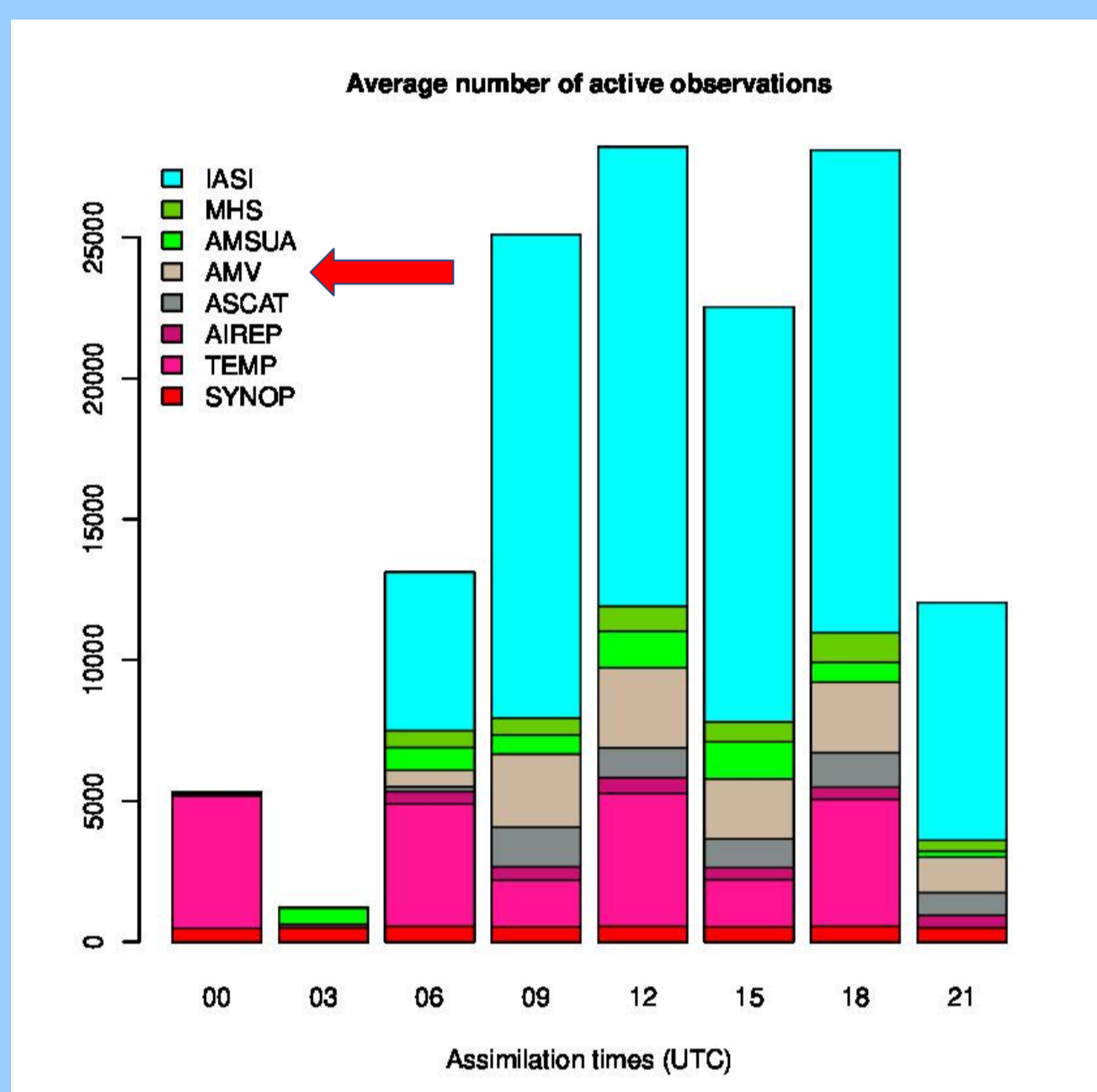
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MOTIVATION

- In the framework of the SAWIRA 1 & 2 project at Met Norway, we studied the availability of the processed atmospheric motion vector winds derived from either geostationary or polar orbiting satellites.
- While the timeliness of the geostationary based winds was found to be short and therefore meets well the operational requirements, only that of the dual polar winds based on the Metop satellites fits into the cut-off of the AROME-Arctic data assimilation. This means that over the Arctic no wind data is accessible from 00 to 06 UTC assimilation times.
- At Met Norway, we have been looking for a solution to process within a reasonable cut-off time the winds derived from US satellites. This became possible from last year thanks to the NWC/PPS-HRW v7.P processing package developed in the framework of the SAF nowcasting.

