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Verification of Operational Weather Prediction Models September to November 2025

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Ryøya, near Tromsø. Photo: Gunnar Noer

Contents

More information...

Verification results are also available on internal web pages

- https://metcoop-comm.smhi.se/ and https://metcoop.smhi.se/ - MetCoOp Web Tools - including verification and observation monitoring
- https://harp.smhi.se/ - MetCoOp verification visualized with harp
- http://verif/vmap/ - timeseries and windroses - on Google map

About this report

This verification report indicates the quality of the main operational weather forecasting models used at the Norwegian Meteorological Institute (MET Norway) for the period indicated. Another purpose of the verification report series is to provide a stable source of information suitable for monitoring longer trends in forecasting quality for interested readers. The report complements the verification and monitoring performed on individual models. Each model is monitored and developed according to the scientific method, where changes are only introduced when they can document a better likely prediction skill. Such documentation is available as research papers, consortium news, and presentations at team-, syndicate- and consortium- meetings. The skill of the forecasting service in severe weather situations is also documented with special emphasis on forecast failures, in order to learn from them and improve the system.

The report includes verification results for 3 Numerical Weather Prediction (NWP) models; MetCoOp ensemble prediction system (MEPS) covering Norway, Sweden, Finland, Denmark and the Baltic states, AROME-Arctic covering Svalbard, Novaja Semlja, Frans Josefs land and the Northern part of Scandinavia and the global Integrated Forecasting System (IFS). The models are further described in the Models section. The variables verified are mean sea level pressure, temperature, wind speed and precipitation. The results are grouped by variable. A short summary of the results and cases studies by forecasters are also included.

Verification results are shown for different groups of stations: Norwegian, Svalbard and North Scandinavian. For temperature there are additional groups with Norwegian coastal and Norwegian inland stations, for wind speed Norwegian coastal and Norwegian mountainous stations, and for precipitation coastal stations, stations more than 500 m above sea level, and stations with daily mean precipitation $>$ 4 mm. For MEPSctrl statistics at the observing sites are also visualized on maps with model climatology. The text size of the statistics increases with the value. Time series with observations and available models are included for selected stations. Post processed variables are compared with MEPSctrl.

Models

The following Numerical Weather Prediction (NWP) models are verified in this report. The verification measures are plotted for each model with the colors indicated in the table below.

Integrated Forecasting System (IFS)	Operational forecasts from the European Centre for Medium-Range Weather Forecasts (ECMWF) are produced with the Integrated Forecasting System (IFS), which is a global model with horizontal resolution of about 9 km. Cycle 49r1 since 12 November 2024. MET Norway always uses the latest available operational cycle. IFS is available about 5 hours later than models run at MET Norway.
MetCoOp ensemble prediction system (MEPSctrl)	MEPS has 30 lagged ensemble members, constructed from 5 members updated hourly and run up to 66 hours. Only member 0, the control, is verified in this report. MEPS is based on HARMONIE with AROME physics and non-hydrostatic dynamics, horizontal resolution defined by a 2.5×2.5 km^2 grid. Cycle 43h2.1 since 23 March 2021. MEPS is run in cooperation with Swedish Meteorological and Hydrological Institute (SMHI), Finnish Meteorological Institute (FMI) and Estonian Environment Agency (ESTEA).
AROME-Arctic (AA25)	HARMONIE with AROME physics, horizontal resolution defined by a 2.5×2.5 km^2 grid. Cycle 46 since 23 September 2025.

Analysis and lead times of forecasts are denoted by e.g. 00+30 UTC which indicates forecast generated at 00 UTC and valid 30 hours later.

A change log for HARMONIE AROME (which MEPSctrl is based on) is available on internal webpages: https://metcoop.smhi.se/dokuwiki/nwp/metcoop/changelog/start

A similar change log for AA25 is found on github:
https://github.com/metno/NWPdocs/wiki/AROME-Arctic-dataset#arome-arctic-changelog

Post processed forecasts

Most of the raw NWP model data are post processed before being published on Yr.

The met nordic temperature forecasts, YrPP in the plots, are post-processed forecasts based on the latest MEPS ensemble runs. The MEPS temperature forecasts are first downscaled to 1 km resolution using the model lapse rate in a neighbourhood. The forecasts are then bias corrected using a fine scale 1 km temperature analysis as reference. The temperature analysis is based on multiple data sources using both conventional and citizen observations.

The MEPS 10 m wind speed forecast is post-processed by downscaling to 1 km resolution to better represent local topography, and called YrPP.

YrPP is plotted with the color below.

The HARMONIE system

HARMONIE is the acronym for HIRLAM's meso-scale forecast system (Hirlam Aladin Regional/Meso-scale Operational NWP In Europe). For documentation see
- *The HARMONIE-AROME Model Configuration in the ALADIN-HIRLAM NWP System* by Bengtsson et al. 2017, available at https://doi.org/10.1175/MWR-D-16-0417.1
- *AROME-MetCoOp: A Nordic Convective-Scale Operational Weather Prediction Model* by Müller et al. 2017, available at https://doi.org/10.1175/WAF-D-16-0099.1

More documentation is also available on hirlam.github.io/HarmonieSystemDocumentation/dev/, www.accord-nwp.org and www.cnrm.meteo.fr/gmapdoc/.

This section presents some of the main components and setups that are used at MET.

AROME physics

AROME (Applications of Research to Operations at MEsoscale) is targeted for horizontal resolution 2.5 km or finer. It uses physical parameterizations based on the French academia model Meso-NH and the external surface model SURFEX. AROME has been operational at Météo-France since 18 December 2008 with a horizontal resolution of 2.5 km and 65 vertical layers, and from April 2015 1.3 km and 90 vertical layers.

SURFEX as surface model

SURFEX (Surface externalisée) is developed at Météo-France and academia for offline experiments and introduced in NWP models to ensure consistent treatment of processes related to surface. Météo-France uses SURFEX in all their configurations. Surface modelling and assimilation benefit from the possibility of running offline experiments. SURFEX is also used for offline applications in e.g. hydrology, vegetation monitoring and snow avalanche forecasts.

SURFEX includes routines to simulate the exchange of energy and water between the atmosphere and 4 surface types (tiles); land, sea (ocean), lake (inland water) and town. The land or nature tile can be divided further into 12 vegetation types (patches). ISBA (Interaction between Soil Biosphere and Atmosphere) is used for modelling the land surface processes. There are 3 ISBA options; 2- and 3-layer force restore and a diffusive approach, where the first one is used in HIRLAM. Towns may be treated by a separate TEB (Town Energy Balance) module. Seas and lakes are also treated separately. The lake model, FLAKE (Freshwater LAKE), has recently been introduced in SURFEX. A global ECOCLIMAP database which combines land cover maps and satellite information gives information about surface properties. The orography is taken from gtopo30.

SURFEX Scientific Documentation and *User's Guide* are available on http://www.cnrm.meteo.fr/surfex/

Data assimilation

NWP models are updated regularly using observations received in real-time from the global observing system. MEPS is updated each third hour; at 00, 03, 06, 09, 12, 15, 18 and 21 UTC.

Surface analysis

Surface analysis is performed by CANARI (Code d'Analyse Nécessaire à ARPEGE pour ses Rejets et son Initialisation) (Taillefer, 2002). The analysis method is Optimal Interpolation and only conventional synoptic observations are used. 2 meter temperature and relative humidity observations are used to update the surface and soil temperature and moisture.

The snow analysis is also performed with CANARI in analogy with the HIRLAM snow analysis. Snow depth observations are used to update Snow Water Equivalent. The snow fields are analysed only at 06 UTC as there are very few snow depth observations at 00, 03, 09, 12, 15, 18 and 21.

The Sea Surface Temperature (SST) and Sea Ice Concentration (SIC) is not analysed, but taken from the boundaries. IFS uses the OSTIA (Operational Sea Surface Temperature and Sea Ice Analysis) product, including SST from UK Met Office and SIC from MET. SST and SIC for the Baltic Sea have since 26 November 2015 been taken from ocean models run at SMHI; first HIROMB and since 26 April 2017 NEMO.

The surface temperature over sea ice was taken from the boundary model and remained unchanged through the forecast. A simple thermodynamical sea ice scheme (SICE) giving prognostic sea ice temperatures in 4 fixed layers was introduced 26 November 2015.

Upper air analysis

MEPS runs three dimensional variational (3D VAR) data assimilation using conventional observations from synop stations, ships, radiosondes and aircrafts and AMSU-A and AMSU-B/MHS data from polar orbiting NOAA and METOP satellites. GNSS were introduced 17 February 2015, radar reflectivities 16 June 2015, IASI 26 November 2015 and ASCAT 17 March 2016. Mode-S EHS, AMSU-A and MHS from METOP-C satellite were introduced June 2020, METOP-C IASI (deactivation of METOP-A IASI), June 2021, radar radial wind observations and German radars, June 2022.

Boundary fields

MEPS gets its boundary values (1-hourly) from the IFS model at approximately 9 km resolution, and has currently 65 vertical levels. None of the HARMONIE configurations at MET Norway have applied digital filter initialization (DFI).

Verification measures

All model forecasts in this report are verified against observations by interpolating (linear) the grid based forecasts to the observational sites. As a consequence, it should be noted that it is the models' abilities to forecast the observations that is being quantifed and assessed. Thus, there is no attempt in this report to verify area averaged precipitation for example.

Verification is carried out both for raw and categorized forecasts. In the following, let $f_1, ..., f_n$ denote the forecasts and $o_1, ..., o_n$ the corresponding observations.

Forecasts of continuous variables

The verification statistics applied to continuous variables are defined in the table below.

Statistic	Acronym	Formula	Range	Optimal score
Mean Error	ME	$\frac{1}{n} \sum_{i=1}^{n} (f_i - o_i)$	$-\infty$ to ∞	0
Mean Absolute Error	MAE	$\frac{1}{n} \sum_{i=1}^{n} \mid f_i - o_i \mid$	0 to ∞	0
Standard Deviation of Error	SDE	$\left(\frac{1}{n} \sum_{i=1}^{n} (f_i - o_i - \mathrm{ME})^2 \right)^{1/2}$	0 to ∞	0
Root Mean Square Error	RMSE	$\left(\frac{1}{n} \sum_{i=1}^{n} (f_i - o_i)^2 \right)^{1/2}$	0 to ∞	0
Correlation	COR	$\frac{\frac{1}{n} \sum_{i=1}^{n} (f_i - \bar{f})(o_i - \bar{o})}{\mathrm{SD}(f)\mathrm{SD}(o)}$	-1 to 1	1

In the formula for COR the following definitions are used

$$\bar{f} = \frac{1}{n}\sum_{i=1}^{n} f_i, \qquad \bar{o} = \frac{1}{n}\sum_{i=1}^{n} o_i$$

$$\mathrm{SD}(f) = \Big(\frac{1}{n}\sum_{i=1}^{n}(f_i - \bar{f})^2\Big)^{1/2}, \qquad \mathrm{SD}(o) = \Big(\frac{1}{n}\sum_{i=1}^{n}(o_i - \bar{o})^2\Big)^{1/2}$$

for the means and standard deviations of the forecasts and observations.

For wind direction the probability density function (PDF) is used to show the distribution of observed and forecast wind directions. The PDF used here is a kernel density estimate, which is a smoothed version of the histogram.

Forecasts of categorical variables

All variables in this report are continuous in raw form, but it is possible to categorize them and verify these. For example, wind speed above a given threshold could be of interest which would result in two possible outcomes (yes and no). The verification is then completely summarized by a contingency table as the one shown below

		event observed	
		yes	no
event forecasted	yes	a	b
	no	c	d

Verification statistics for such forecasts are listed in the following table

Statistic	Acronym	Formula	Range	Optimal score
Hit rate	HR	$\frac{a}{a+c}$	0 to 1	1
False alarm rate	F	$\frac{b}{b+d}$	0 to 1	0
False alarm ratio	FAR	$\frac{b}{a+b}$	0 to 1	0
Equitable threat score	ETS	$\frac{a-ar}{a+b+c-ar}$	$-1/3$ to 1	1 (0 = no skill)
Hanssen-Kuipers skill score	KSS	HR - F	-1 to 1	1 (0 = no skill)
Heidke skill score	HSS	$\frac{(a+d)/n-ssf}{1-ssf}$	$-\infty$ to 1	1 (0 = no skill)

In the formula for ETS $ar=(a+b)(a+c)/n$.
In the formula for HSS the score for the standard forecast $ssf=[(a+b)(a+c)+(b+d)(c+d)]/n^2$.

Observations

All observations come from frost.met.no. Only synop stations are used. From June 1 2021, both the model wind speed and the post-processed wind speed are verified against mean wind observations, FF. The model wind gust is verified against the observed wind gust, FG. FF and FG are defined as follows:

- FF: Wind speed (10 meters above ground) - defined as the mean value for the last 10 minutes before the time of the observation.
- FG: Gust wind speed (10 m above ground) - defined as highest gust wind speed (3 second mean) the last 10 minutes before the time of the observation.

Summary of the results

Summarized statistics show that IFS in general forecasts sea level pressure better than MEPSctrl/AA25, but the errors are small for both.

Temperature is on average better forecast by MEPSctrl/AA25 than IFS. IFS underestimates the temperature for all the different groups of stations. MEPSctrl shows almost no average bias for the Norwegian stations. AA25 shows a small underestimation for the Svalbard stations. For the North Norwegian stations there is a small overestimation for both MEPSctrl and AA25. Still, the errors are small, indicating that the timing of the temperature changes is generally good. The temperature forecast from MEPSctrl is further improved by post processing, particularly for the shortest lead times. The improvement is larger for inland stations than coastal stations, which have less variation in temperature and smaller errors than inland stations for both MEPSctrl and post processed forecasts.

For wind speed and precipitation, a larger number of verification scores is used to assess model quality, including threshold statistics.

Wind speed is challenging to evaluate. MEPSctrl performs better than IFS over land, and particularly in the mountains, where IFS underestimates the speed considerably as seen in the monthly mean error and mean absolute error. AA25 performs about as well as IFS for the Svalbard stations. While AA25 has a general tendency to overestimate the wind speed, IFS shows the opposite. For the North Norwegian stations MEPSctrl and AA25 show a slightly better skill than IFS, at least for shorter lead times. The threshold scores indicate that wind speed is better forecast for lower than for higher wind speeds for all models. The post-processing of wind speed shows a small effect in the mean error and mean absolute error, while the other scores show almost identical results for MEPSctrl and YrPP.

Precipitation also shows varying results, depending on the amount and location. On average IFS has slightly more precipitation than MEPSctrl. Both models have more errors for both very small and very high amounts, than for precipitation in the mid range.

For temperature and wind, the monthly scores for the last three years show that the models generally perform better during summer months than during winter. A possible cause is that storm activity is challenging to predict accurately, and that there are often more storms with high wind speeds during fall and winter than during summer. Precipitation does not have clear seasonal patterns. Convective cases that are challenging to predict may occur with different frequency for different months and years. A challenge with verification of precipitation that occurs during winter is the undercatchment of observed snow. This is the case when there is strong wind in combination with snow, which is often the case especially in Northern Norway and in the mountainous areas in Southern Norway. It is suspected that the models are too dry in the coastal and fjord areas, but the undercatchment leads to cases where the observations give an impression that there is better fit in the models with regards to precipitation than what is actually the case. AA25 and MEPSctrl show very similar results, which is expected since both are HARMONIE models with AROME physics and a horizontal resolution defined by a 2.5×2.5 km^2 grid.

Case 1. Winds during the extreme weather Amy

On the 3rd and 4th of October, the extreme weather Amy hit southern Norway with full force. Very strong winds and large amounts of precipitation resulted in both yellow, orange and red weather warnings for large parts of southern Norway. On the two oil rigs Gullfaks C and Oseberg A, both located in the North Sea off the coast of western Norway, the wind speeds were expected to become severe. The aviation forecasters on duty had to use their prior knowledge of forecasting strong winds for the oil rigs to try to predict how strong the wind speeds and gusts would become in the TAF (Terminal aerodrome forecast). On these platforms the wind speed is measured rather high above sea level (141 m for Gullfaks C and 116 m for Oseberg A), a factor to take into account when creating the TAFs.

