Norwegian Meteorological Institute

Assessment and use of AMV at MET Norway

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outline

- Experimental AROME models

- Access to the (Geo and Polar) AMV data at MET Norway

- Impact study
  - Sensitivity of the analyses to observations – case of Geo winds
  - Impact on short-range forecasts

- Concluding remarks

Experimental model setup for AROME-Arctic and AROME-MetCoOp

– **System setup: (**Harmonie cycle 38h1.1)

– **Domain:** 750x960 grid points; **Horizontal resolution:** 2.5 km;

– **Model level definition:** 65 level (up to 10 hPa); Non-hydrostatic dynamic;

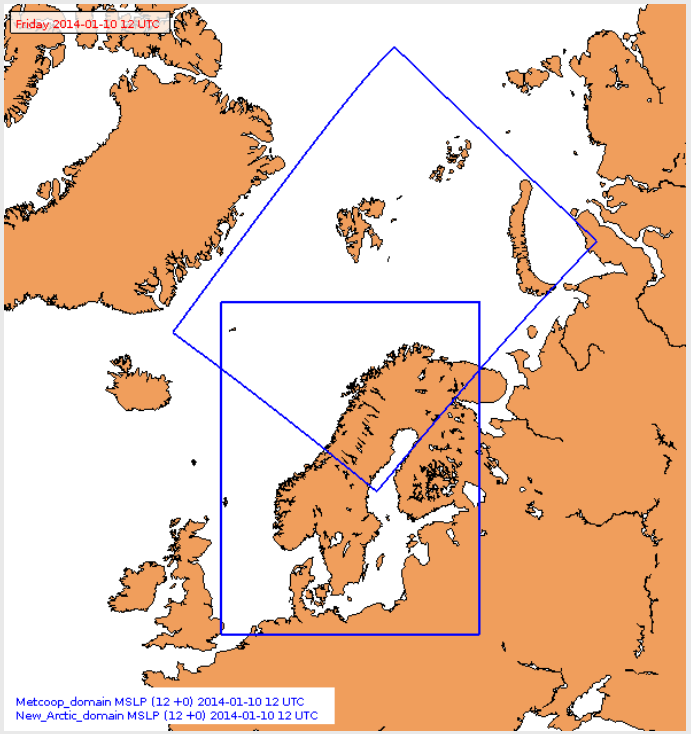
– **Physical parametrisation:** AROME/mezo-NH;

– **Assimilation strategy:** 3-hourly cycling; **Surface:** OI; **Upper-air:** 3D-VAR

– **Observations:** Surface, Aircraft, Radiosonde, AMSU-A, AMSU-B/MHS

– **Lateral boundary conditions:** hourly ECMWF;

Model domains



Experimental model setup
Use of observations

Conventional observations: Surface, Radiosondes, Aircraft
Radiances assimilation:
– AMSU-A : Channels 5 -10;
– AMSU-B/MHS: Channels 3 - 5;
– IASI : 65 Active channels
38, 51, 63, 85, 87, 104, 109, 167, 173, 180, 185, 193, 199, 205, 207, 212, 224, 230, 236, 239, 242, 243, 249, 252, 265, 275, 294, 296, 306, 333, 337, 345, 352, 386, 389, 432, 2701, 2819, 2910, 2919, 2991, 2993, 3002, 3008, 3014, 3027, 3069, 3087, 3098, 3207, 3228, 3281, 3309, 3322, 3339, 3438, 3442, 3484, 3491, 3499, 3506, 3575, 3582, 3658, 4032

AMV data: Geo MPEF and HRW AMVs;
Polar AMVs

Where HRW are produced locally using SAF-NWC package and Hungarian configuration (Maria Putsay and Máté Mile)

Getting the Atmospheric Motion Vectors data

– **Geo AMV:** MPEF – through EUMETCast

HRW AMV – produced locally using SAF-NWC package and Hungarian configuration (Maria Putsay and Máté Mile)

The main characteristics of the HRW product are the following:

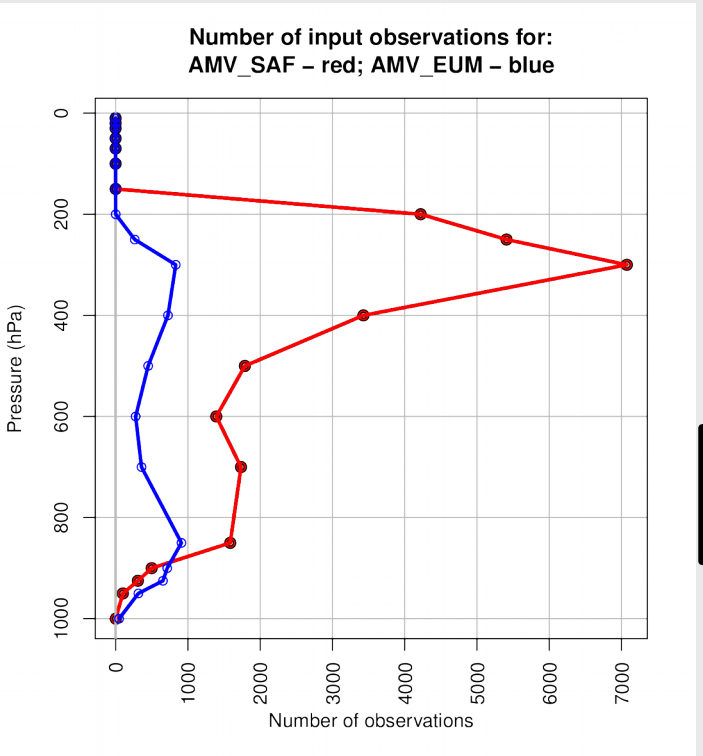
BUFR format for data assimilation: EUM

Output filtering QI_THRESHOLD = 70%

Channels used for AMV retrieval: HRVIS, VIS08, IR108, WV062, WV073

Without using wind guess information WIND_GUESS = 0

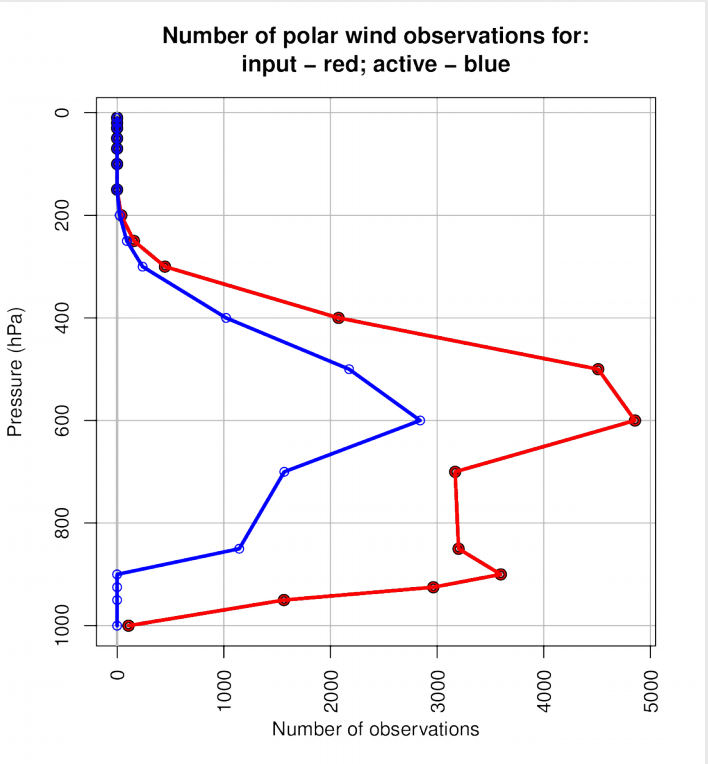
– **Polar AMV:** through EUMETCast



Number of available MPEF and HRW

Number of available and active Polar Wind

10 days statistics



Assimilation of the AMVs at MET Norway

The following experiments were conducted:

<u>For Geo winds:</u>

AMV_EUM – experiment using geo wind from EUMETSAT and tested in AROME-MetCoOp;

AMV_SAF – experiment using locally produced geowind and tested in AROME-MetCoOp;

AMV_SAF1 – experiment using locally produced geowind and tested in AROME-MetCoOp;

AMV_NOW – reference experiment (no geo wind) for the MetCoOp test runs;

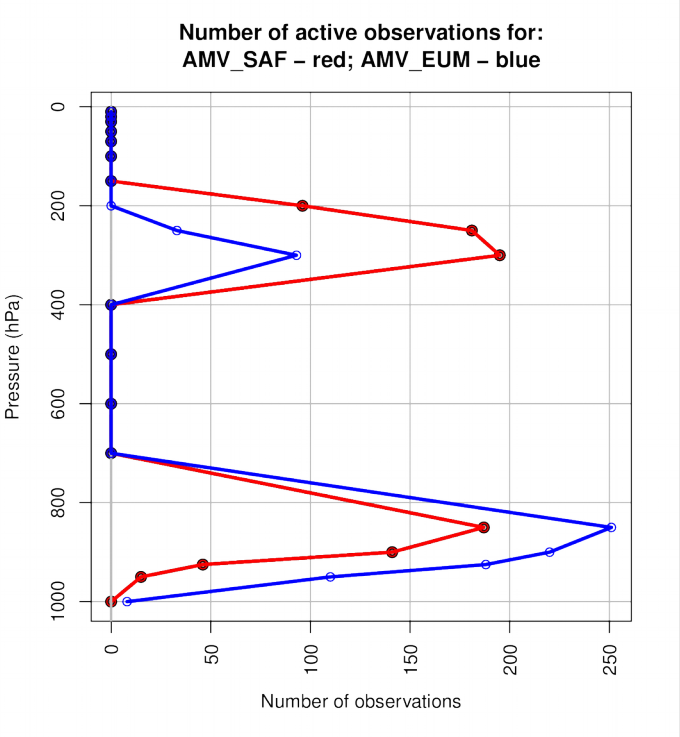
<u>For Polar winds:</u>

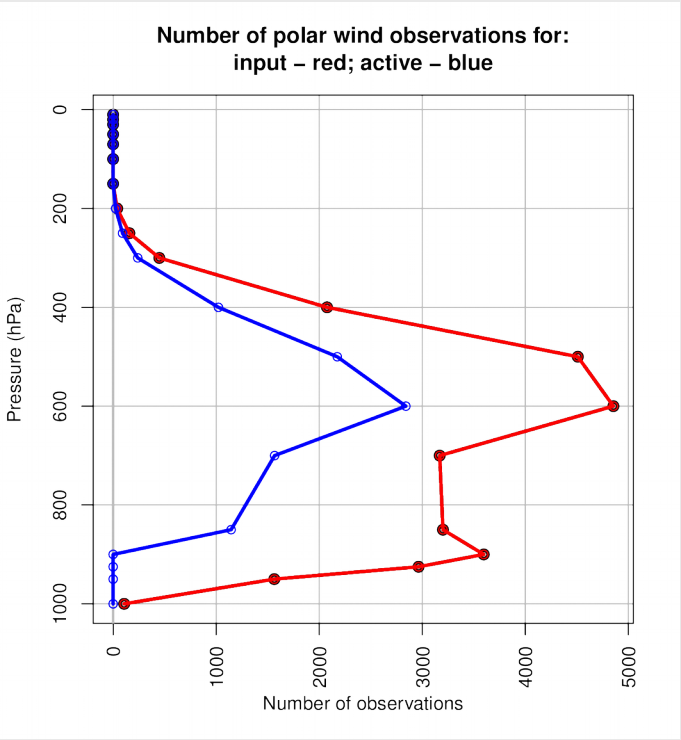
AMV_2ME – experiment using polar winds and tested in AROME-Arctic;

AMV_ANO – reference experiment (no polar winds) for the Arctic test run.

	Geowinds from EUMETSAT (retrieval technique used)	Locally produced geowinds (retrieval technique used)	Polar winds (retrieval technique used)
00 UTC	IR108, WV062, WV073	IR108, *WV062, WV073* IR108, *WV062, WV073*	IR
03 UTC	IR108, WV062, WV073	IR108, *WV062, WV073* IR108, *WV062, WV073*	IR
06 UTC	HRVIS, VIS08, IR108, WV062, WV073	*HRVIS, VIS08,* IR108, *WV062, WV073* HRVIS, VIS08, IR108, *WV062, WV073*	IR
09 UTC	HRVIS, VIS08, IR108, WV062, WV073	*HRVIS, VIS08,* IR108, *WV062, WV073* HRVIS, VIS08, IR108, *WV062, WV073*	IR
12 UTC	HRVIS, VIS08, IR108, WV062, WV073	*HRVIS, VIS08,* IR108, *WV062, WV073* HRVIS, VIS08, IR108, *WV062, WV073*	IR
15 UTC	HRVIS, VIS08, IR108, WV062, WV073	*HRVIS, VIS08,* IR108, *WV062, WV073* HRVIS, VIS08, IR108, *WV062, WV073*	IR
18 UTC	HRVIS, IR108, WV062, WV073	*HRVIS, VIS08,* IR108, *WV062, WV073* HRVIS, VIS08, IR108, *WV062, WV073*	IR
21 UTC	HRVIS, IR108, WV062, WV073	IR108, *WV062, WV073* IR108, *WV062, WV073*	IR