AVAILABILITY OF OBSERVATIONS

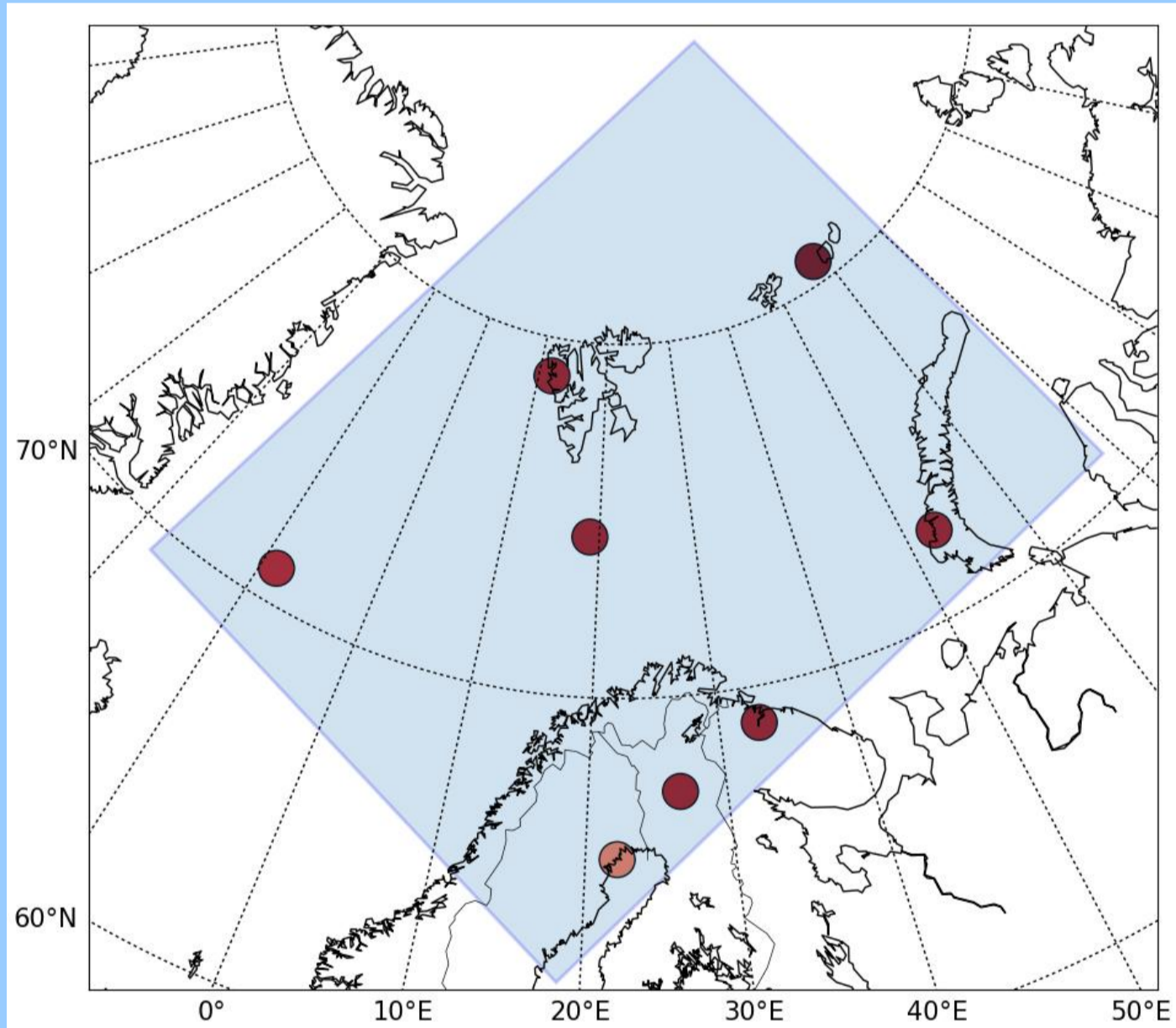


Assim times	Satellite			
	Metop B	Metop C	JPSS-0	NOAA-20
00 UTC	X	X		
03 UTC	X	X		
06 UTC		X		
09 UTC				
12 UTC				
15 UTC			X	X
18 UTC			X	X
21 UTC	X	X	X	X