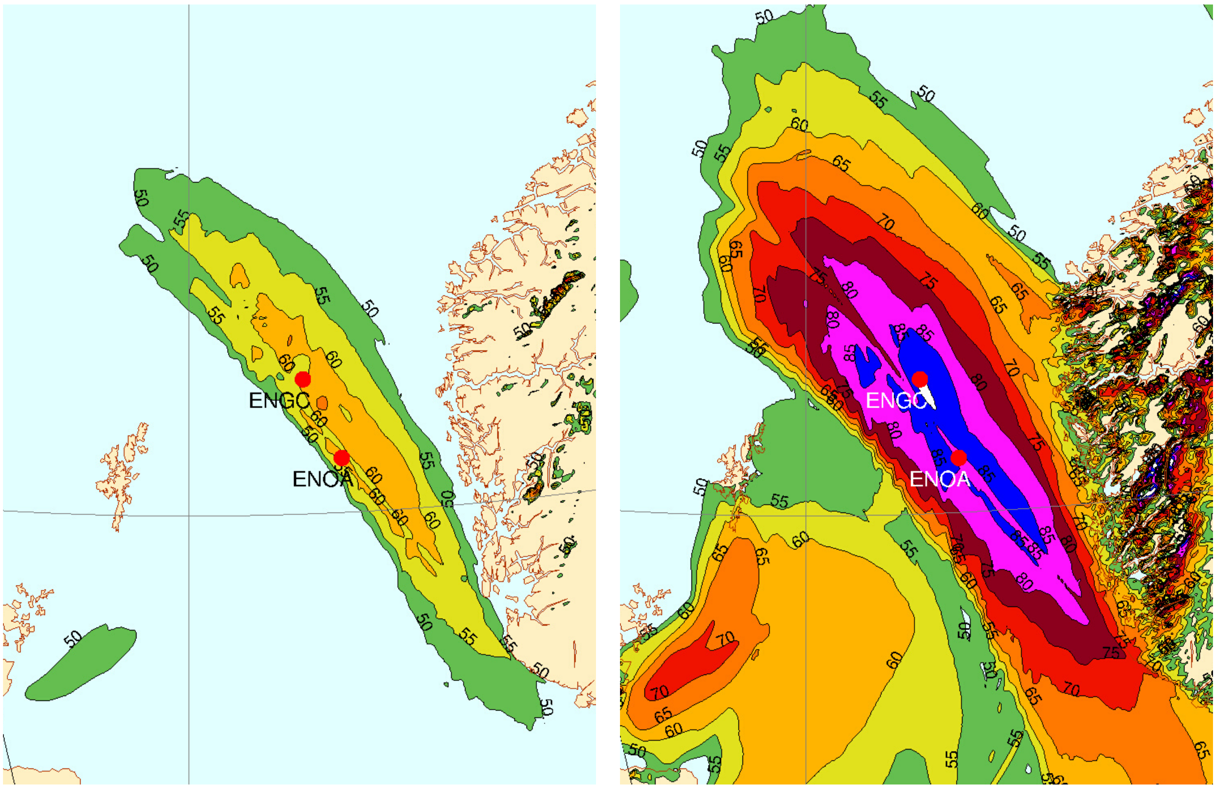


Figure 1: 10 m wind speed (left) and 10 m wind gust (right) from MEPSctrl at 00 UTC October 4th.

Figure 1 shows the 10 m wind speed and gust from MEPSctrl at the time of the expected maximum wind speeds. The model wind speed laid around 60 knots near the two platforms and the wind gust laid around 85 knots. The experience from the forecasters is that in situations with strong winds, the 10 m gust parameter is a good metric to use for forecasting the middle wind speed on the oil rigs. On top of that, they use a certain gust factor to find the magnitude of the wind gusts. In this case they ended up forecasting a middle wind of 85 knots and wind gusts of 100 knots for both platforms. Considering that 100 knots is the maximum value possible to write in the TAF code, this is not your everyday forecast!

METAR ENGC	METAR ENOA
031950Z 14070KT	031920Z 14053G81KT
032020Z 14066G83KT	032020Z 14058G79KT
032050Z 14075G92KT	032050Z 14061G86KT
032120Z 14081G98KT	032120Z 14068G81KT
032150Z 14079G98KT	032150Z 14067G86KT
032220Z 14080G97KT	032220Z 14068G94KT
032250Z 14081G97KT	032250Z 14066G94KT
032320Z 15078G90KT	032320Z 14061KT
032350Z 15082G100KT	032350Z 14066G88KT
040020Z 15066G87KT	040020Z 16071G85KT
040050Z 15075G88KT	040050Z 16060G79KT

Figure 2: Available METAR observations (only including wind) from Gullfaks C (ENGC) and Oseberg A (ENOA) in the time of the strongest winds. The time of observation is given in UTC time, followed by the observed wind direction in degrees, the middle wind and (if significant) the wind gust (following the letter G) in knots.

For Gullfaks C, the strongest wind was expected between 20 UTC October 3rd and 01 UTC October 4th, while for Oseberg A it was expected between 19 UTC October 3rd and 01 UTC October 4th. Figure 2 shows the METAR wind observations in those time frames. In such an extreme situation the most important thing is to forecast the strongest winds, so while some of the observations lie a little lower than what is written in the TAFs, the forecasts are quite accurate. Especially for Gullfaks C the forecast came very close to predicting what was observed.

Case 2. Fog/low clouds

On November 7th there were widespread low clouds in southeastern Norway, and particularly in some of the valleys (figure 3). The finer scale MEPSctrl model only produced low clouds in a band along the coast but missed the stratus clouds further inland. The coarser scale IFS model was much better at producing low clouds in this case (figure 4), and even managed to give correct cloudiness along the Setesdal and Fyresdal valleys.

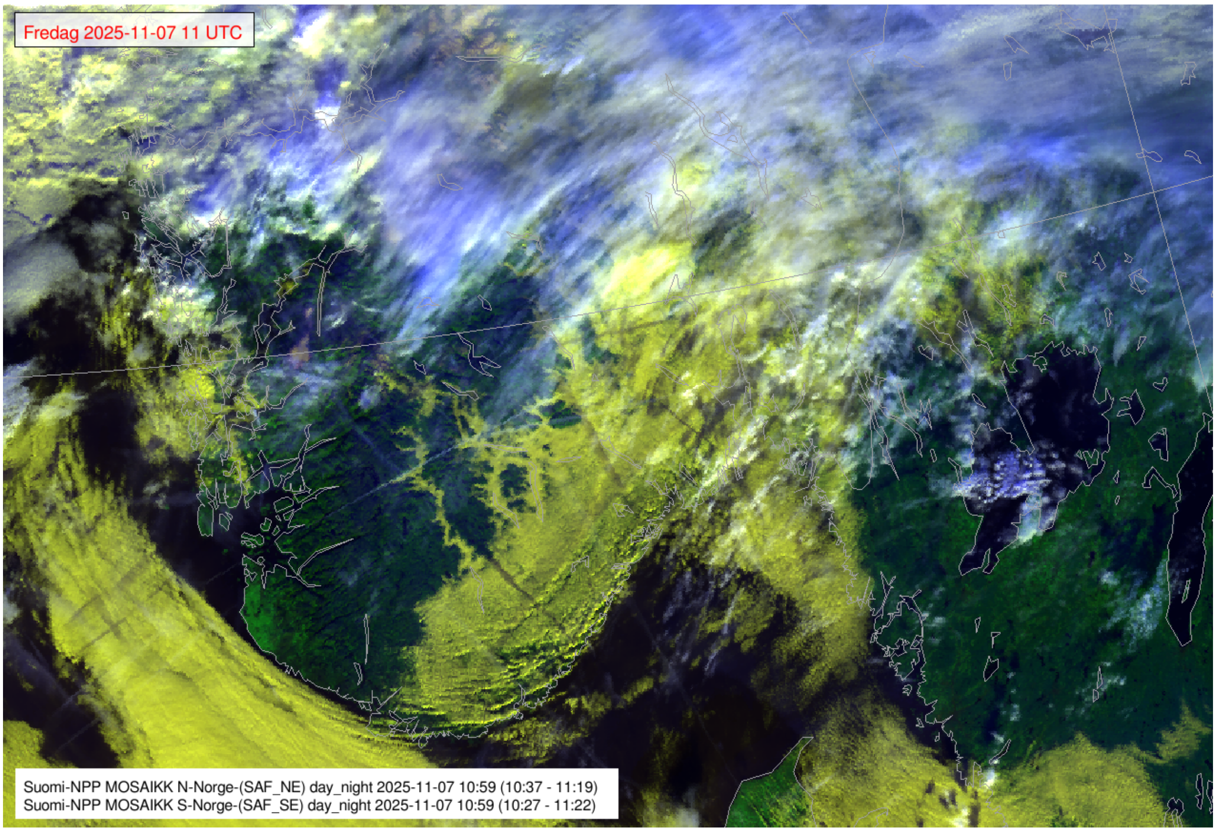


Figure 3: Satellite image from November 7th 11 UTC showing low clouds (yellow areas) over southeastern Norway.

An examination of two-meter temperature (T_{2m}) and two-meter dew point temperature (T_{d2m}) from MEPSctrl (figure 5) shows that the T_{d2m} is too low in large parts of the area throughout the late morning, which leads to an absence of low clouds. This also translates to the T_{2m} rising too fast in the prognosed cloud free area, further enhancing mixing and the thinning of the clouds.

This case is similar to a case from a previous verification report (summer 2025) where the T_{d2m} was found to be too low over land, but in that case leading to underforecasting of convective clouds in southeastern Norway.

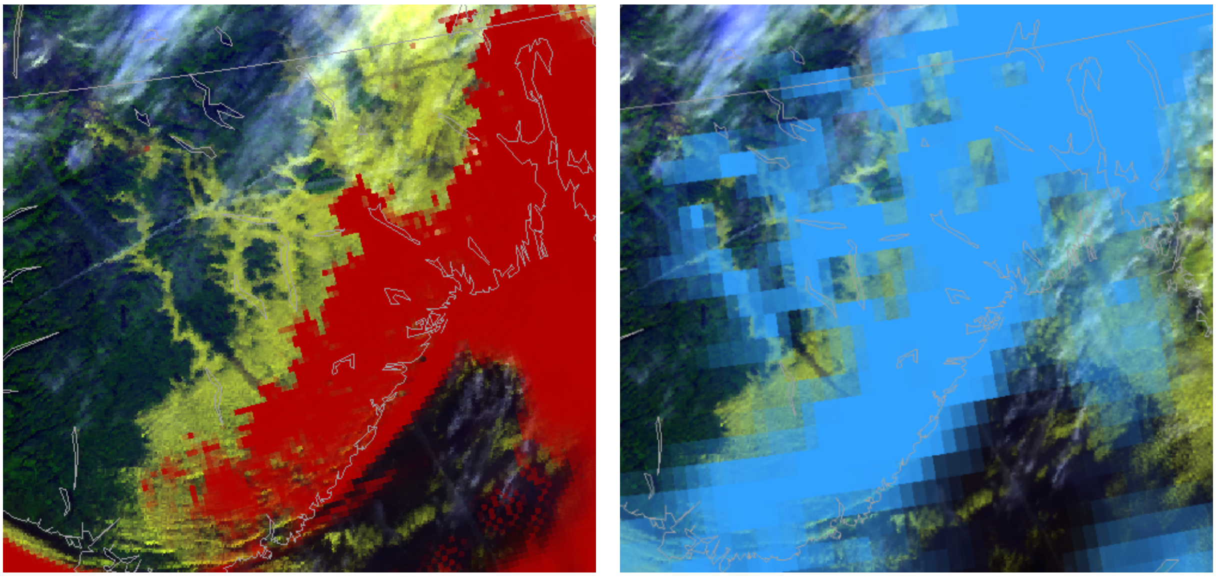


Figure 4: Low clouds from MEPSctrl (left panel in red) and IFS (right panel in blue) at 11 UTC November 7th, both for 11 hour lead times.

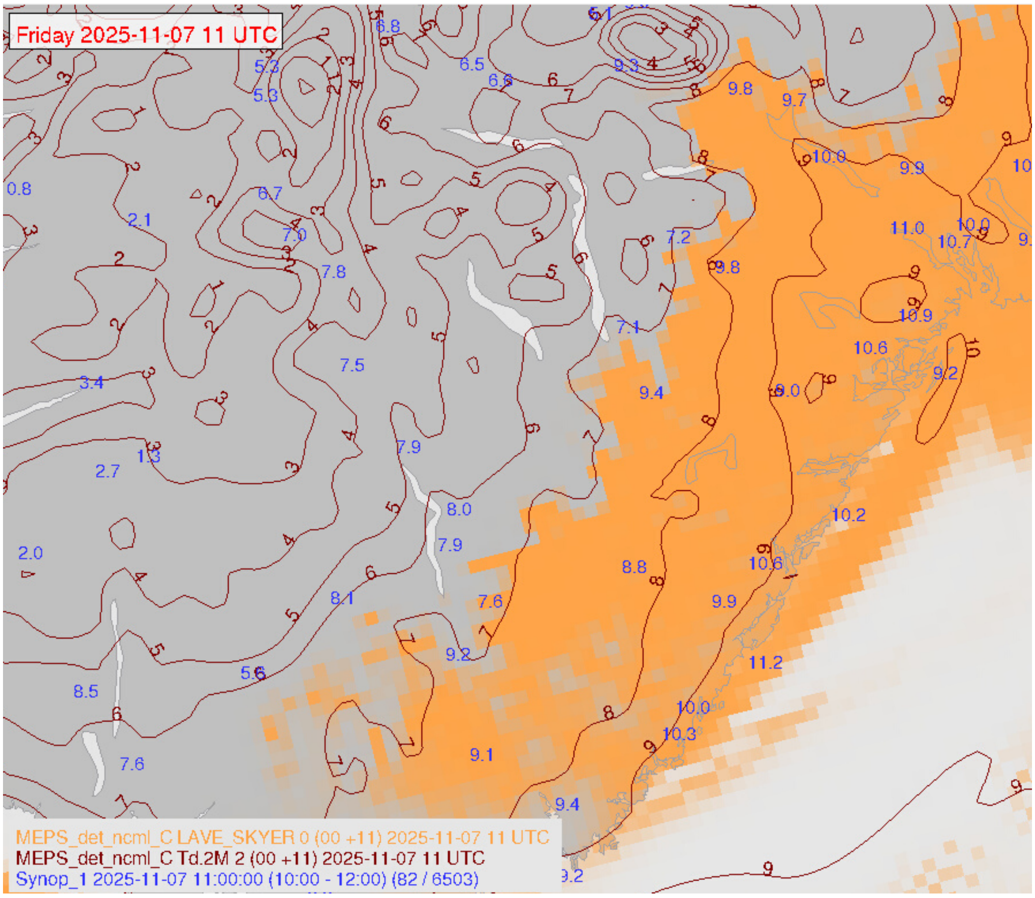


Figure 5: Low clouds (orange) and T_{d2m} (dark red contour lines) from MEPSctrl with 11 hours lead time. Synoptic observations of the T_{d2m} in blue.

Case 3. Misplaced low-pressure centers

Mean sea level pressure (MSLP) is perhaps the most fundamental parameter to look at when forecasting the weather, and while it is generally well forecast in the models used at MET Norway, we sometimes see cases of largely misplaced low-pressure systems. The synoptic uncertainty of mesoscale features is usually small for shorter lead times. The following case shows an instance where there were significant differences in the placement of two low-pressure centers for AA25, MEPSctrl and IFS for a 27 hour lead time.

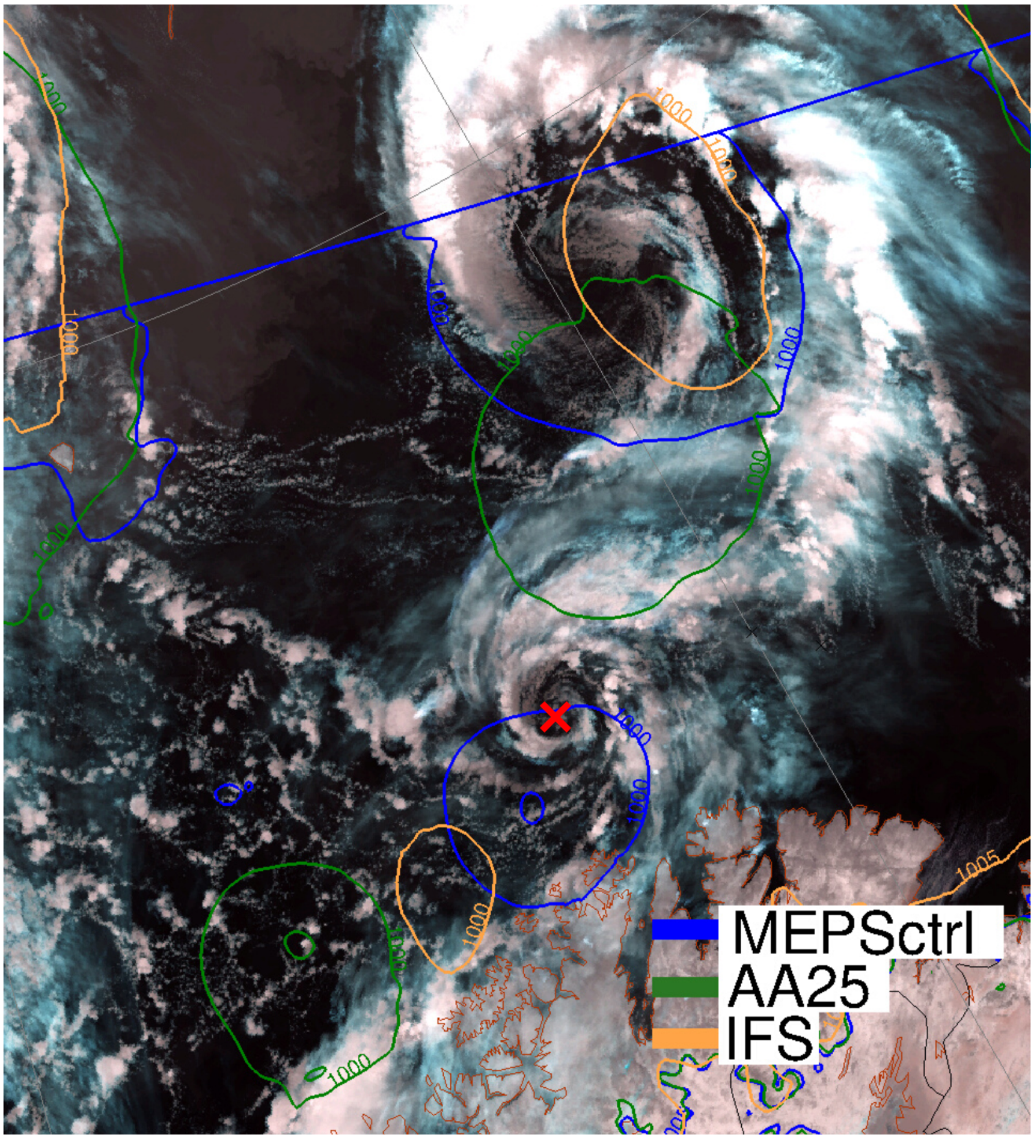


Figure 6: MSLP from MEPSctrl, AA25 and IFS laid on top of a satellite image from 09 UTC November 24. All models are showing values for the 06 UTC November 23 run with a 27 hour lead time. The position of the observed low pressure minimum for one of the low pressure systems is marked with a red X.