Use of the AMV in the analyses





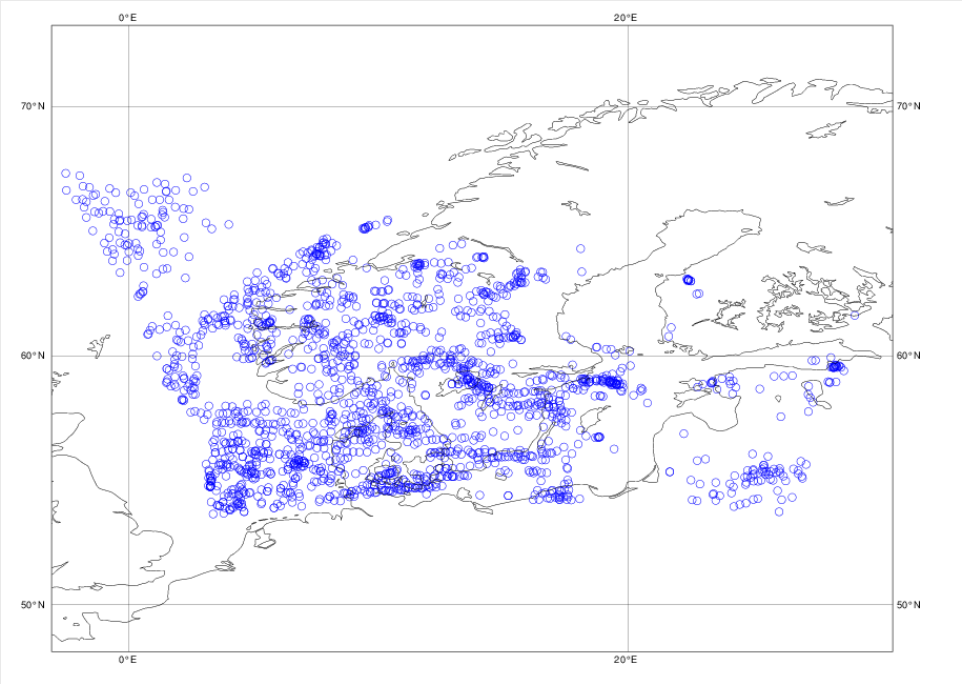
Geo Winds

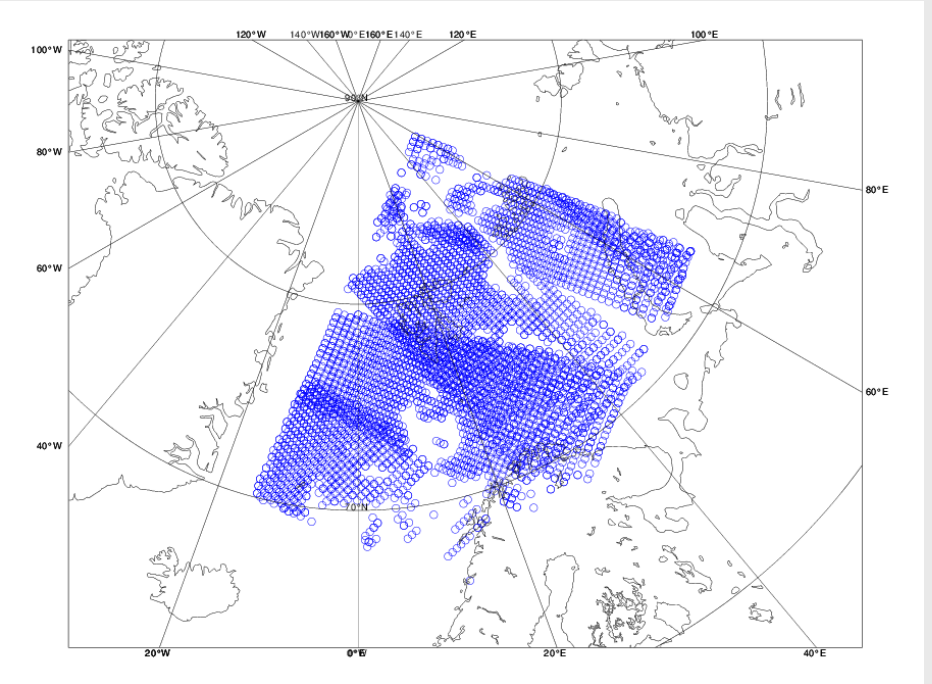
650 – MPEF
870 – HRW

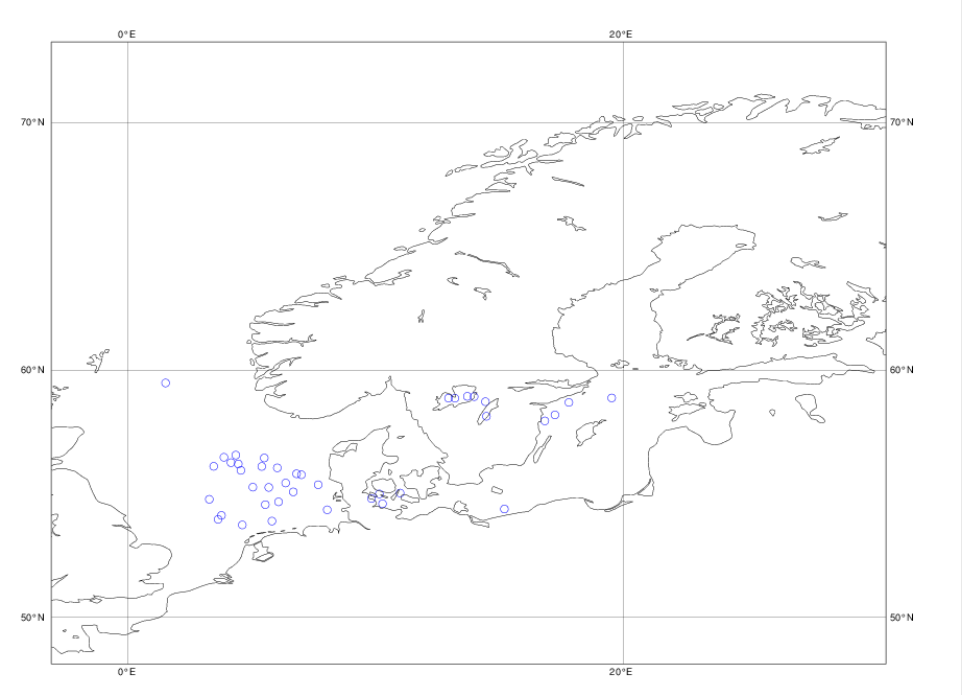
Polar Winds