Table 1: Use of the locally proceed AMV: Active (green) and blacklisted (X)

Ten-day averaged number of active observations

The AROME-Arctic model



System setup: Harmonie cycle 43h2.2.1
Domain: 750x960 grid points;
Horizontal resolution: 2.5 km;
Model level definition: 65 level;
Non-hydrostatic dynamic;
Physics: Harmonie-Arome;
Assimilation strategy: 3-hourly cycling;
Lateral boundary conditions: hourly ECMWF;
Surface data assimilation: Optimum interpolation;
Upper-air data assimilation: 3D-VAR; Background error statistics computed as mean over 4 seasons.
Observations: Surface (SYNOP, DRIBU), Radiosondes, Aircraft, AMV (polar winds), ASCAT winds, ATOVS (AMSU-A, MHS), ATMS, MWH-2, and IASI.

The Arome-Arctic domain with the location of radiosonde observations

THE PERFORMED EXPERIMENTS

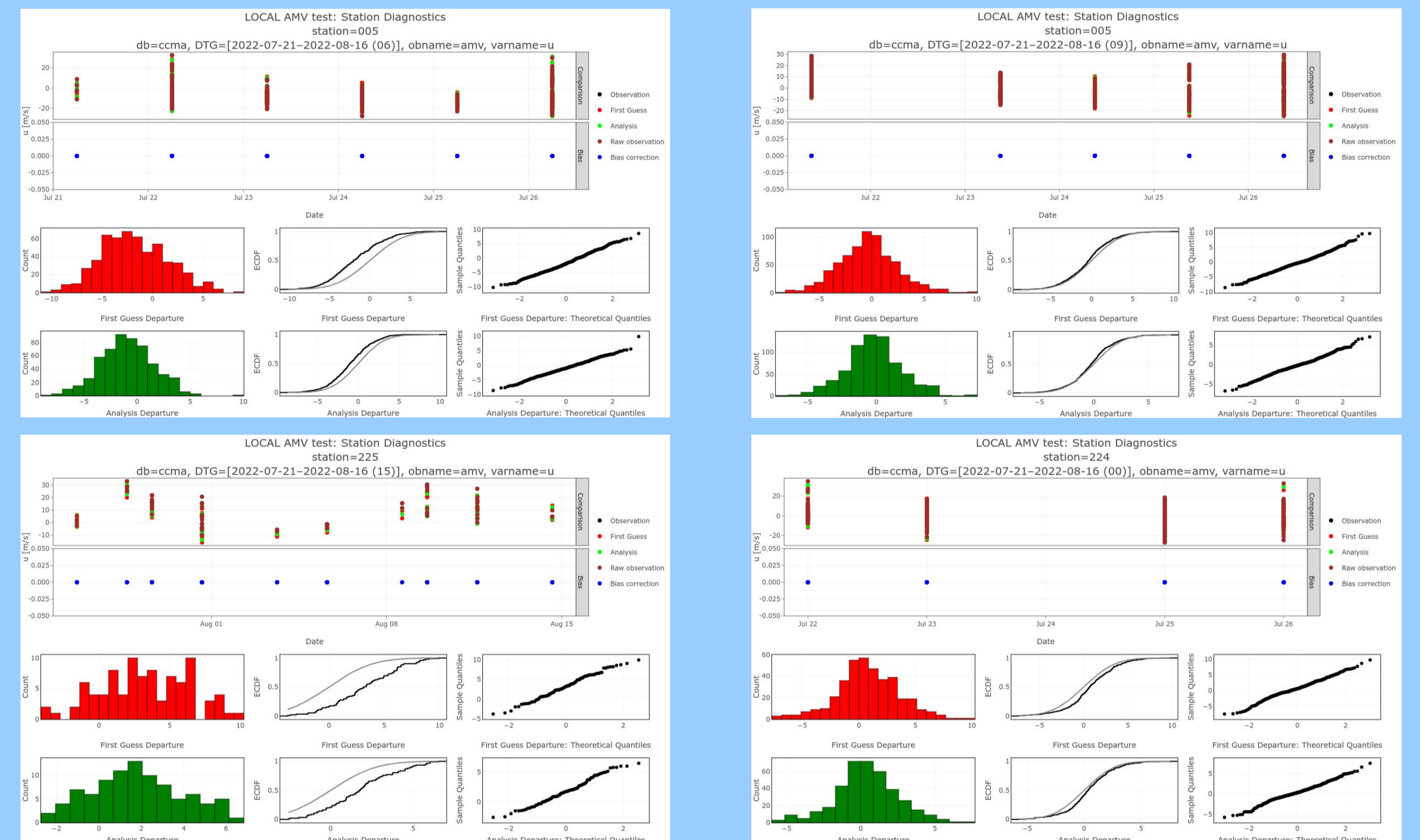
Summer period 2022: Warming: 20 – 31 July; Verif: 1 – 31 August