On the 24th of November two low-pressure centers were situated in the Barents Sea north of northern Norway. A day in advance, there were rather large differences in the placement of the pressure minimas between the three models (figure 6). While MEPSctrl was quite accurate, both IFS and especially AA25 showed large misplacements. For the southern-most low-pressure system near the coast of Finnmark the error in placement (distance from the red X in figure 6) at 09 UTC was ∼60 km for MEPSctrl, ∼125 km for IFS and ∼220 km for AA25.

The difference in placement between AA25 and MEPSctrl also resulted in differences in the placement of precipitation (figure 7) and wind patterns.

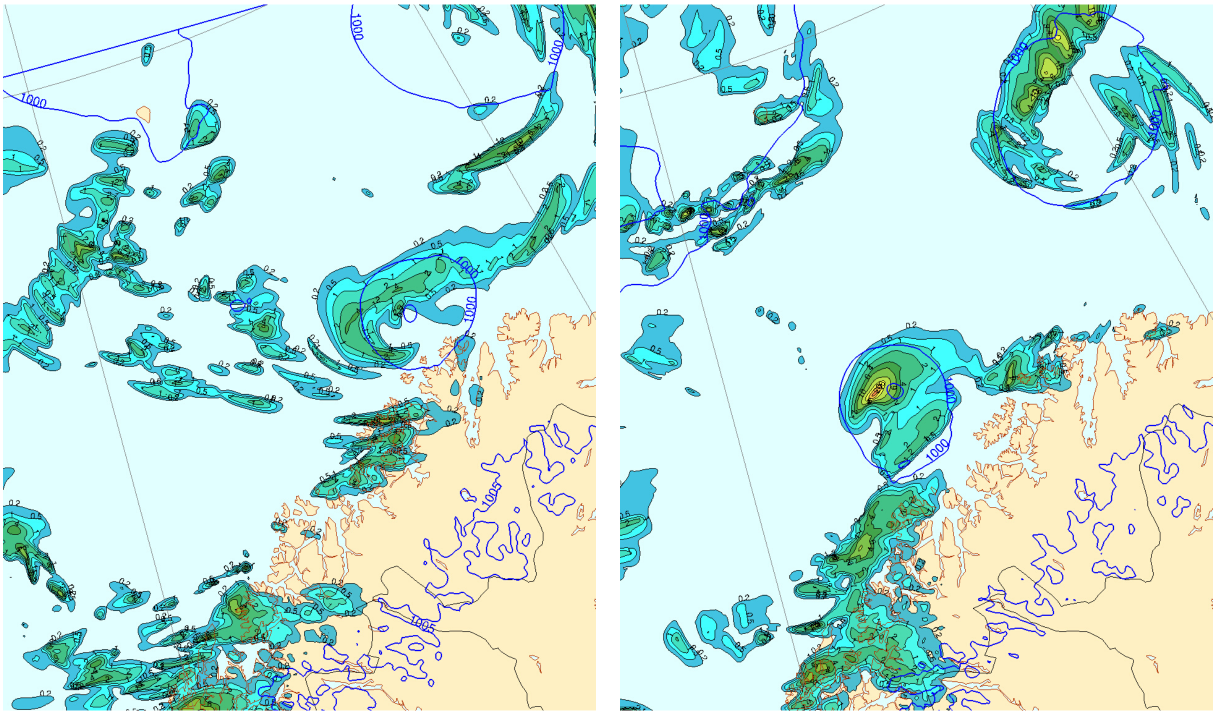
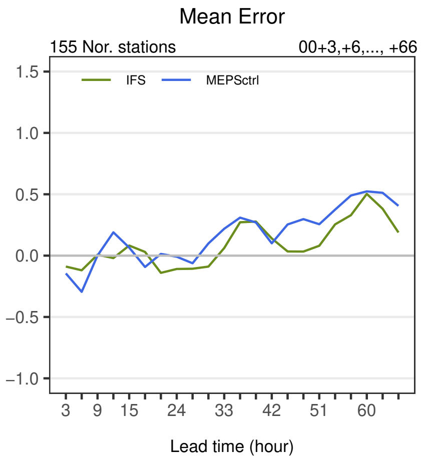
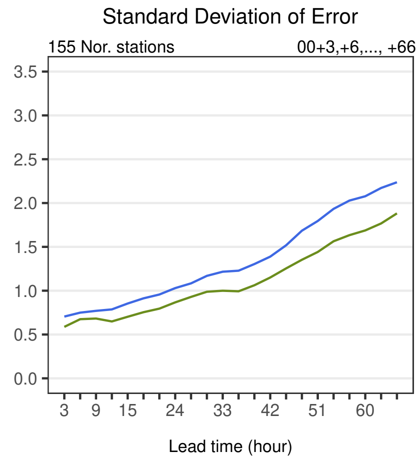


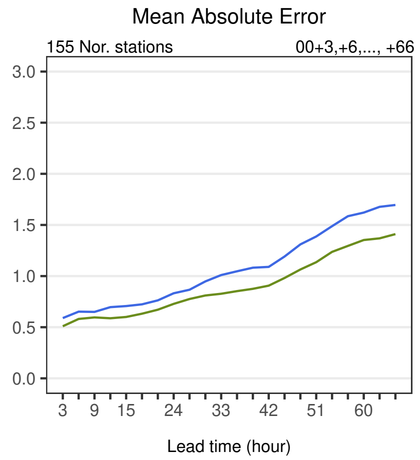
Figure 7: MSLP and 3-hour precipitation from MEPSctrl (left) and AA25 (right) at 09 UTC November 24. Both models are showing values for the 06 UTC November 23 run with a 27 hour lead time.

Both MEPSctrl and AA25 use IFS as model input on the borders, but the borders of MEPSctrl are closer to the area of interest than those of AA25. Additionally, AA25 now runs on cycle 46, while MEPSctrl still runs on cycle 43. This could perhaps explain why there are such large differences, but it is difficult to come to a clear conclusion.

Summarized statistics


Mean Error
155 Nor. stations
00+3,+6,..., +66
IFS
MEPSctrl
1.5
1.0
0.5
0.0
−0.5
−1.0
3 9 15 24 33 42 51 60
Lead time (hour)


Standard Deviation of Error
155 Nor. stations
00+3,+6,..., +66
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3 9 15 24 33 42 51 60
Lead time (hour)


Mean Absolute Error
155 Nor. stations
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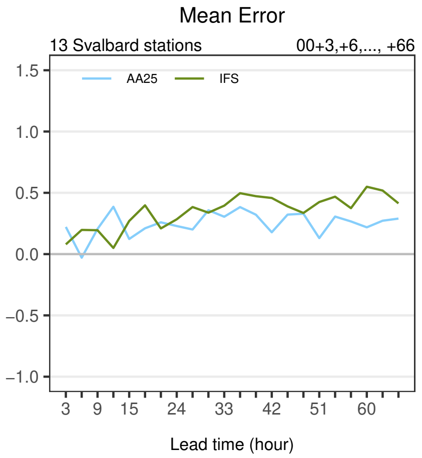
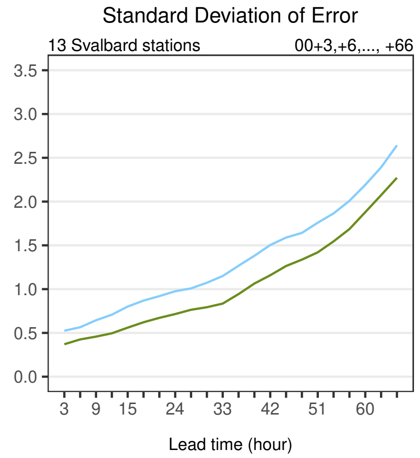
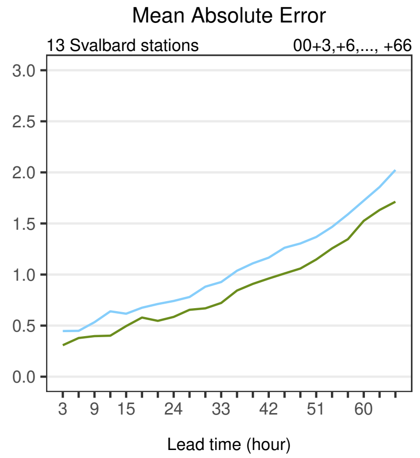
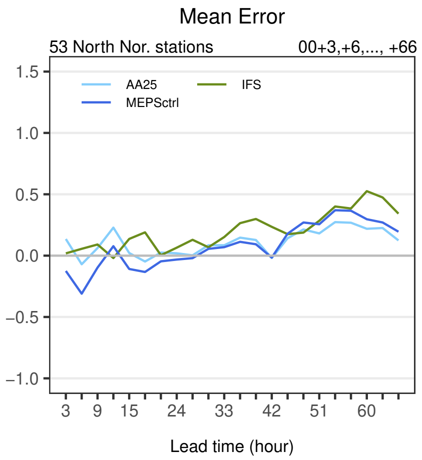
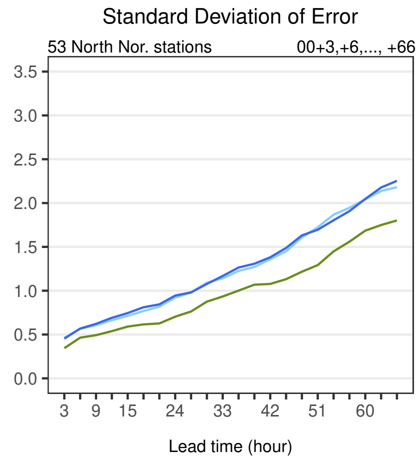
2.5
2.0
1.5
1.0
0.5
0.0
3 9 15 24 33 42 51 60
Lead time (hour)

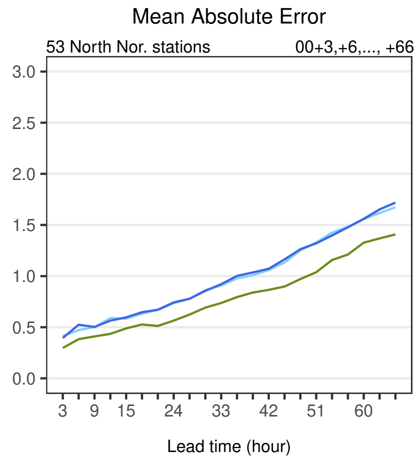

Mean Error
13 Svalbard stations
00+3,+6,..., +66
AA25
IFS
1.5
1.0
0.5
0.0
−0.5
−1.0
3 9 15 24 33 42 51 60
Lead time (hour)

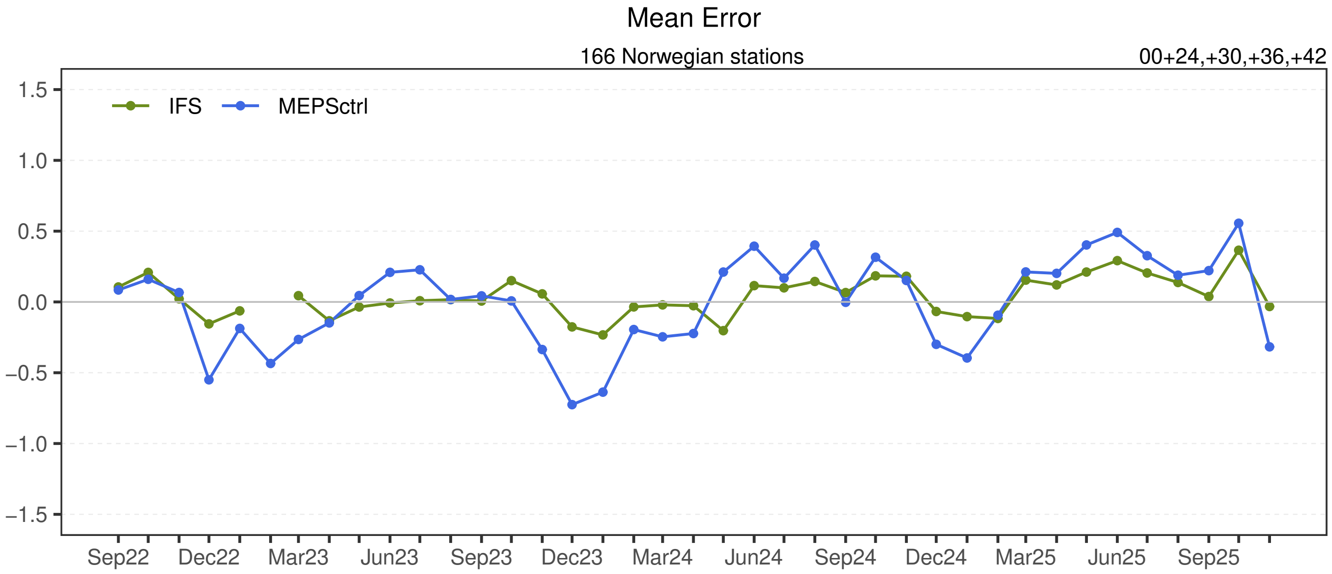

Standard Deviation of Error
13 Svalbard stations
00+3,+6,..., +66
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3 9 15 24 33 42 51 60
Lead time (hour)

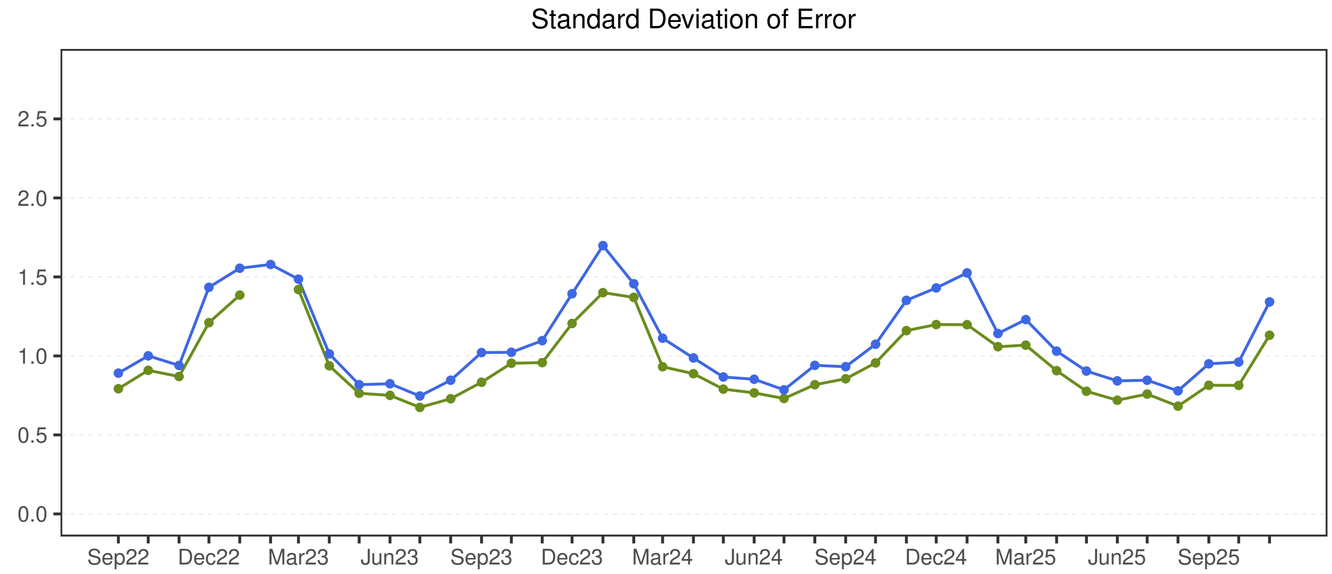

Mean Absolute Error
13 Svalbard stations
00+3,+6,..., +66
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3 9 15 24 33 42 51 60
Lead time (hour)