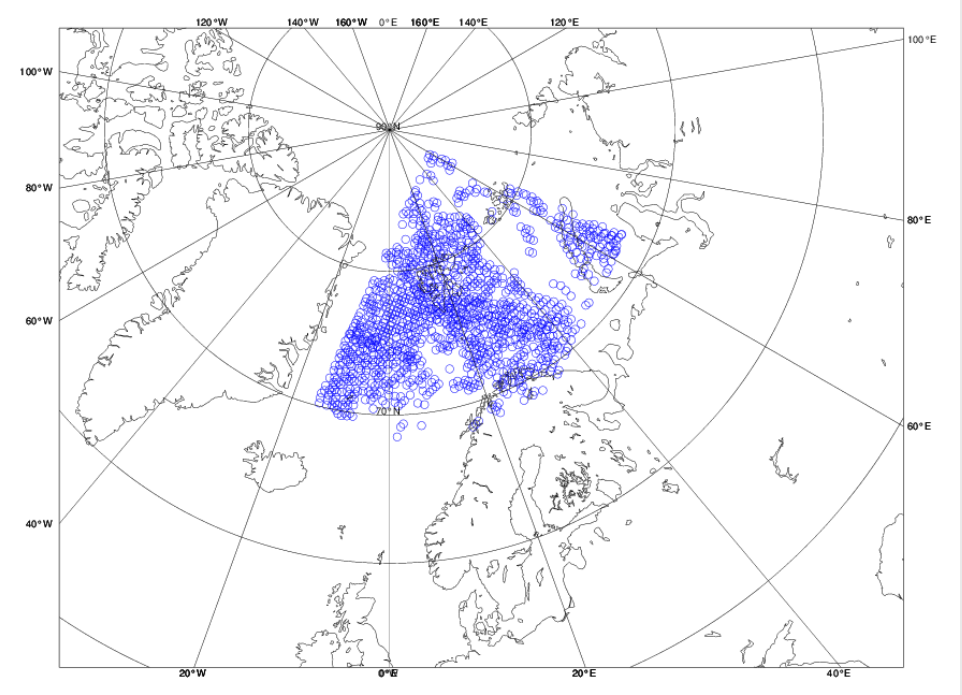
8750 – Polar wind

Availability of AMV data: 2015.09.10 12UTC

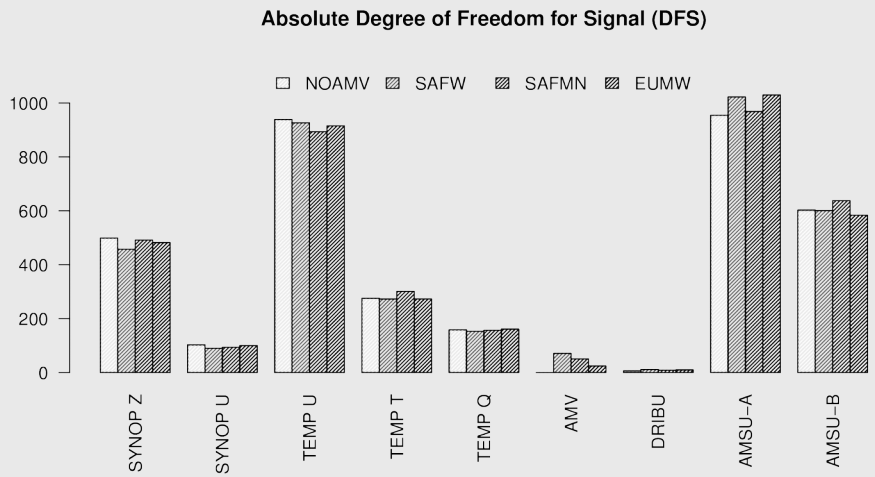


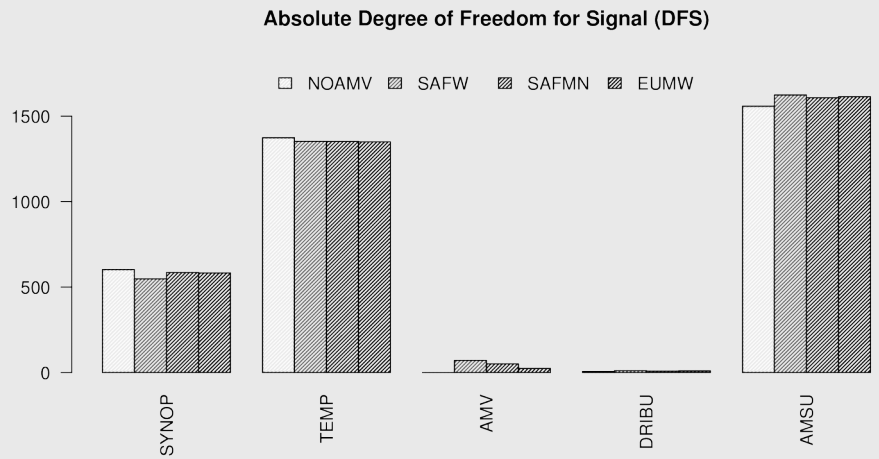


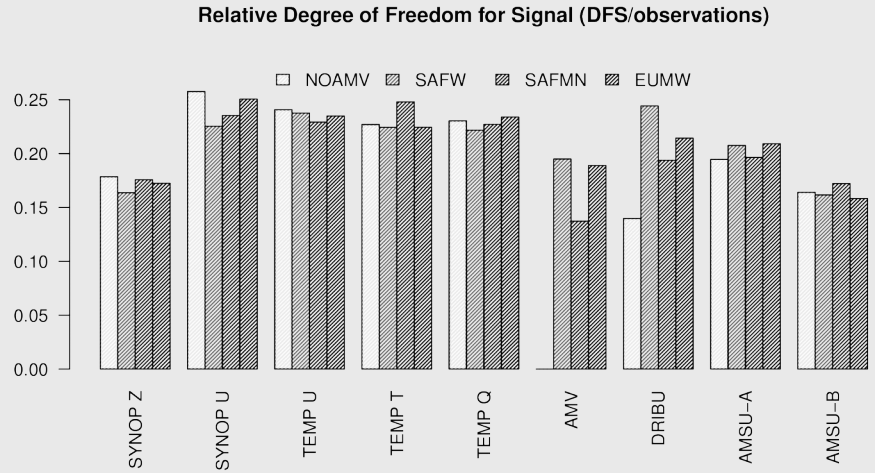