- LAMVREFS – All observations with the dual polar winds (operational option)
- LAMVBLKS – All observations with the locally processed polar winds (blacklist applied, see tab 1)
- 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 tab 1)
- LAMVALLW – All observations with the locally processed polar winds (all avail. AMV)
- LAMVRNOW – Run without polar winds

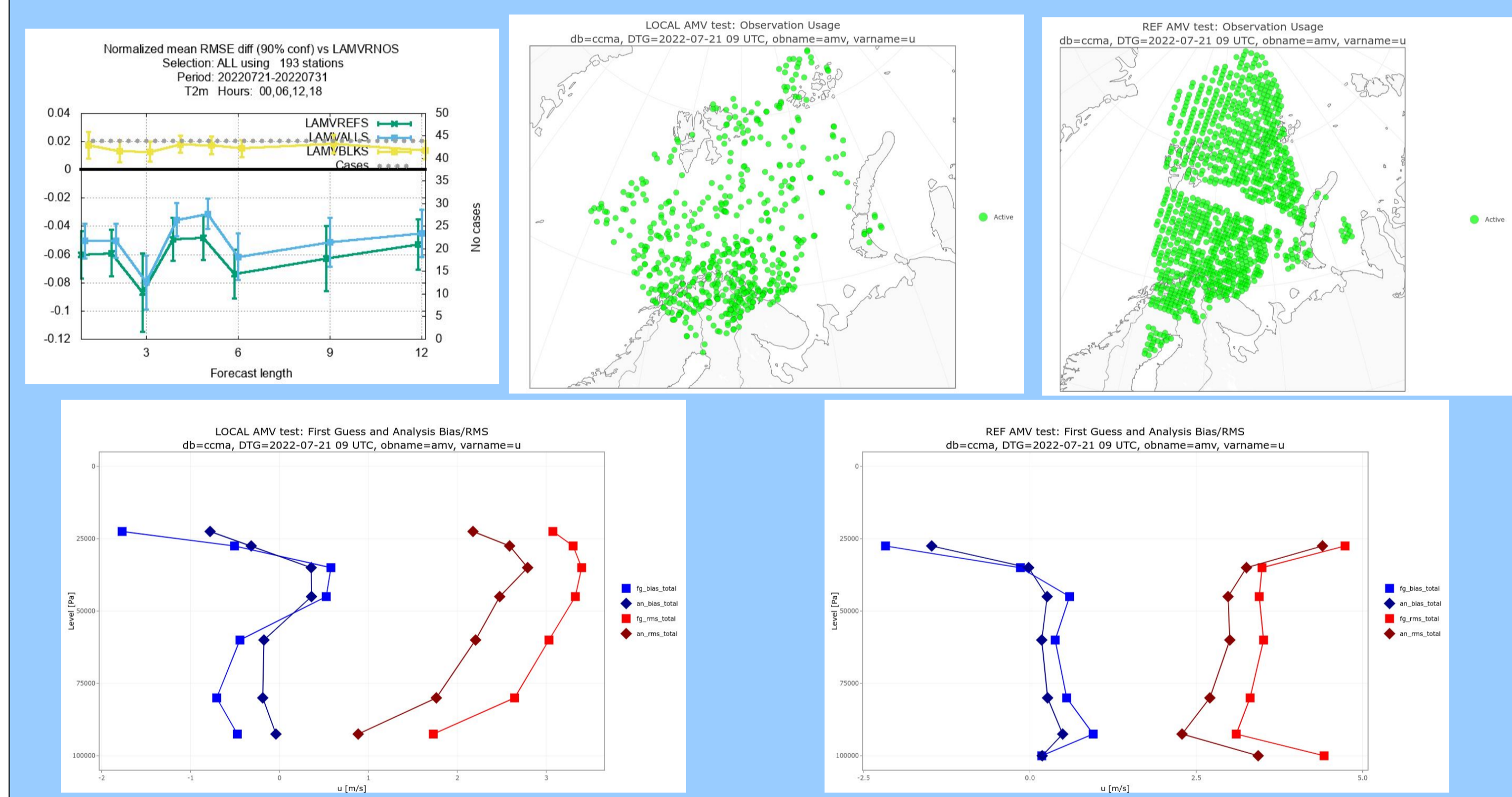
POLAR WINDS DIAGNOSTICS



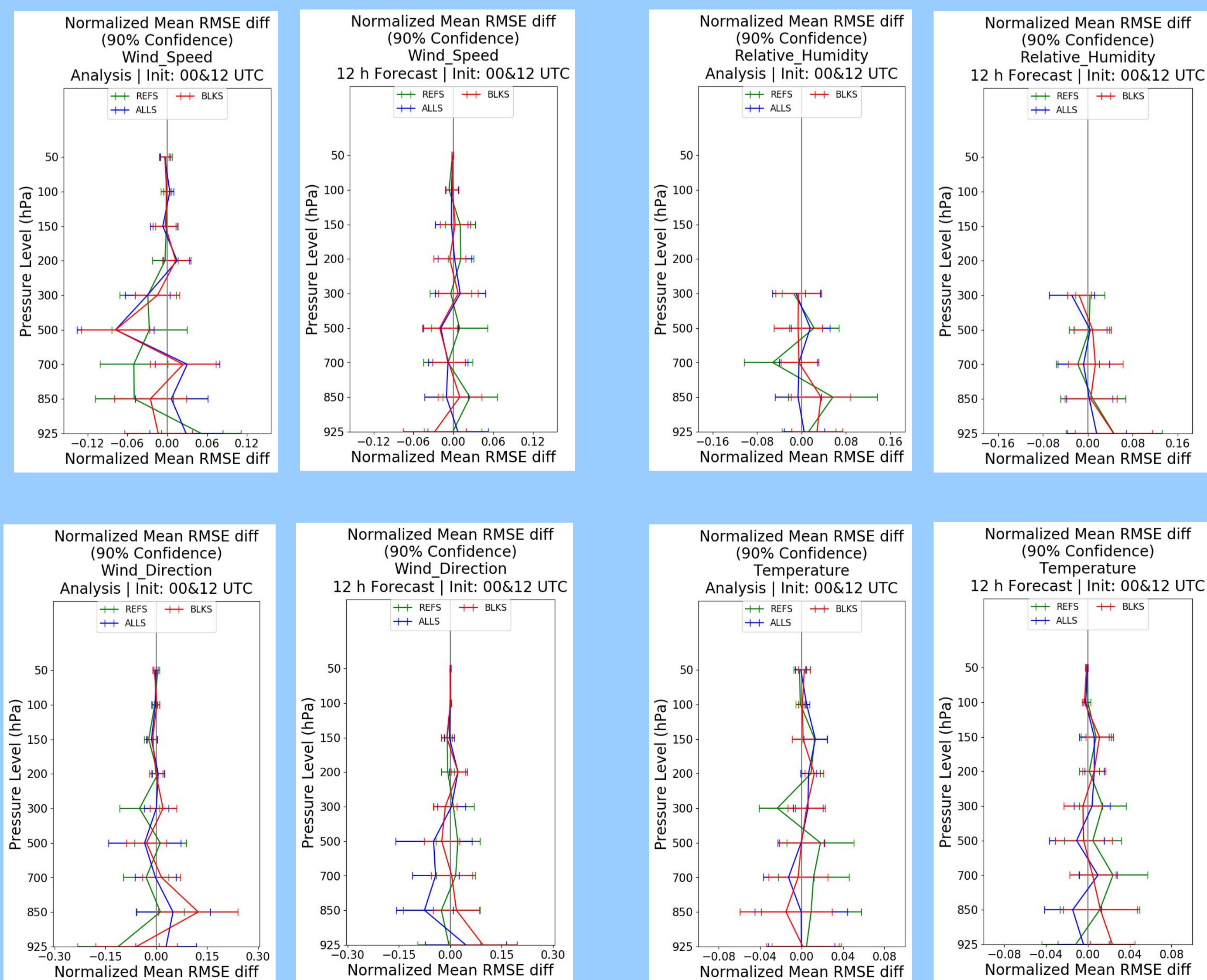
Examples of blacklisted paths