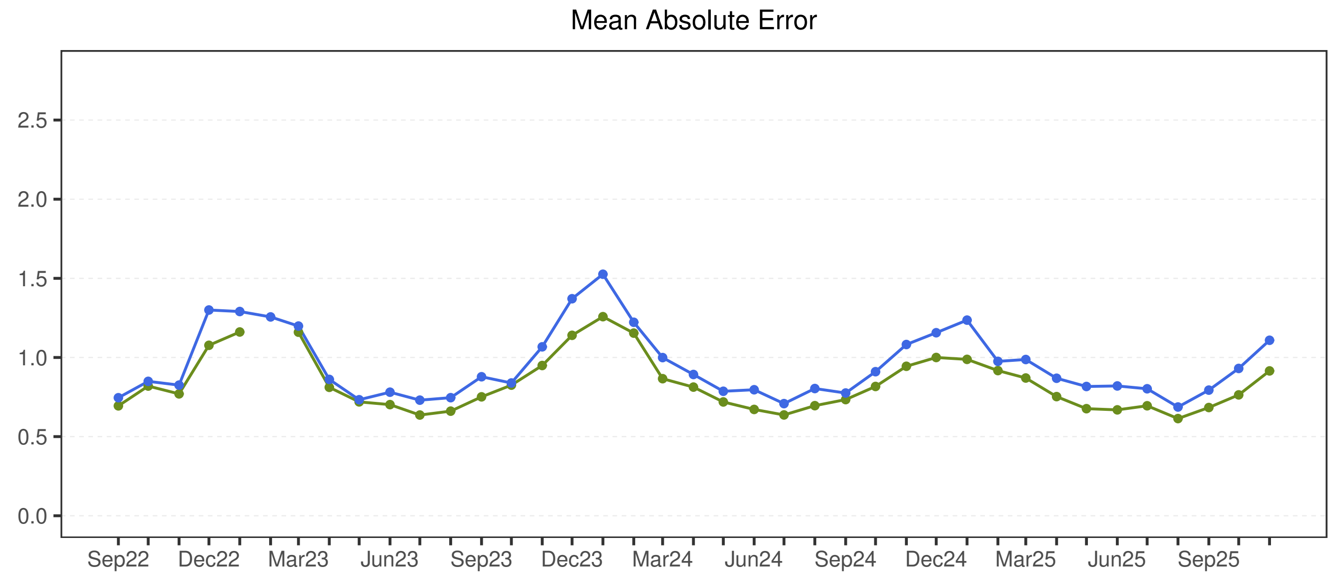

Mean Error
53 North Nor. stations
00+3,+6,..., +66
AA25
IFS
MEPSctrl
1.5
1.0
0.5
0.0
−0.5
−1.0
3 9 15 24 33 42 51 60
Lead time (hour)

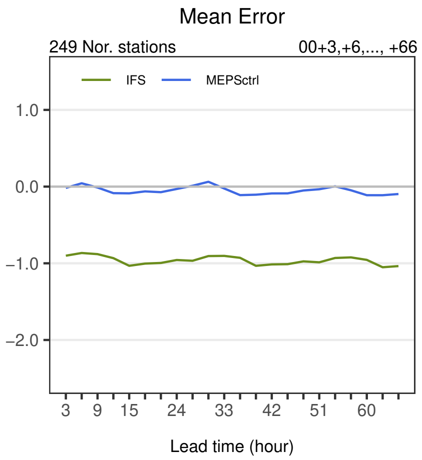

Standard Deviation of Error
53 North Nor. stations
00+3,+6,..., +66
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3 9 15 24 33 42 51 60
Lead time (hour)

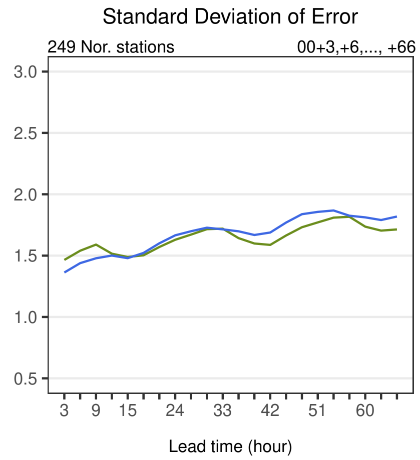

Mean Absolute Error
53 North Nor. stations
00+3,+6,..., +66
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3 9 15 24 33 42 51 60
Lead time (hour)

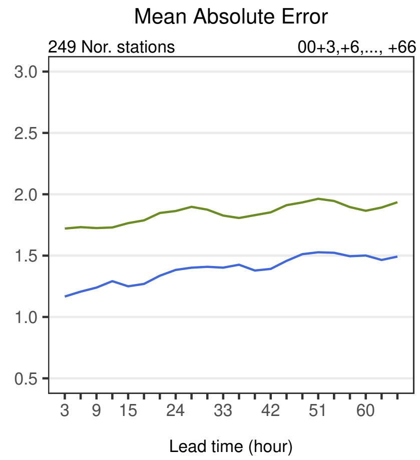

Mean Error
166 Norwegian stations
00+24,+30,+36,+42
IFS
MEPSctrl
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25

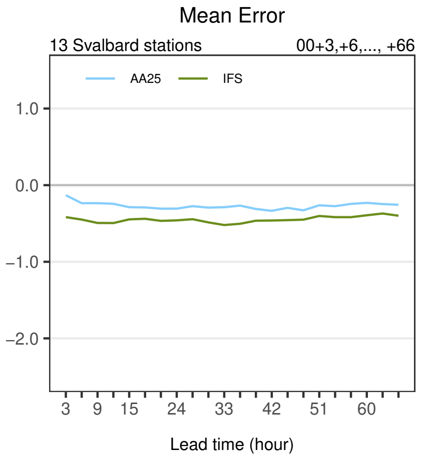

Standard Deviation of Error
2.5
2.0
1.5
1.0
0.5
0.0
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25

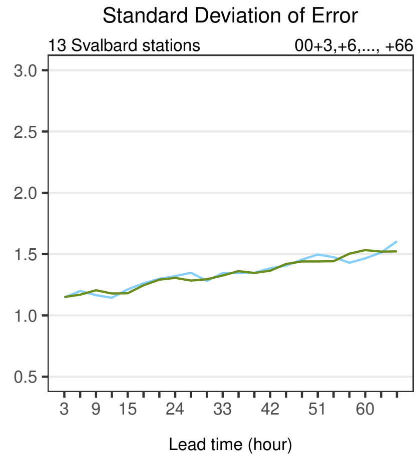

Mean Absolute Error
2.5
2.0
1.5
1.0
0.5
0.0
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25

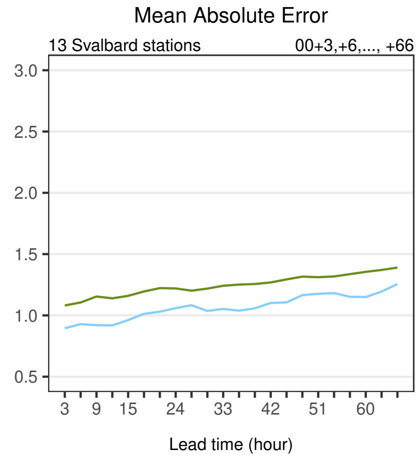

Mean Error
249 Nor. stations
00+3,+6,..., +66
IFS
MEPSctrl
1.0
0.0
−1.0
−2.0
3 9 15 24 33 42 51 60
Lead time (hour)

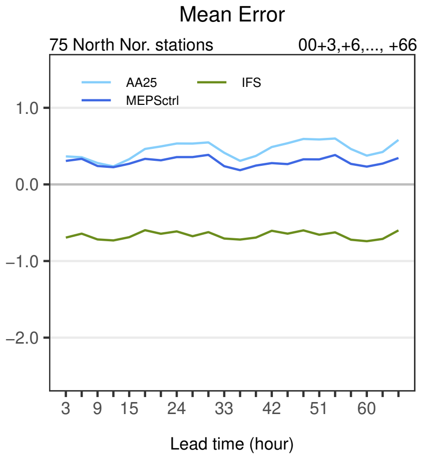

Standard Deviation of Error
249 Nor. stations
00+3,+6,..., +66
3.0
2.5
2.0
1.5
1.0
0.5
3 9 15 24 33 42 51 60
Lead time (hour)

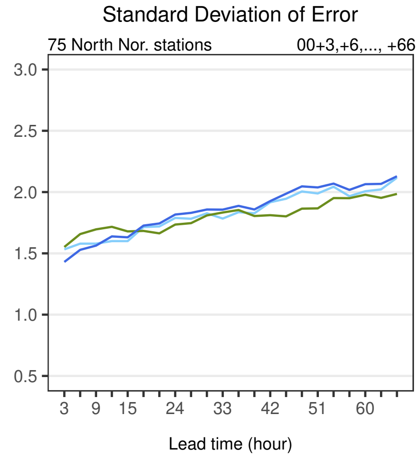

Mean Absolute Error
249 Nor. stations
00+3,+6,..., +66
3.0
2.5
2.0
1.5
1.0
0.5
3 9 15 24 33 42 51 60
Lead time (hour)

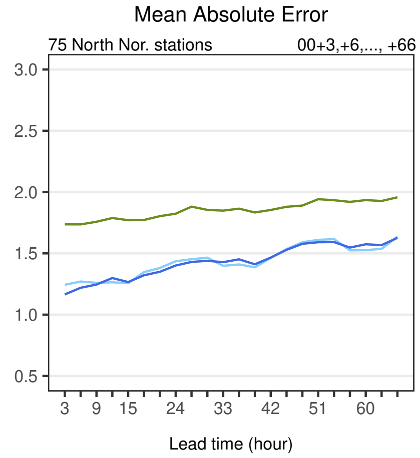

Mean Error
13 Svalbard stations
00+3,+6,..., +66
AA25
IFS
1.0
0.0
−1.0
−2.0
3 9 15 24 33 42 51 60
Lead time (hour)

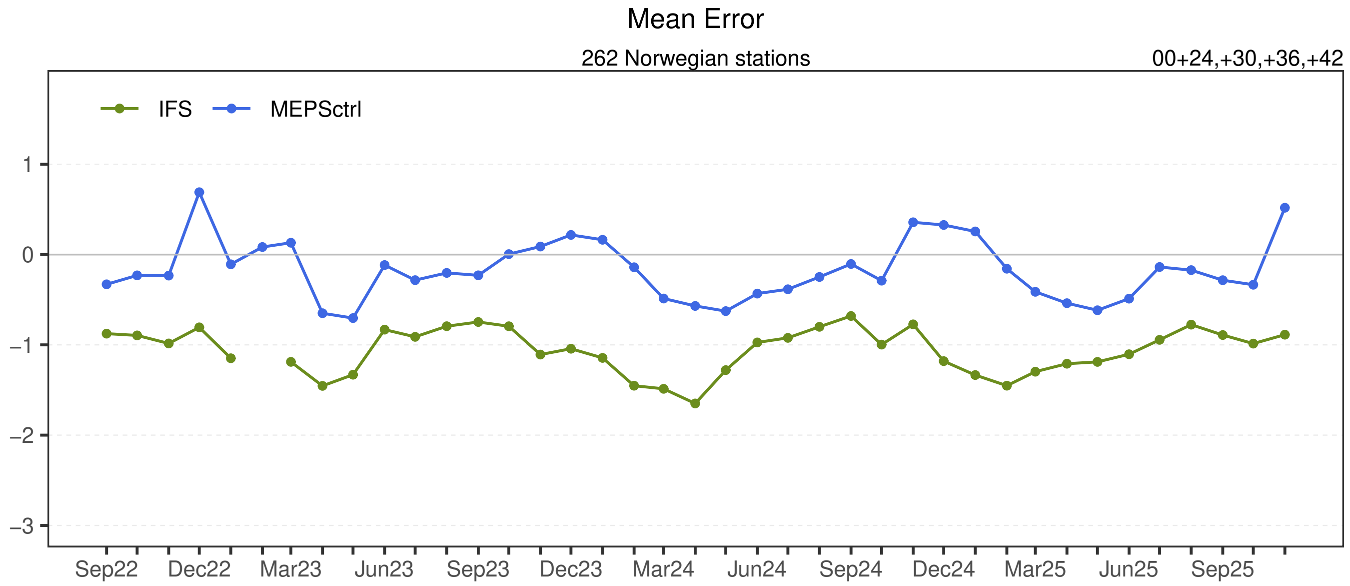

Standard Deviation of Error
13 Svalbard stations
00+3,+6,..., +66
3.0
2.5
2.0
1.5
1.0
0.5
3 9 15 24 33 42 51 60
Lead time (hour)

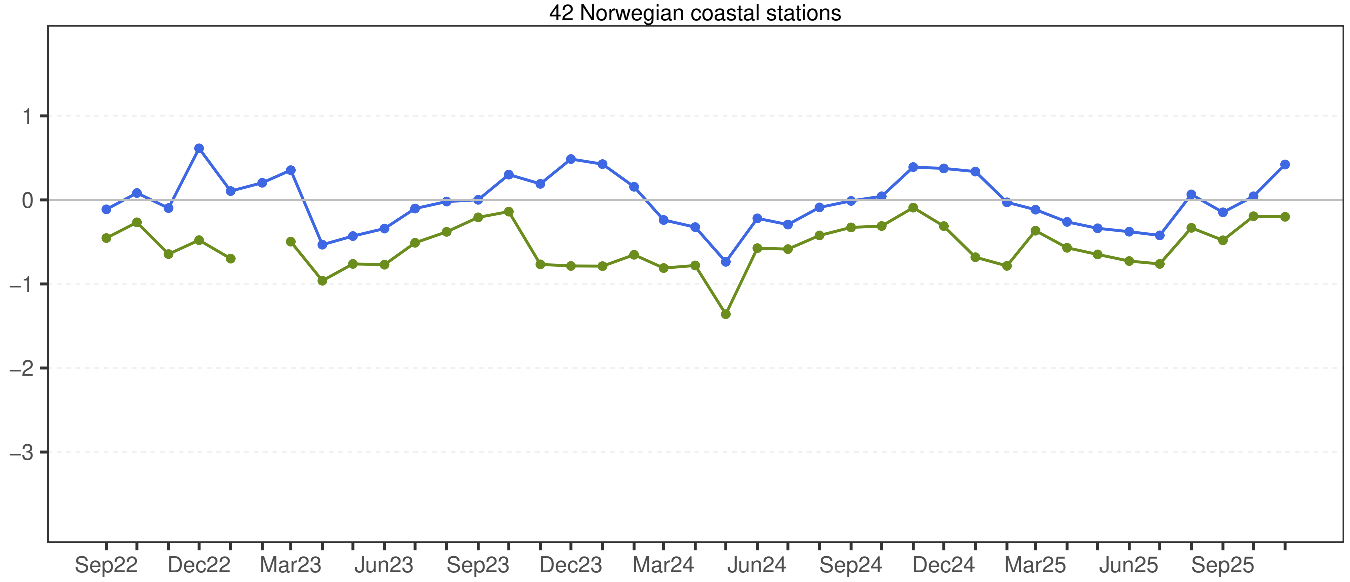

Mean Absolute Error
13 Svalbard stations
00+3,+6,..., +66
3.0
2.5
2.0
1.5
1.0
0.5
3 9 15 24 33 42 51 60
Lead time (hour)

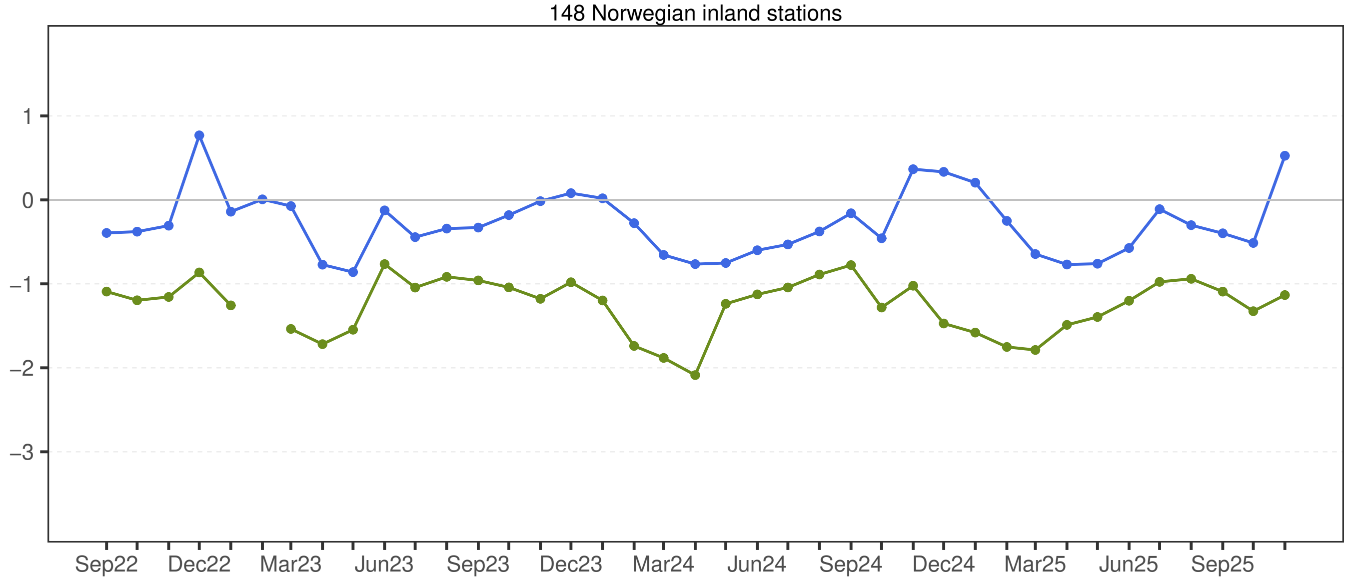

Mean Error
75 North Nor. stations
00+3,+6,..., +66
AA25
IFS
MEPSctrl
1.0
0.0
−1.0
−2.0
3 9 15 24 33 42 51 60
Lead time (hour)