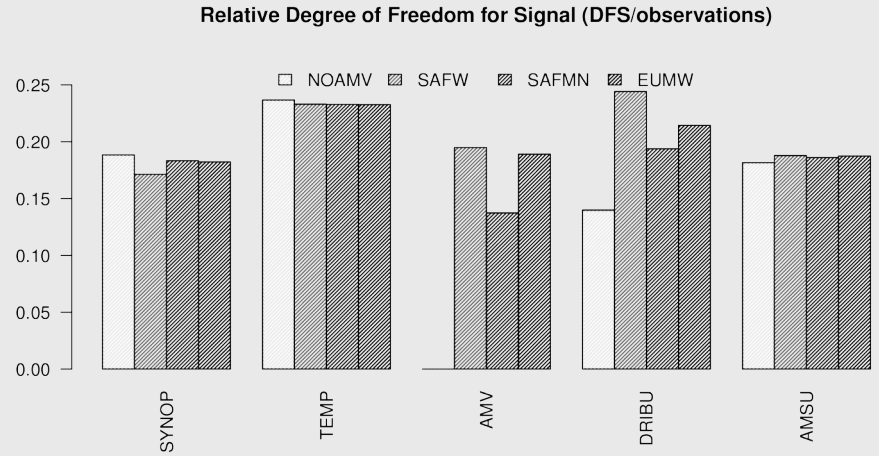


Sensitivity of analysis to observations – DFS









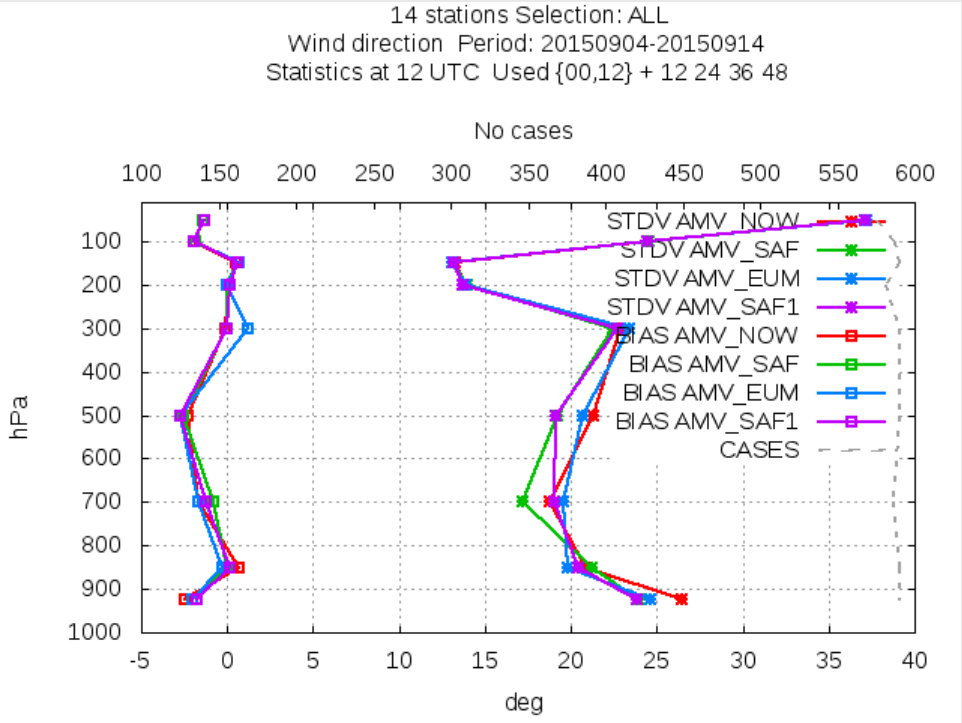
NOANV – No AMV;
SAFW – version of SAF AMV;
SAFWN – Version of SAF AMV;
EUMW – MPEF AMV