Examples of selected (active) paths

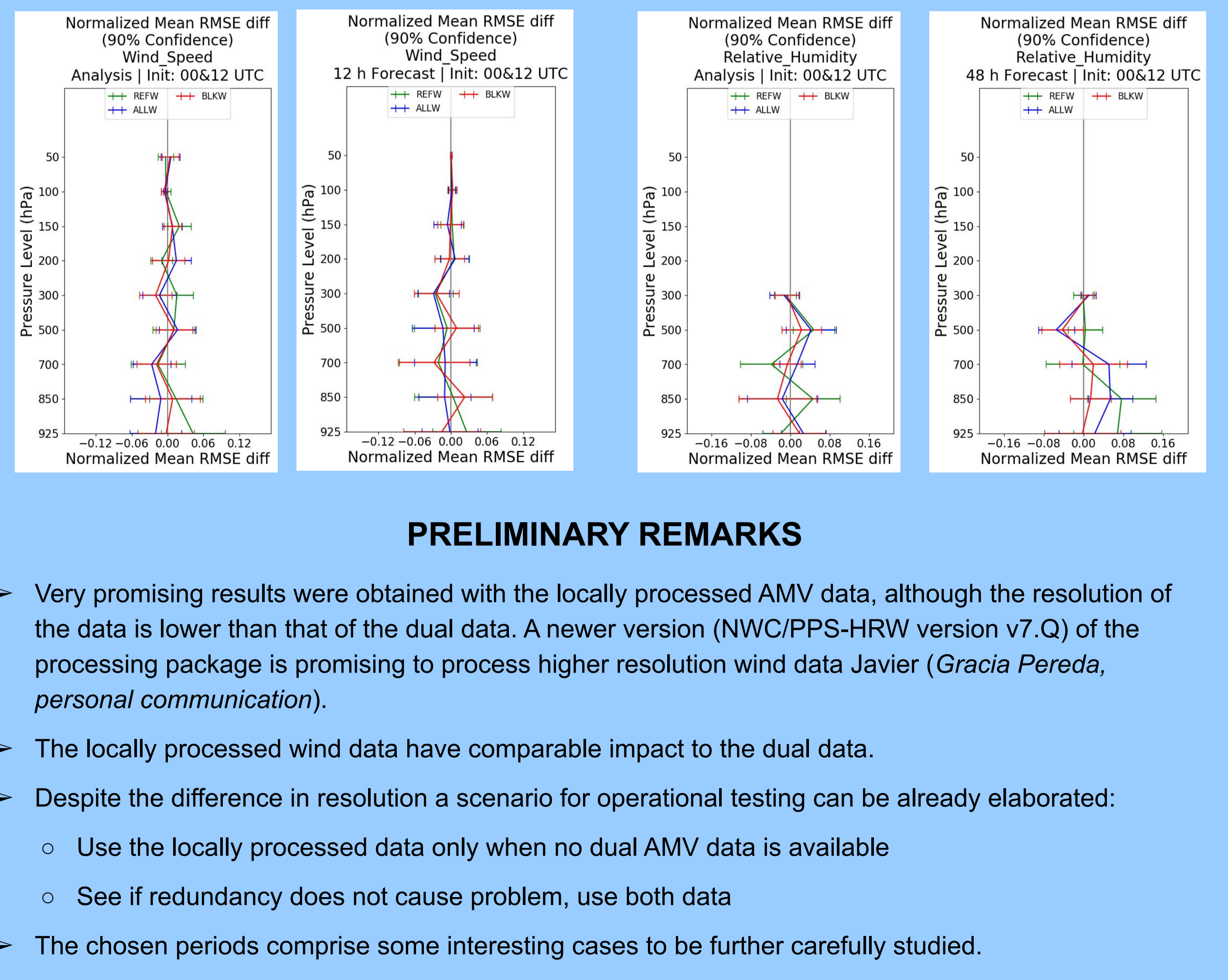
SOME OBSERVED FEATURES



RELATIVE IMPACT OF DUAL AND LOCALLY PROCESSED WINDS SUMMER PERIOD



IMPACT OF DUAL WINDS vs LOCALLY PROCESSED WINDS WINTER PERIOD



PRELIMINARY REMARKS

- Very promising results were obtained with the locally processed AMV data, although the resolution of the data is lower than that of the dual data. A newer version (NWC/PPS-HRW version v7.Q) of the processing package is promising to process higher resolution wind data Javier (*Gracia Pereda, personal communication*).
- The locally processed wind data have comparable impact to the dual data.
- Despite the difference in resolution a scenario for operational testing can be already elaborated:
 - Use the locally processed data only when no dual AMV data is available
 - See if redundancy does not cause problem, use both data
- The chosen periods comprise some interesting cases to be further carefully studied.