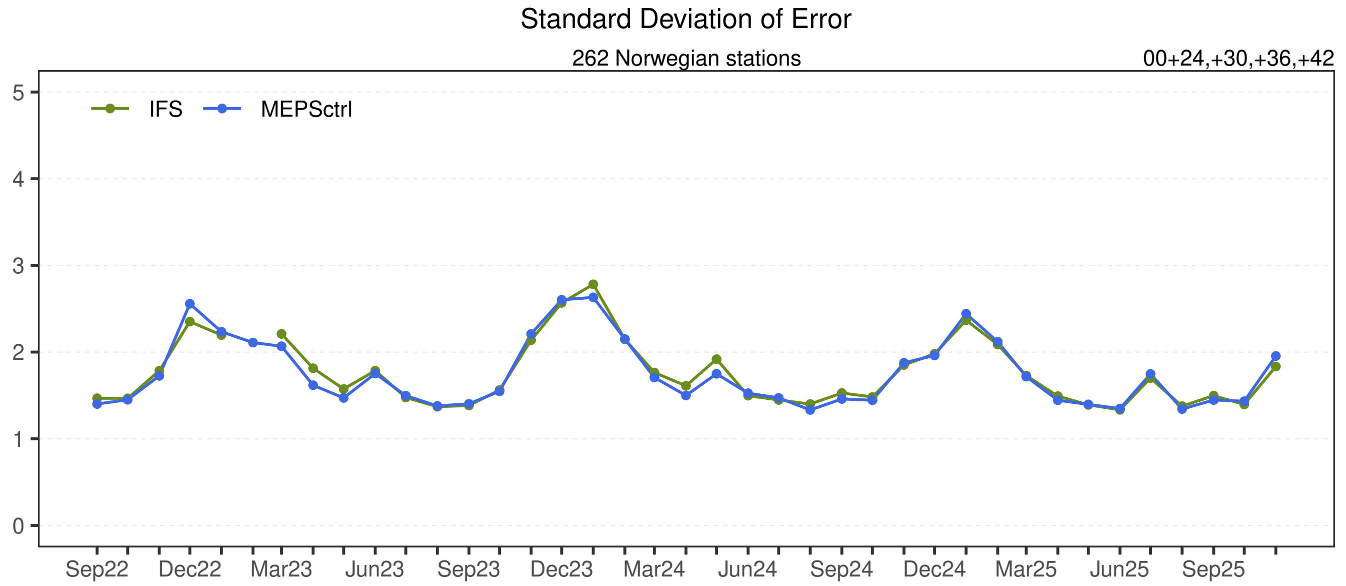

Standard Deviation of Error
75 North Nor. stations
00+3,+6,..., +66
3.0
2.5
2.0
1.5
1.0
0.5
3 9 15 24 33 42 51 60
Lead time (hour)

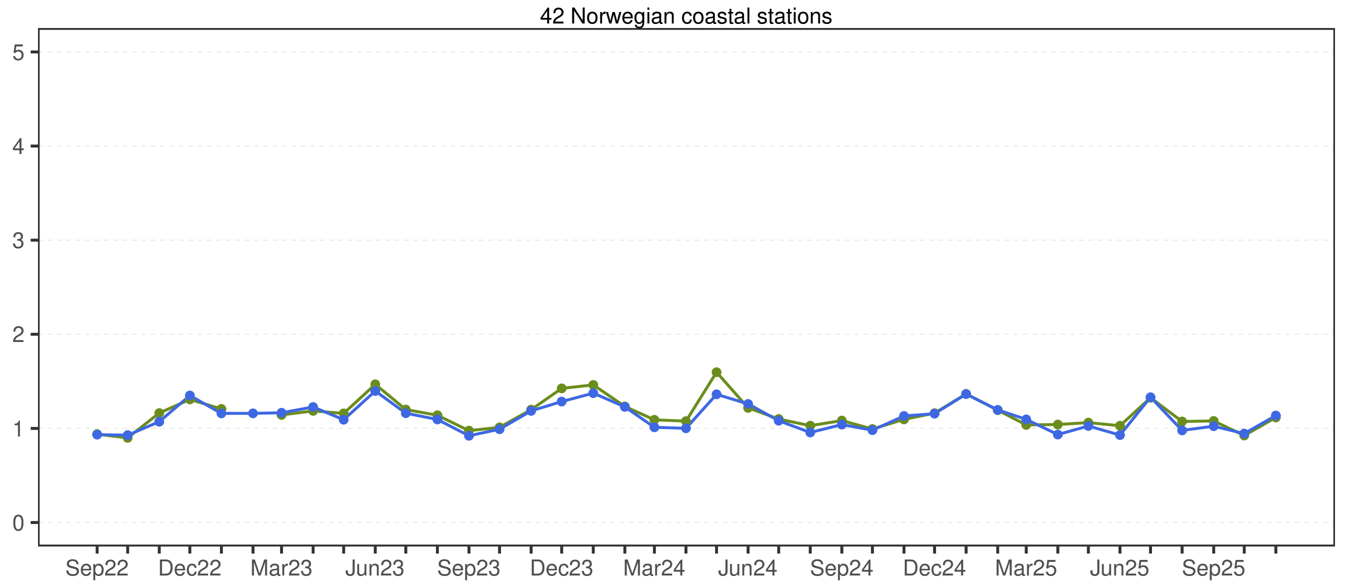

Mean Absolute Error
75 North Nor. stations
00+3,+6,..., +66
3.0
2.5
2.0
1.5
1.0
0.5
3 9 15 24 33 42 51 60
Lead time (hour)

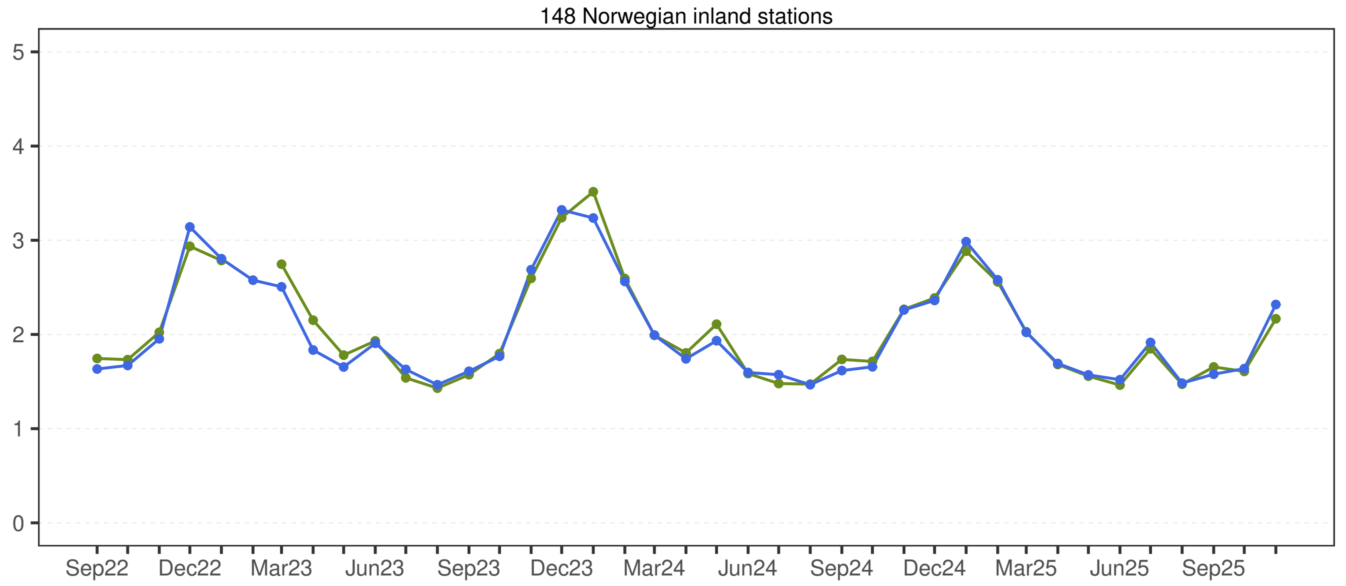

Mean Error
262 Norwegian stations
00+24,+30,+36,+42
IFS
MEPSctrl
1
0
−1
−2
−3
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25

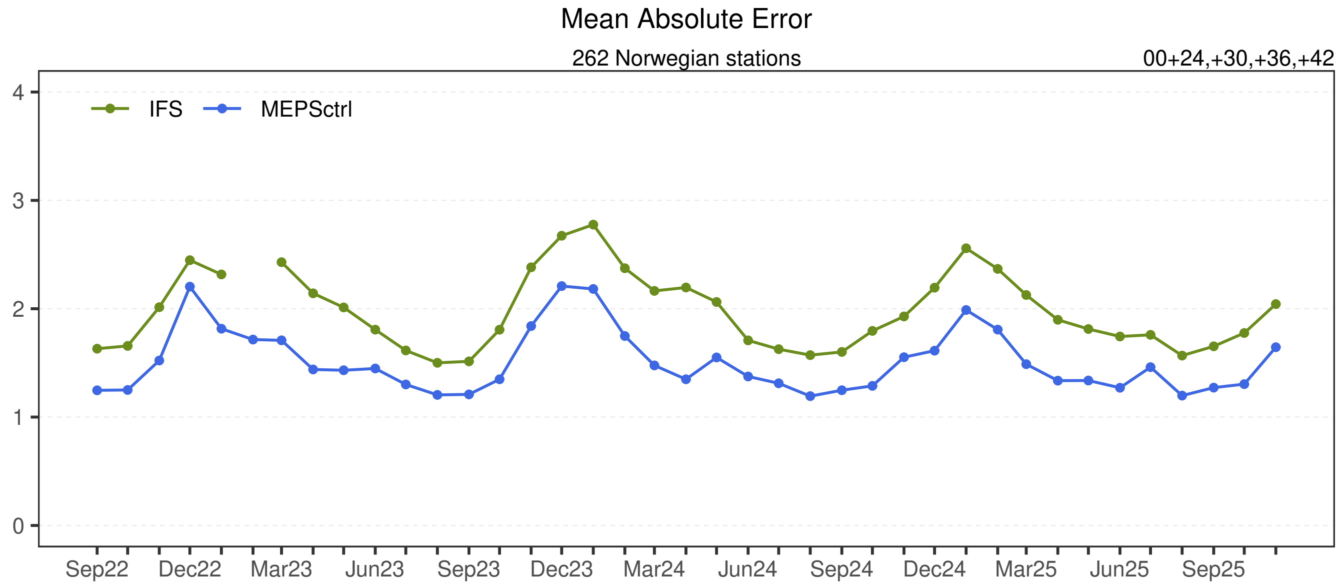

42 Norwegian coastal stations
1
0
−1
−2
−3
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25

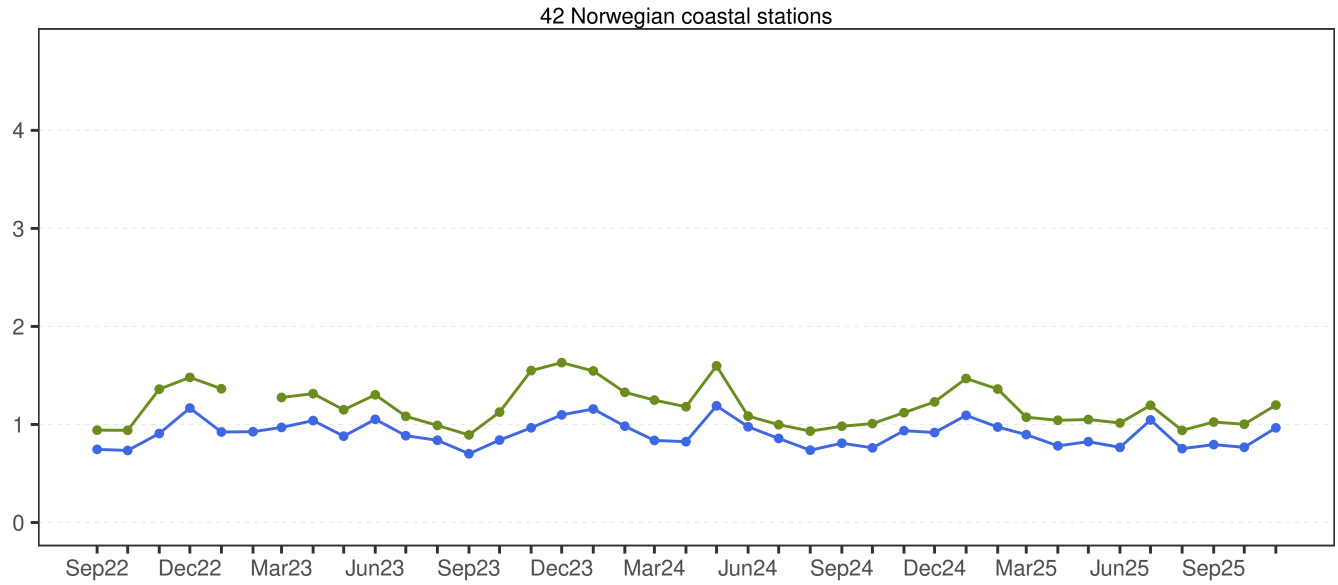

148 Norwegian inland stations
1
0
−1
−2
−3
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25

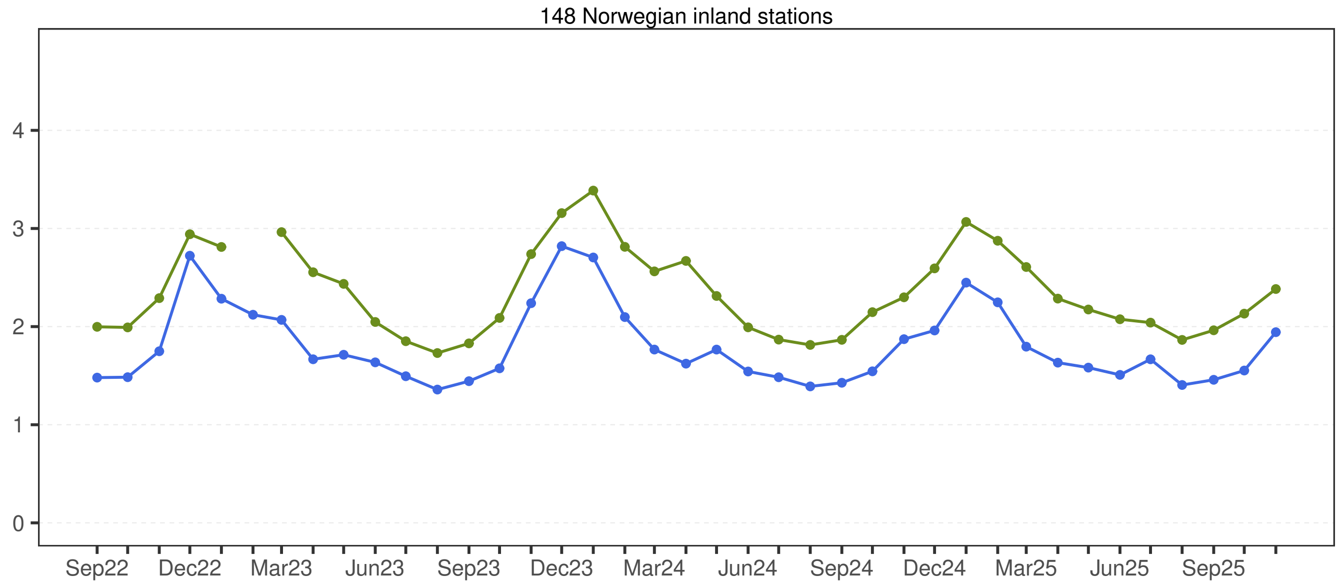

Standard Deviation of Error
262 Norwegian stations
00+24,+30,+36,+42
IFS
MEPSctrl
0
1
2
3
4
5
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25


42 Norwegian coastal stations
0
1
2
3
4
5
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25


148 Norwegian inland stations
0
1
2
3
4
5
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25

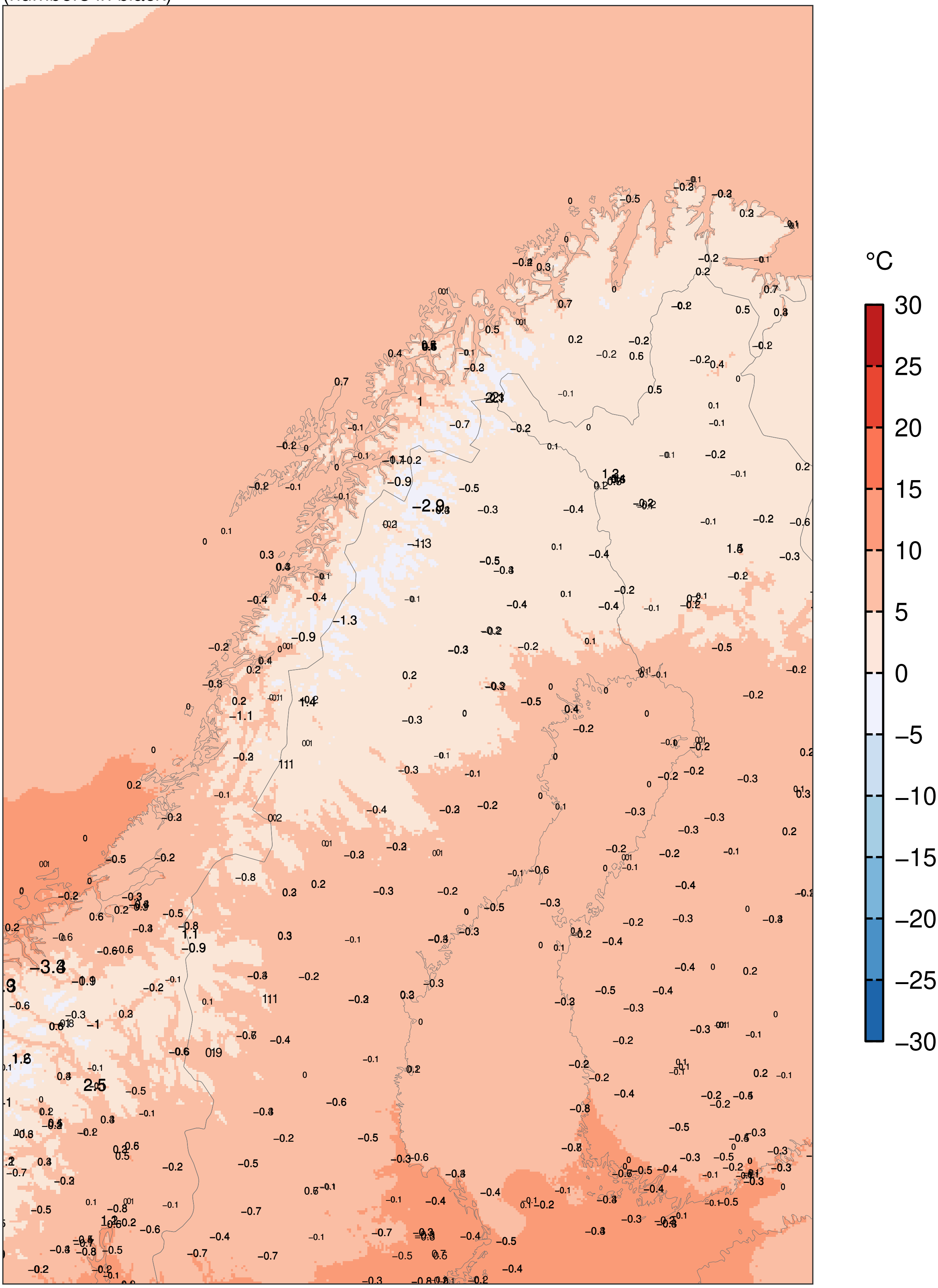

Mean Absolute Error
262 Norwegian stations
00+24,+30,+36,+42
IFS
MEPSctrl
0
1
2
3
4
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25