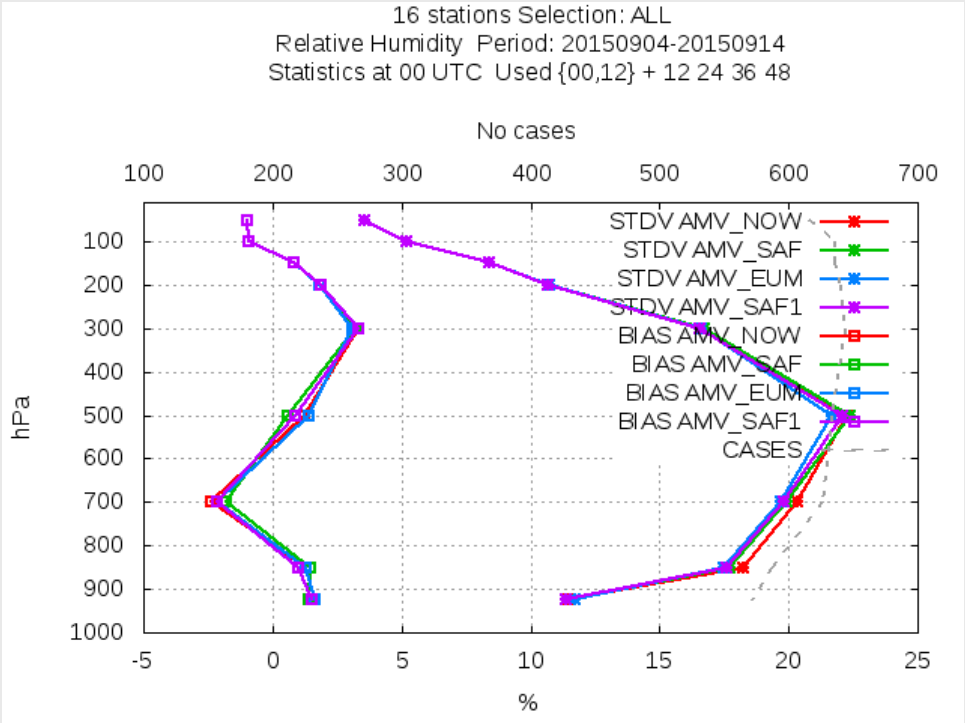
Impact of AMV on forecasts

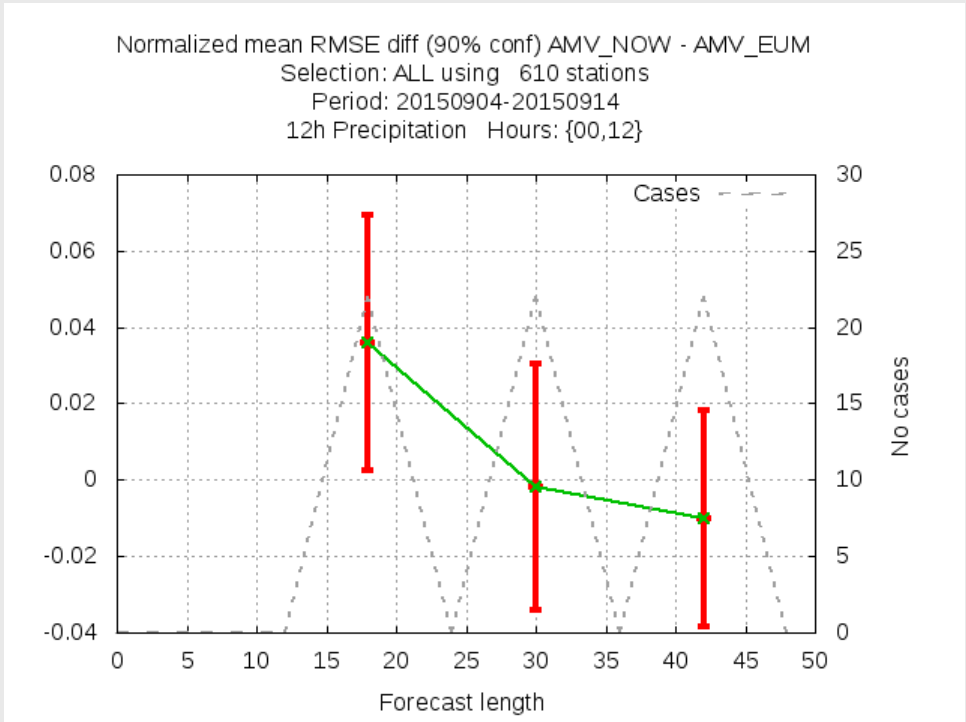
01 – 14 September 2015

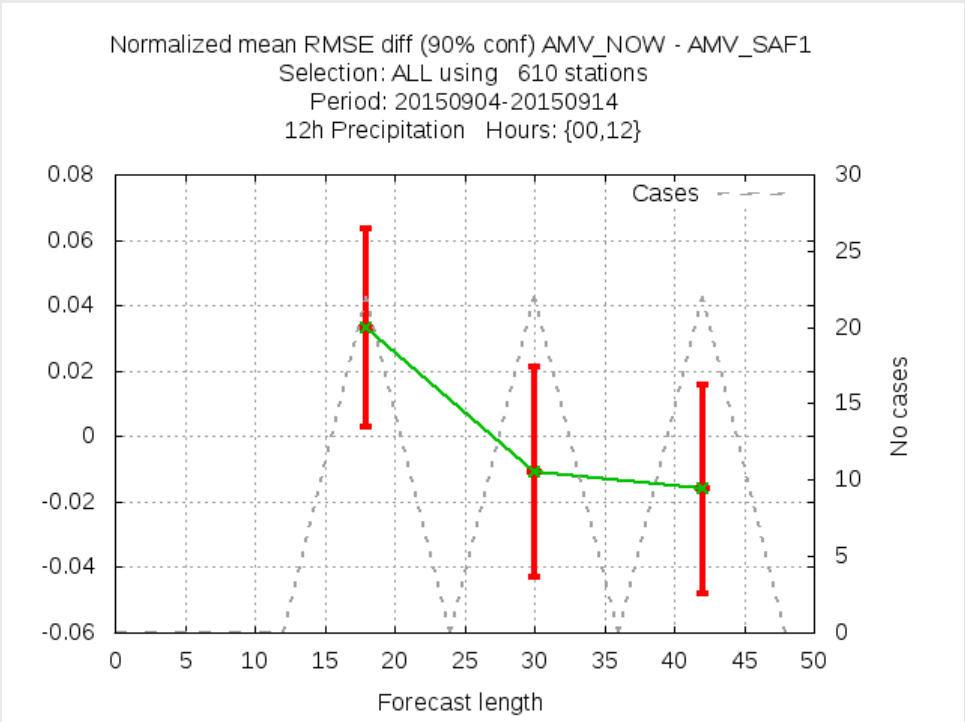
Verification against observation
04 – 14 September 2015

Impact of Geo winds on forecasts

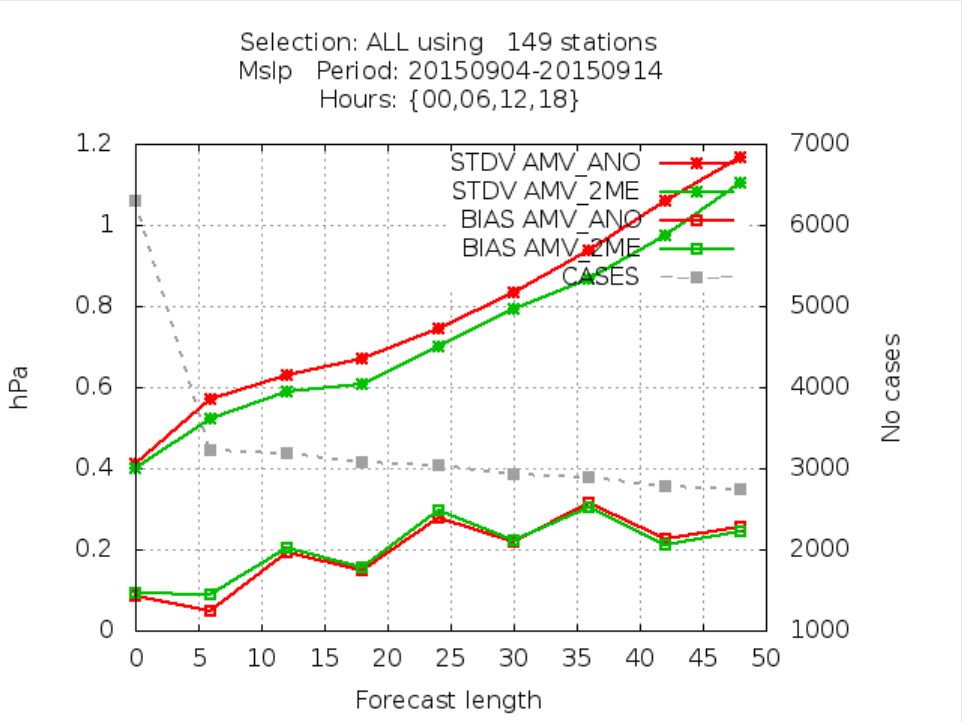


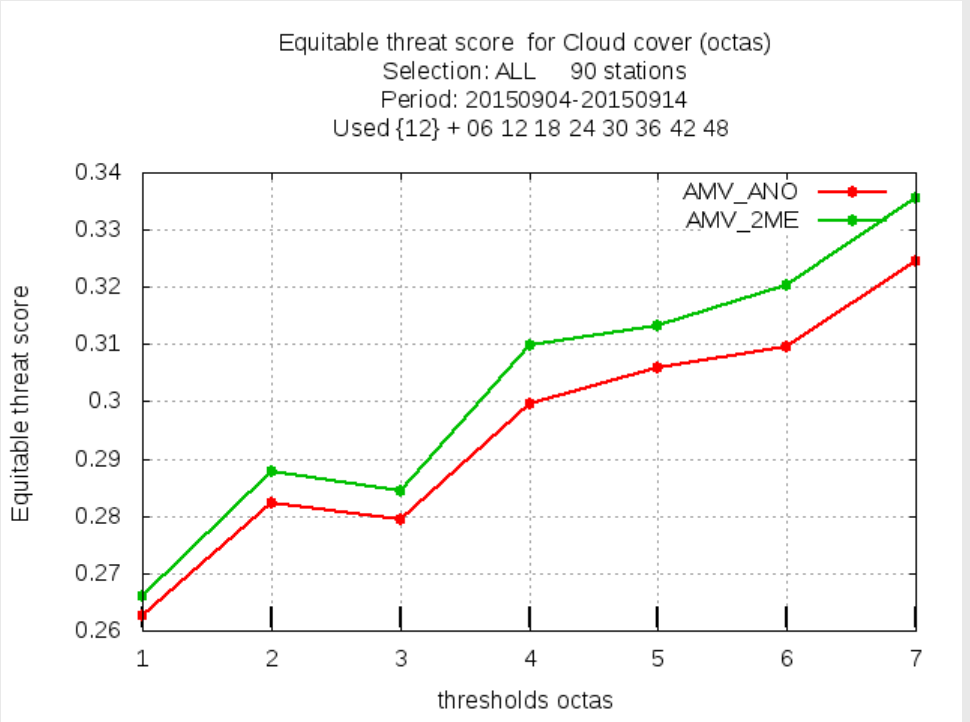


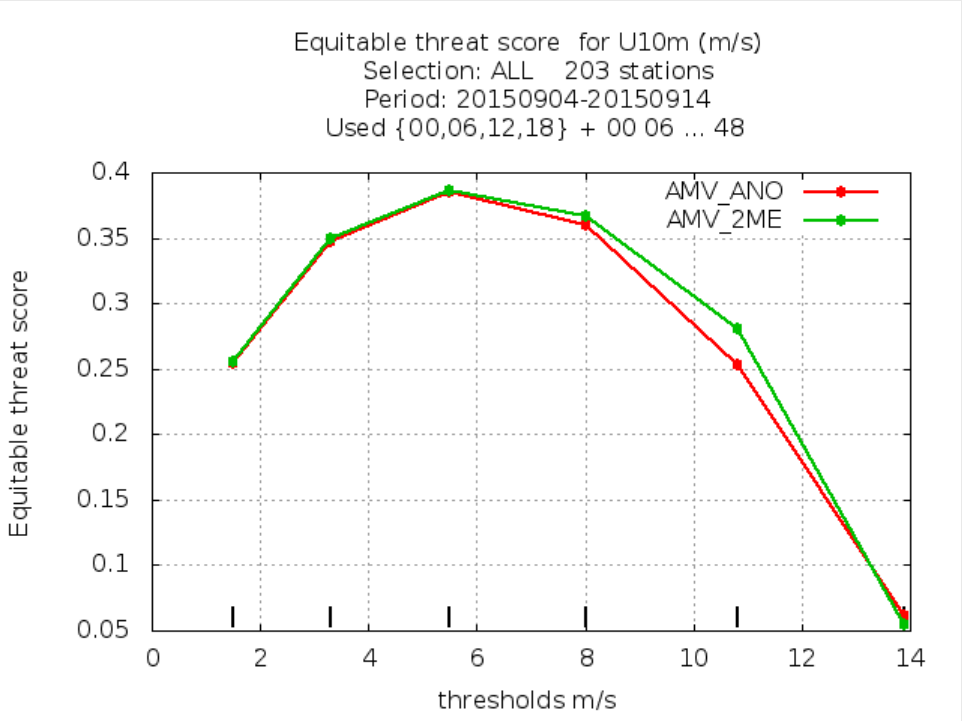


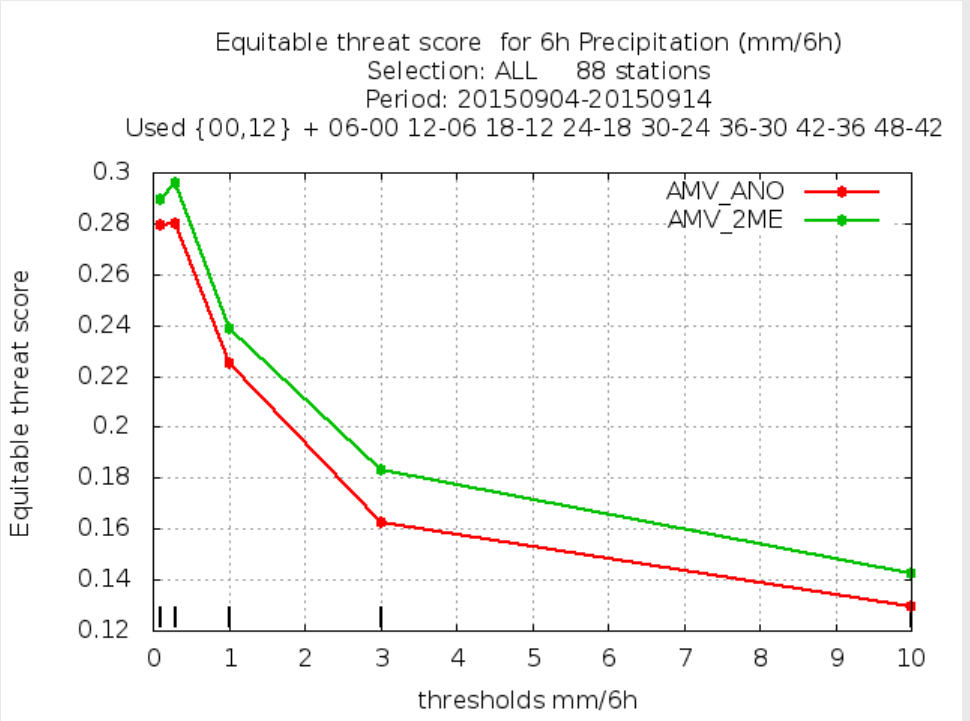


Impact of Polar winds on forecasts









Access to AMV data at MET Norway
What we need to have these data in operational DA?

– We receive the AMV data trough two sources:
  1) the EUMETSAT data transmission system – EUMETCast and
  2) the global telecommunication system – GTS.

– Almost all products are available through the EUMETCast, and with lower timeliness than those received through GTS;

– The timeliness of the EUMETSAT geostationary satellite based AMV received through EUMETCast is roughly **9 minutes**, which is far less than our **cut-off time** (**1h 45min**);

– Large differences between timeliness of polar winds:
  – **Triplet Metop B-A-B**: maximum timeliness of **1 hour 10 min** => fit well but not available for early morning runs (00, 03, 06 UTC);
  – **Triplet Metop A-B-A**: maximum timeliness of **1 hour 53 min**;
  – **Dual winds (Metop B-A)** arrive with acceptable timeliness (**tested in this study!**);
  – **These products should be guaranteed for the future**;

  – **Polar winds from TERRA** satellite and produced in Tromsø: **minimum timeliness of 2 hours**; when these data are produced at EUMETSAT, the timeliness is even longer;