42 Norwegian coastal stations
0
1
2
3
4
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25


148 Norwegian inland stations
0
1
2
3
4
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25

MEPSctrl 00+12

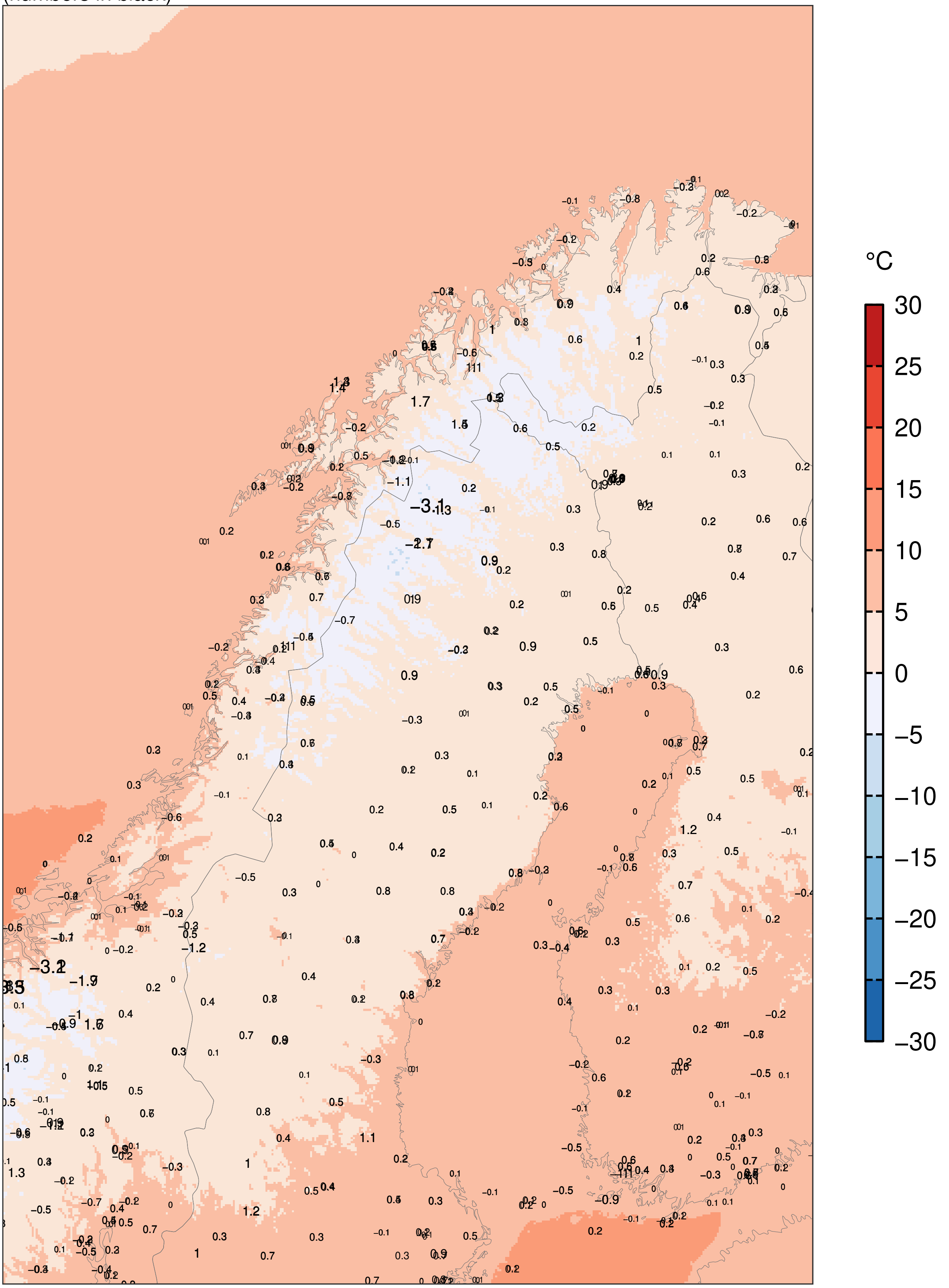
ME at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+24

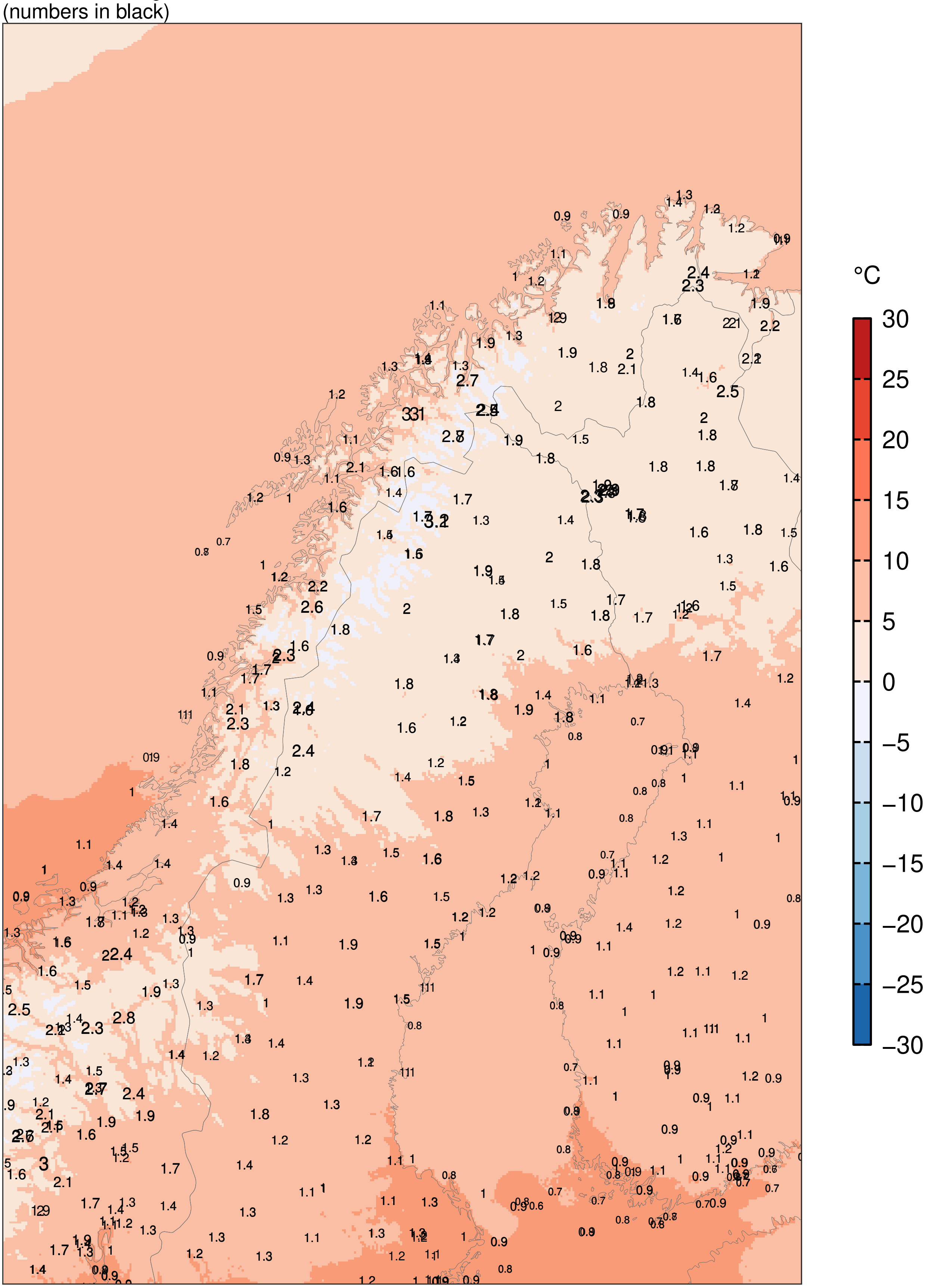
ME at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+12

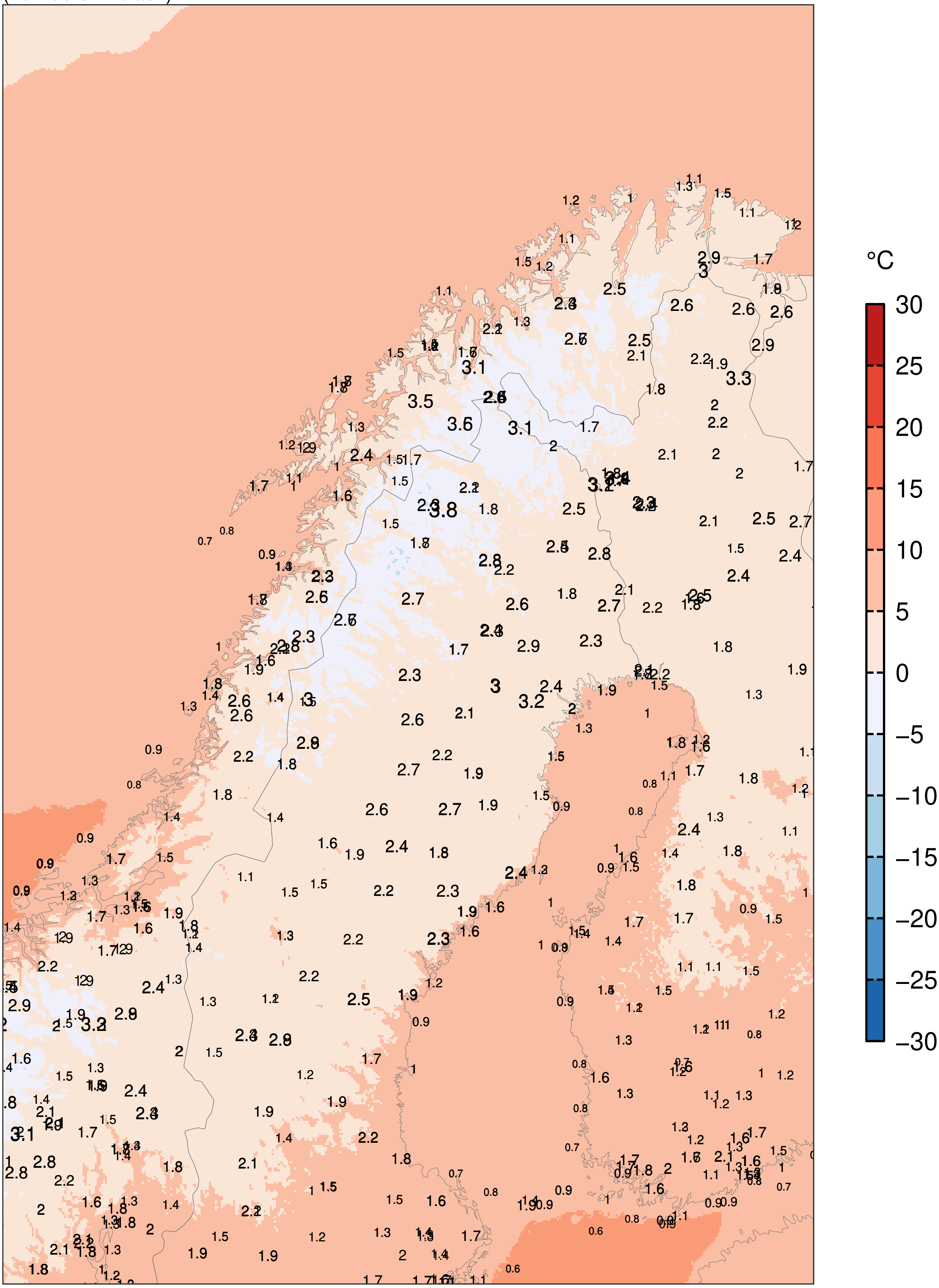
SDE at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+24

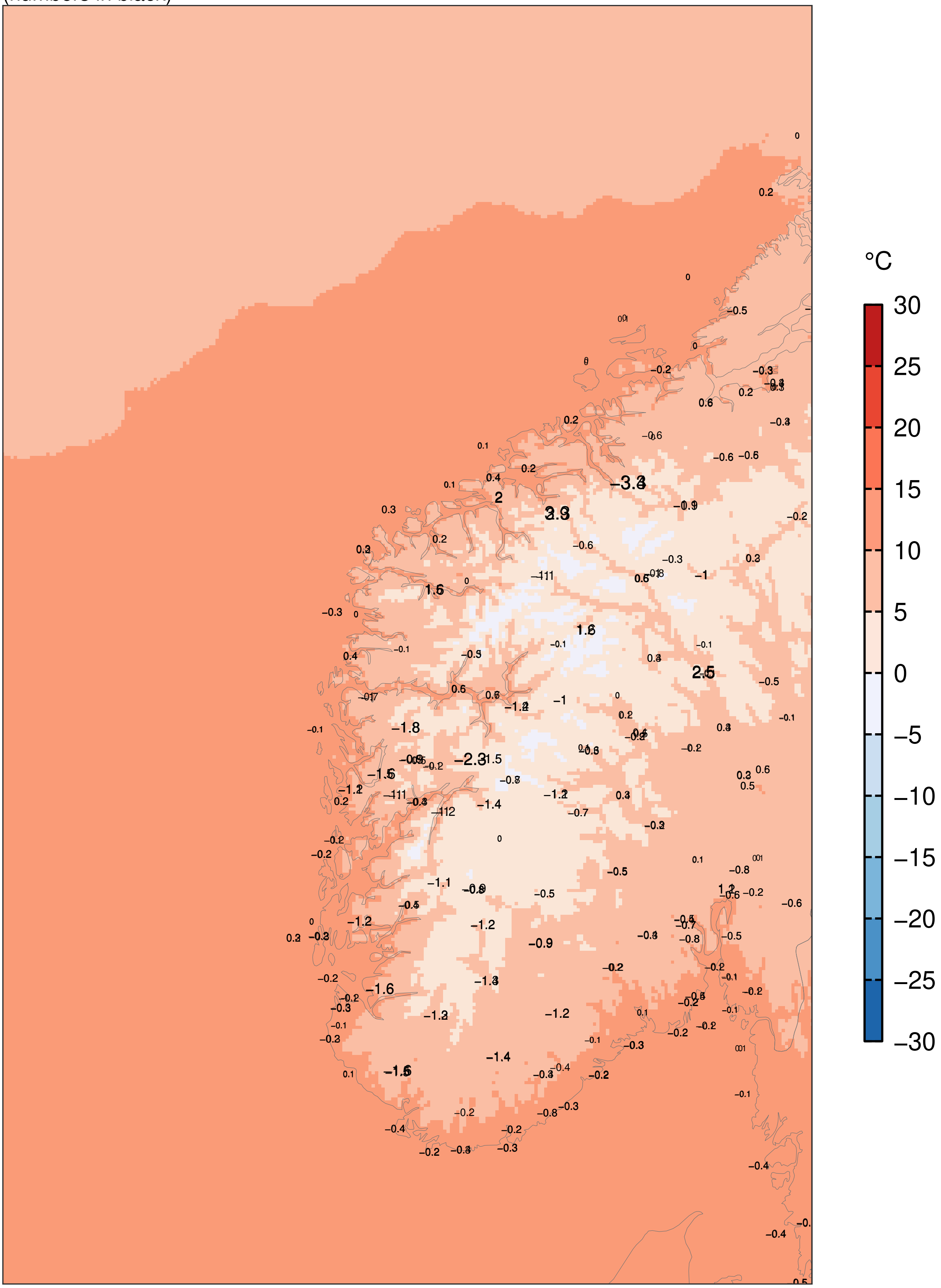
SDE at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+12

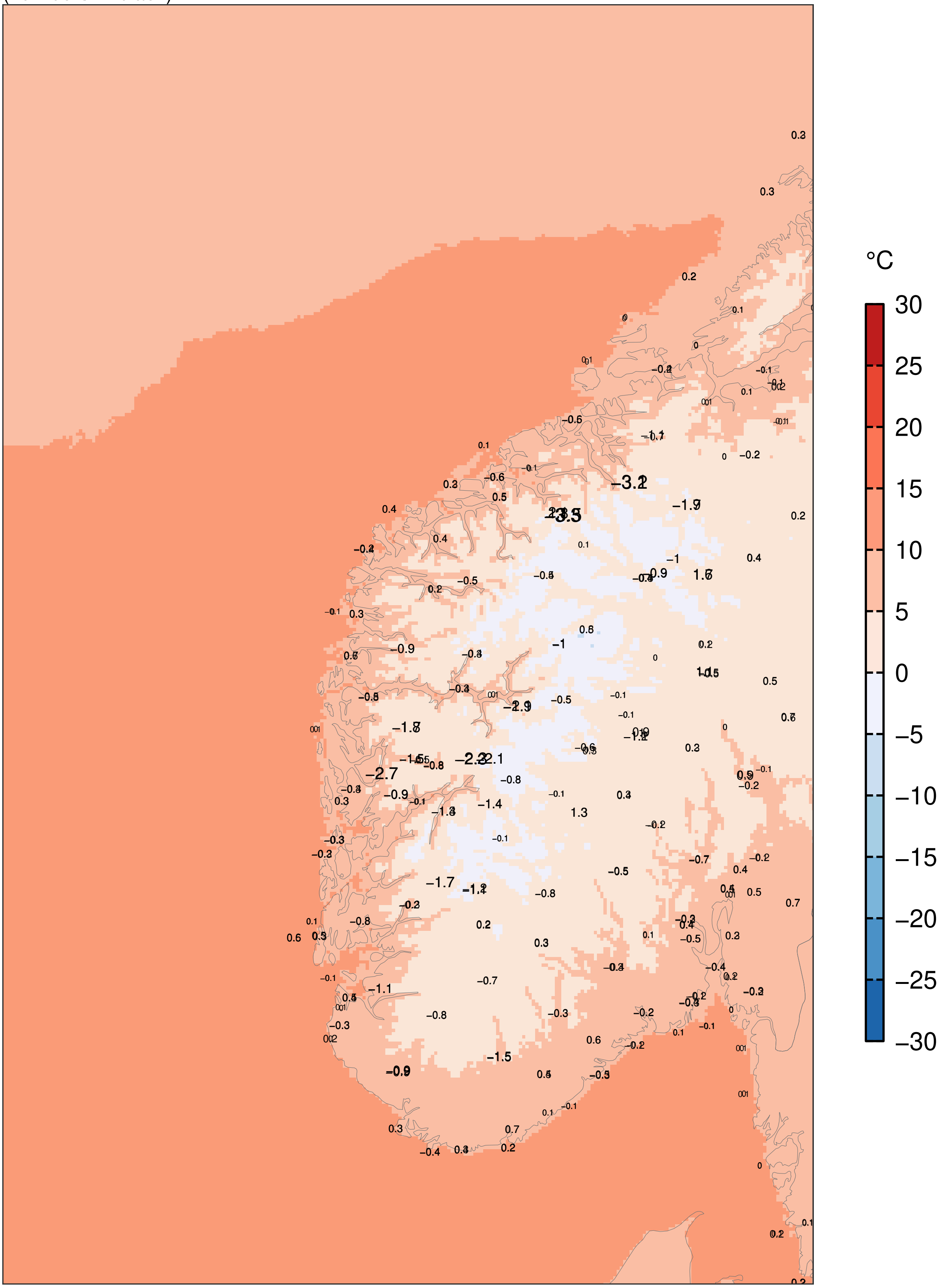
ME at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+24

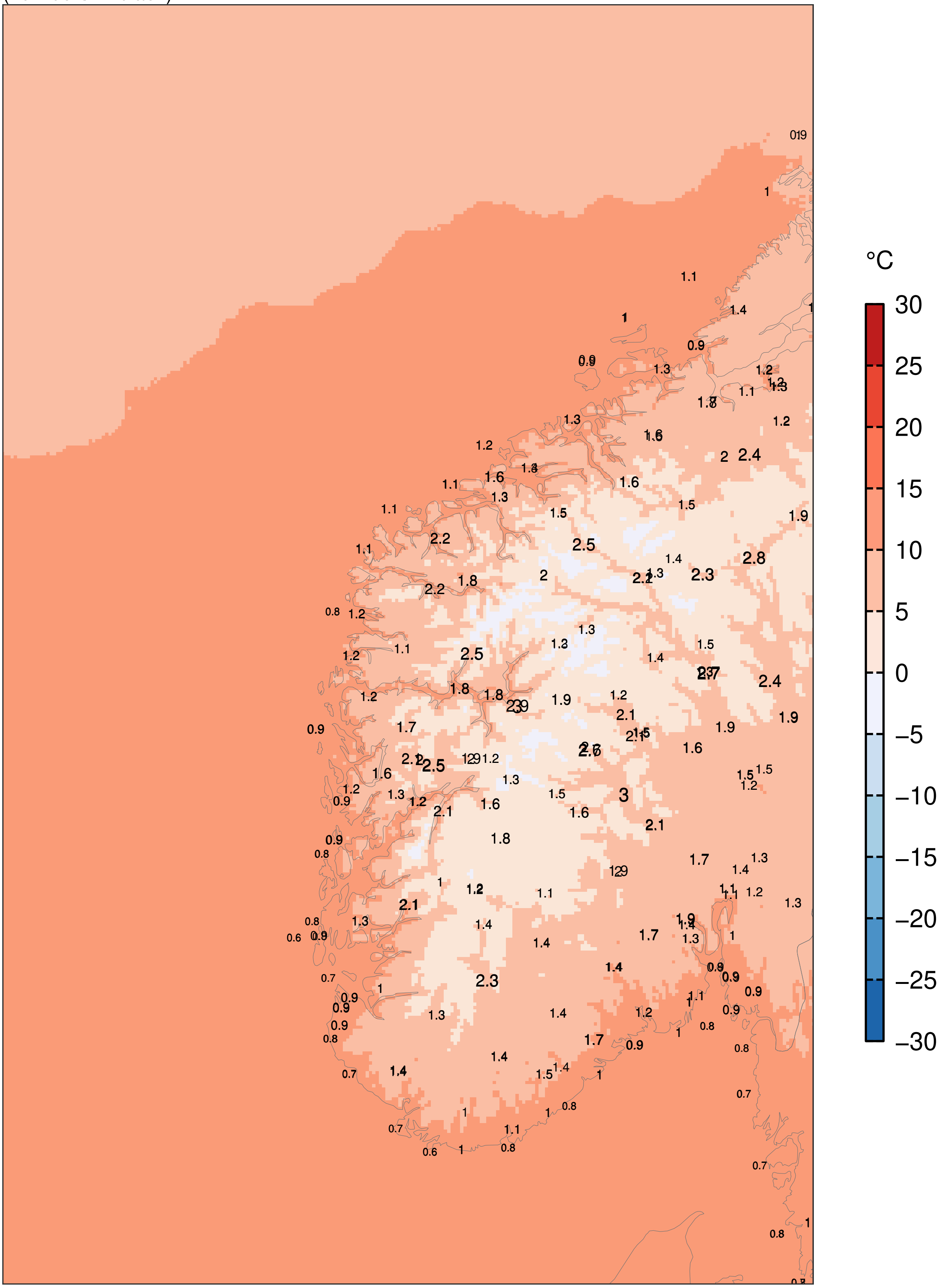
ME at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+12

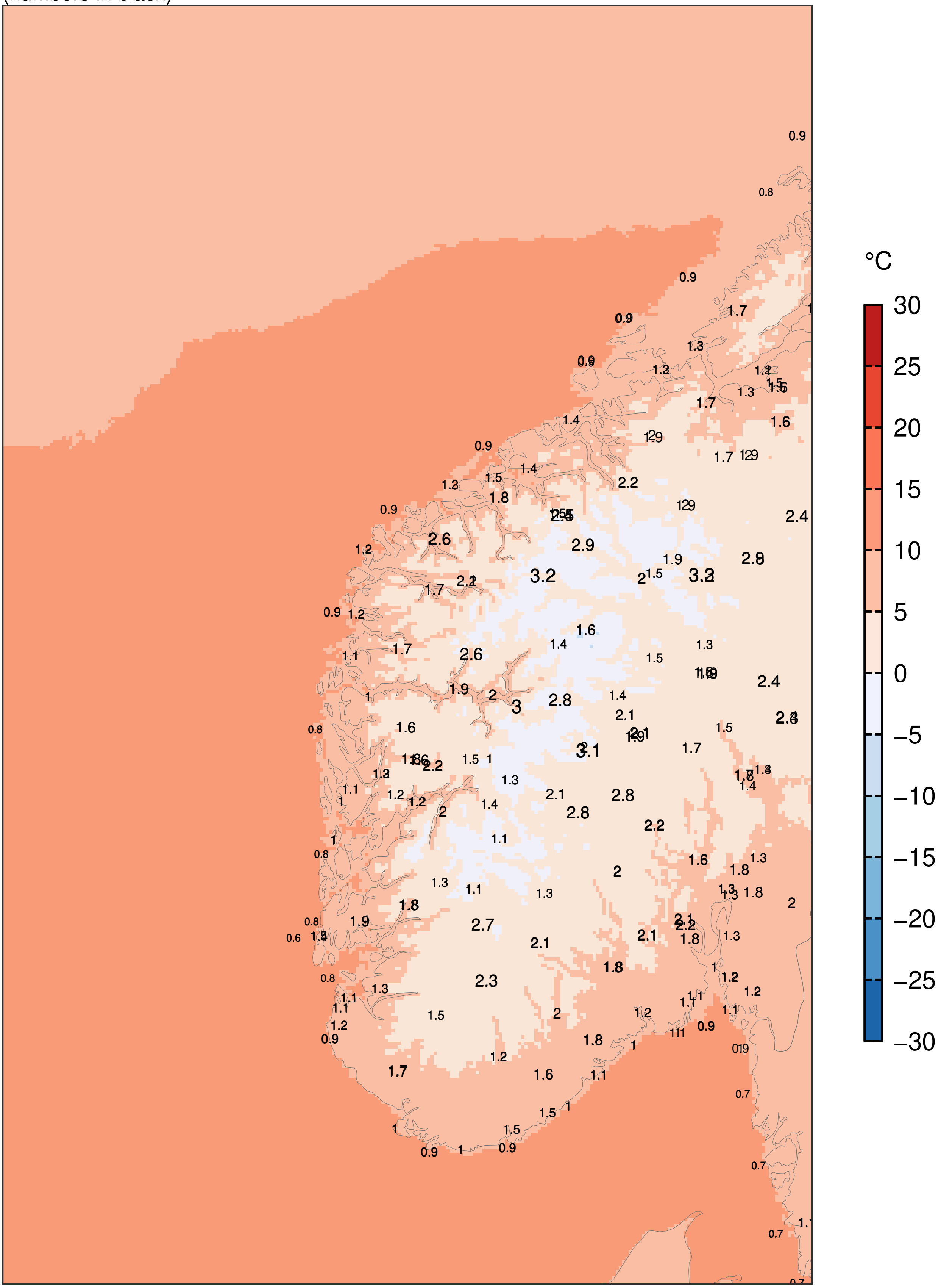
SDE at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+24

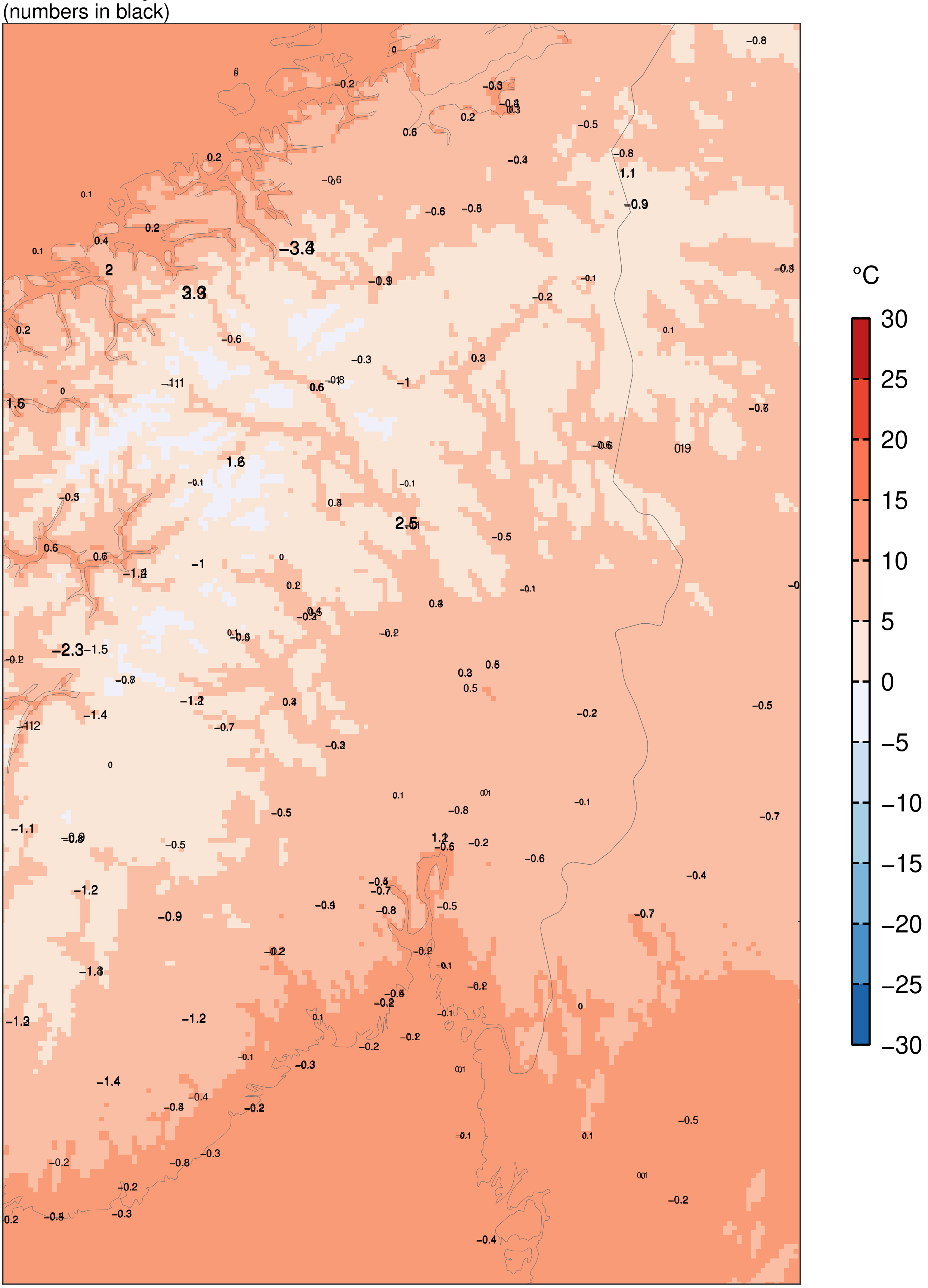
SDE at observing sites
(numbers in black)