  – We need to find solution for the morning AMVs derived from US satellites but probably producing them locally;
    – Possible solution can be **CSPP with AMV retrieval in it**.

Concluding remarks

Access to geostationary AMVs:

– Geo AMV data are available at MET Norway with very reliable timeliness for both short-range and nowcasting (rapid refresh system) weather forecasting;
– We assess in this report access to kinds of products: 1) locally processed and 2) produced at EUMETSAT;

Access to Polar AMVs:

– Polar AMV can have serious long timeliness for some of the products;
– Dual Metop (B-A) and triplets can provide winds with acceptable timeliness and suitable for our operational applications from 09 to 21 UTC;
– We need data for our early morning runs (00, 03 and most of time for 06 UTC);
  – Locally processing can solve the timeliness problem;

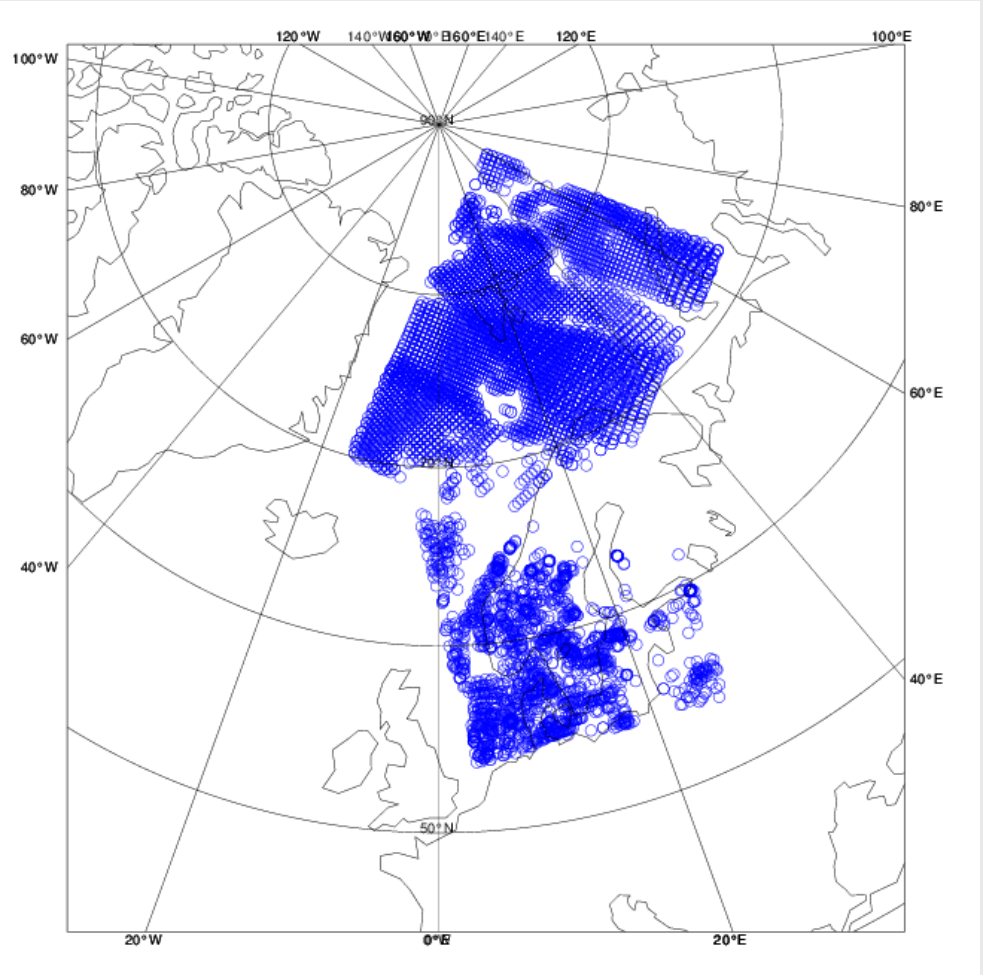
Impact of the AMVs:

– Some tuning on the use of the AMV data is further needed in our system;
– All the tested AMV data have good quality to be explored;
– Based on two weeks experiments, both Geo and Polar winds showed very promising impact on both analyses and short-range forecasts;

Future work:

– Once the above issues clarified or solved, we would like to explore all available data for sooner operational implementation.

Thank you


120°W
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