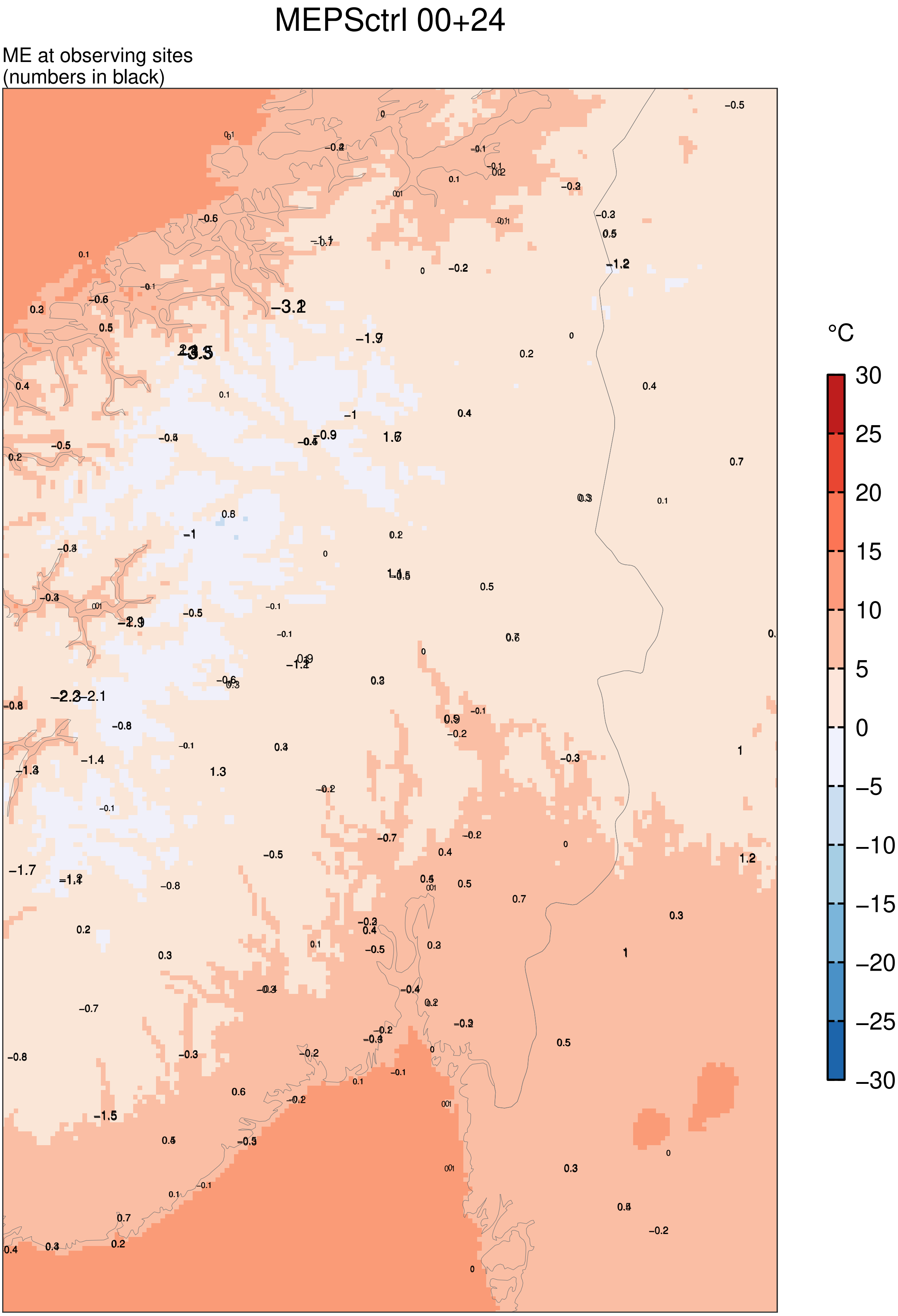
Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+12

ME at observing sites
(numbers in black)



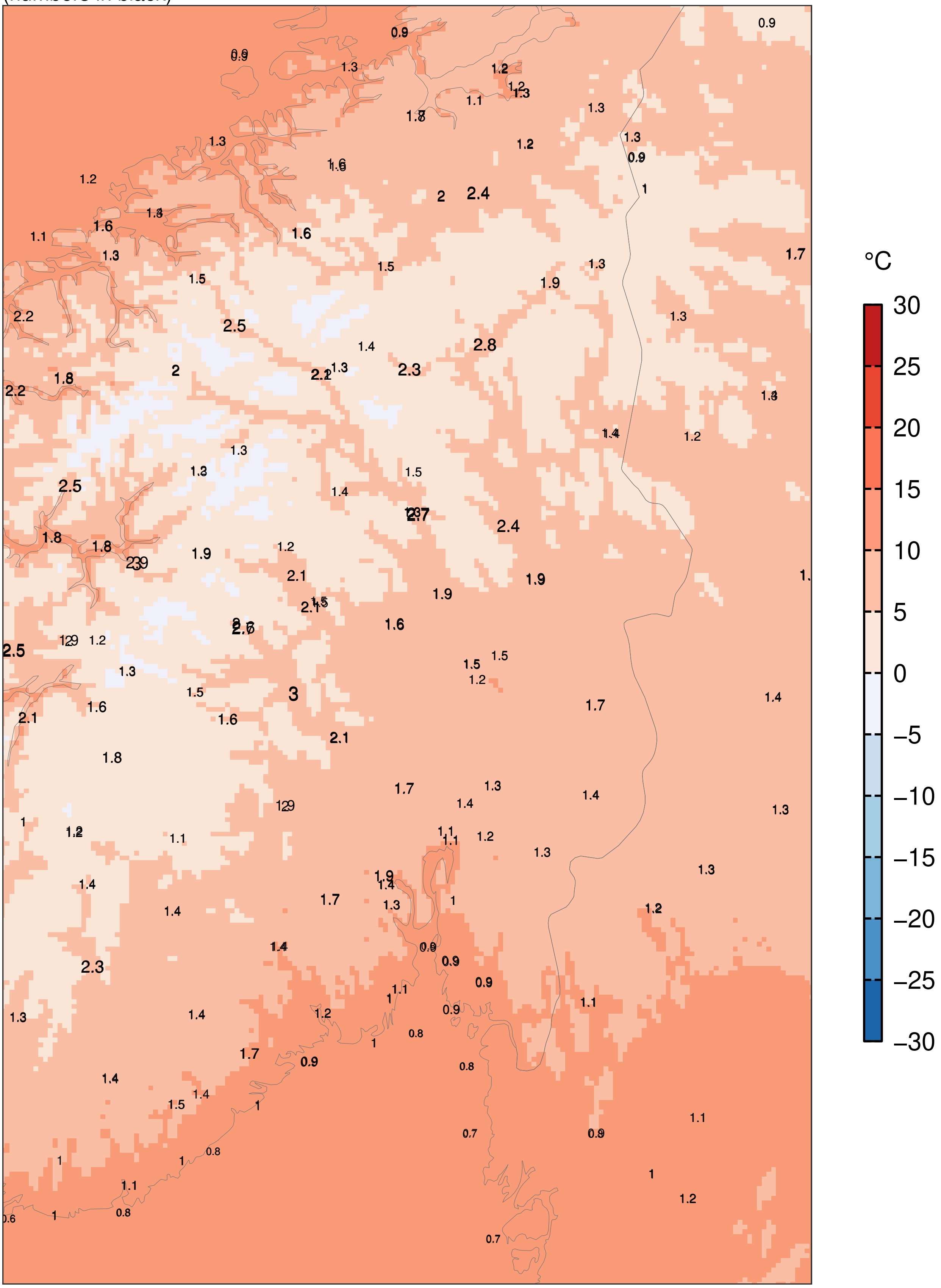
Model "climatology" 01.09.2025–30.11.2025



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+12

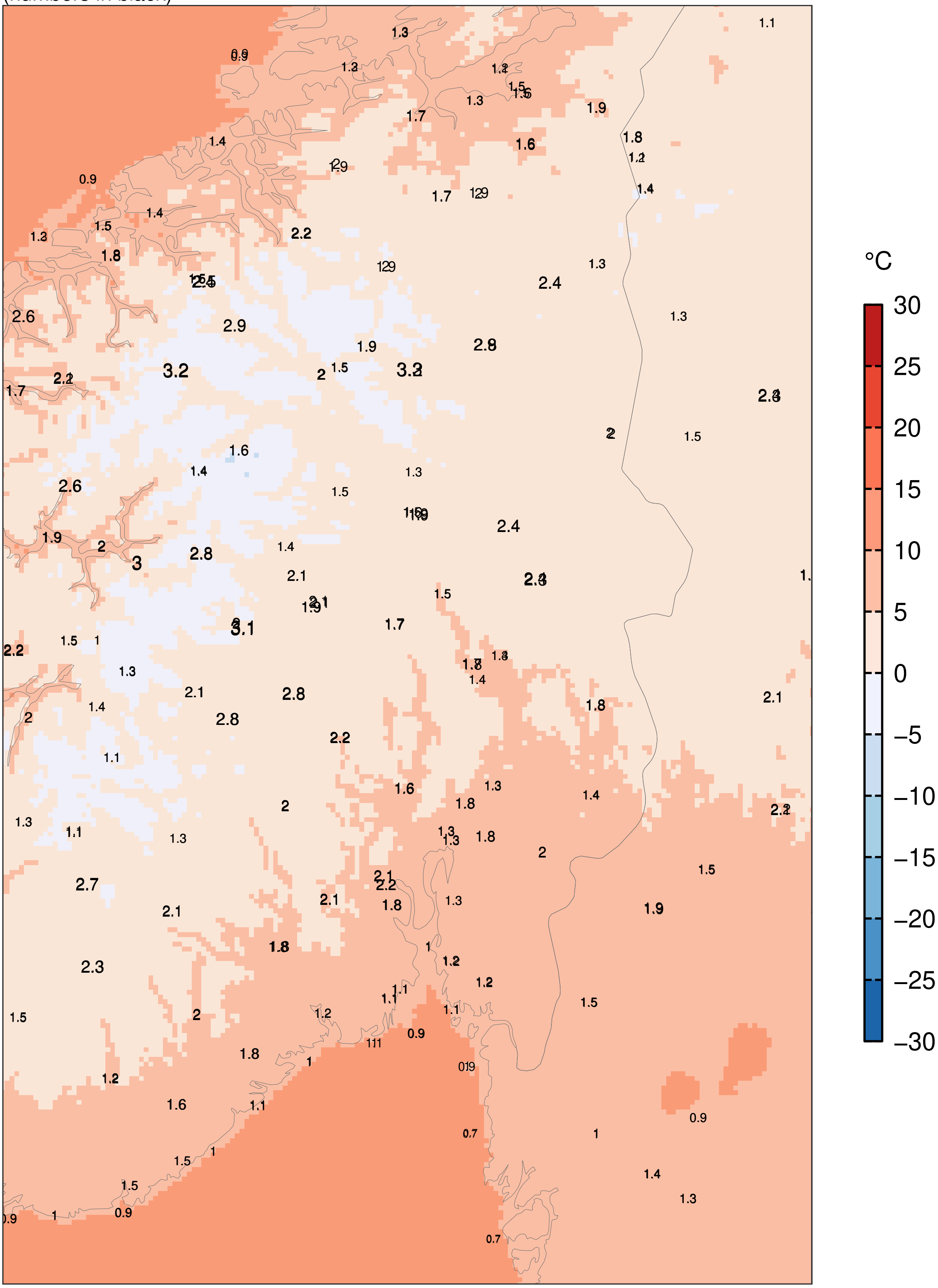
SDE at observing sites
(numbers in black)



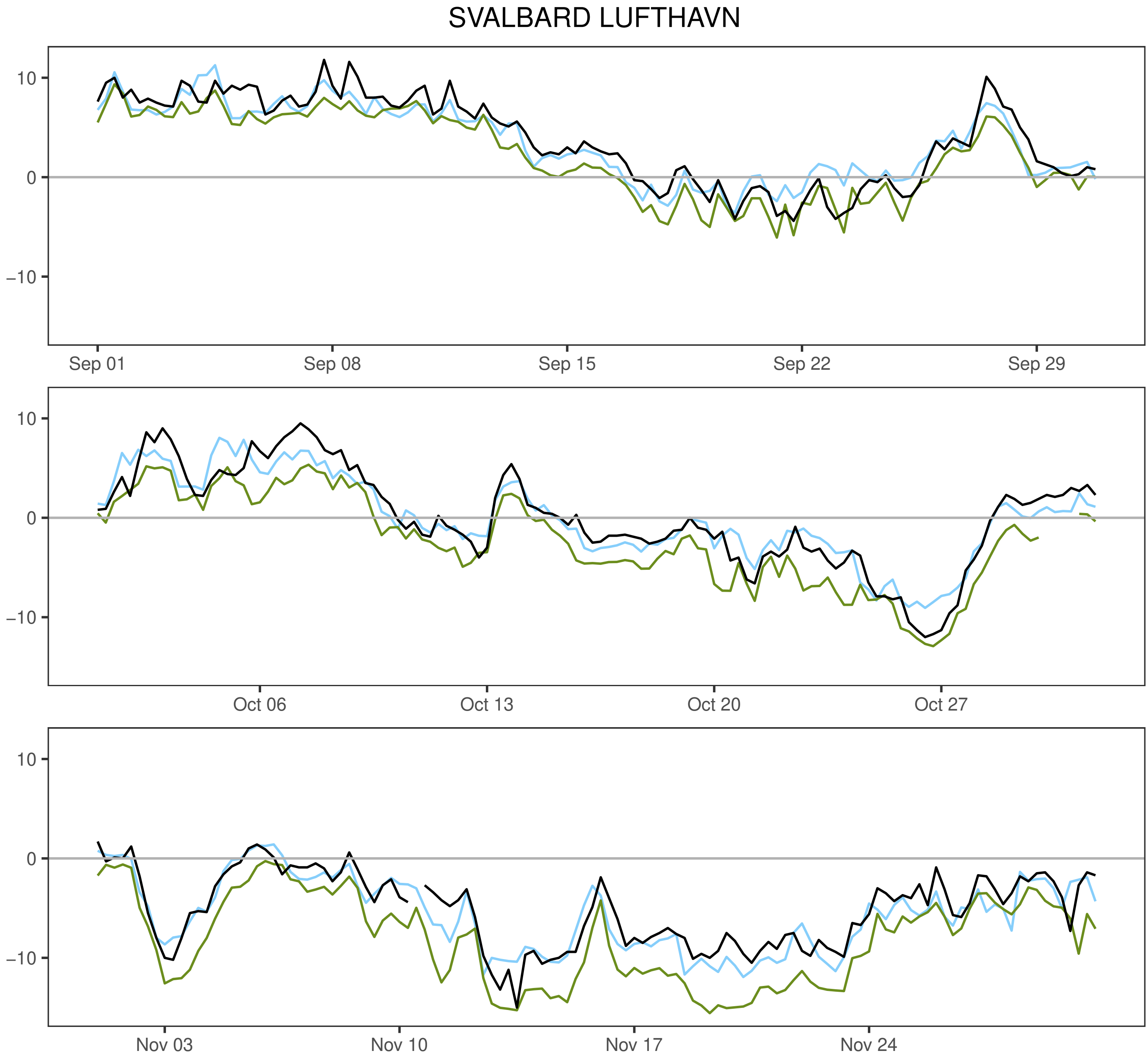
Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+24

SDE at observing sites
(numbers in black)

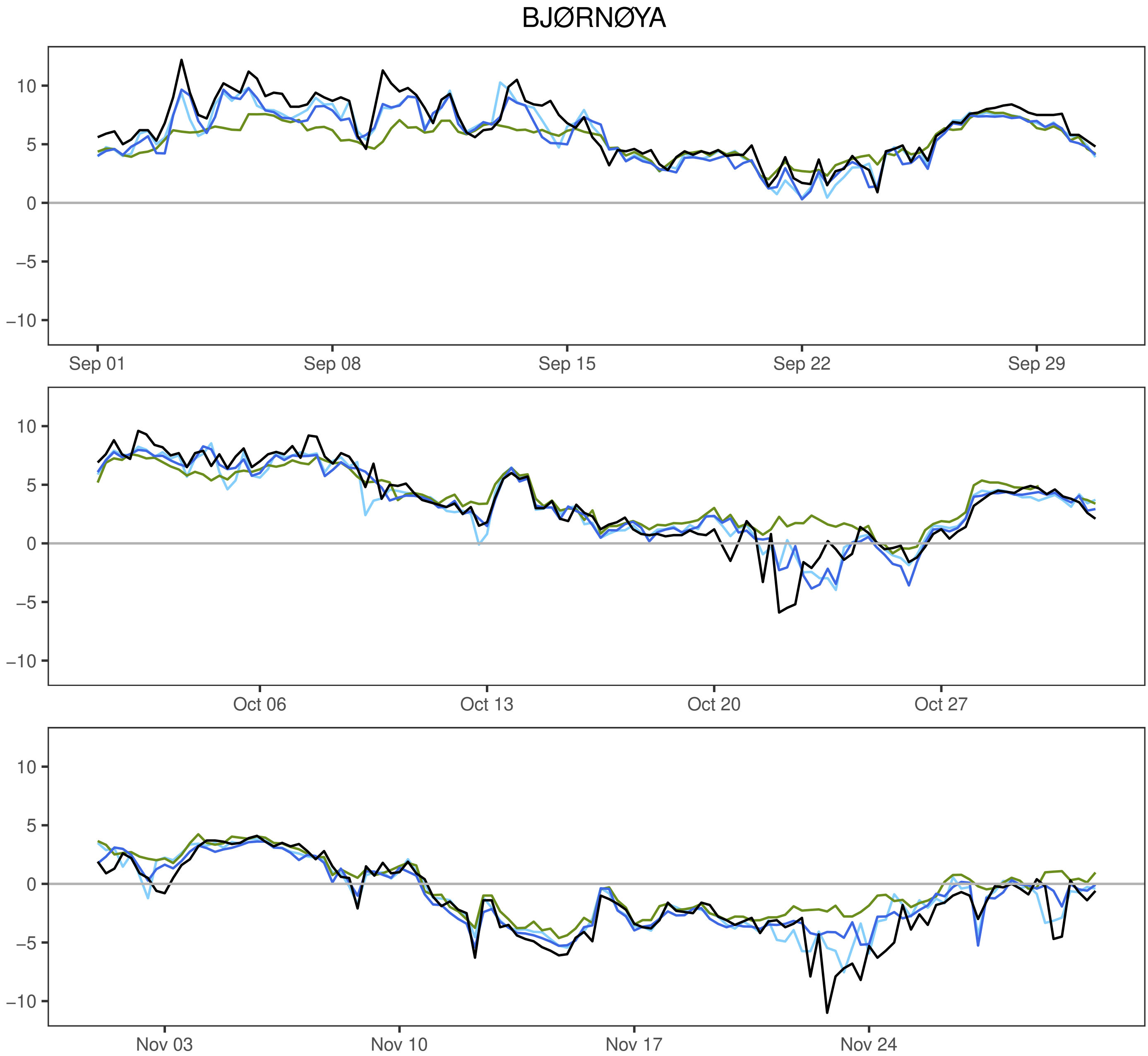


Model "climatology" 01.09.2025–30.11.2025



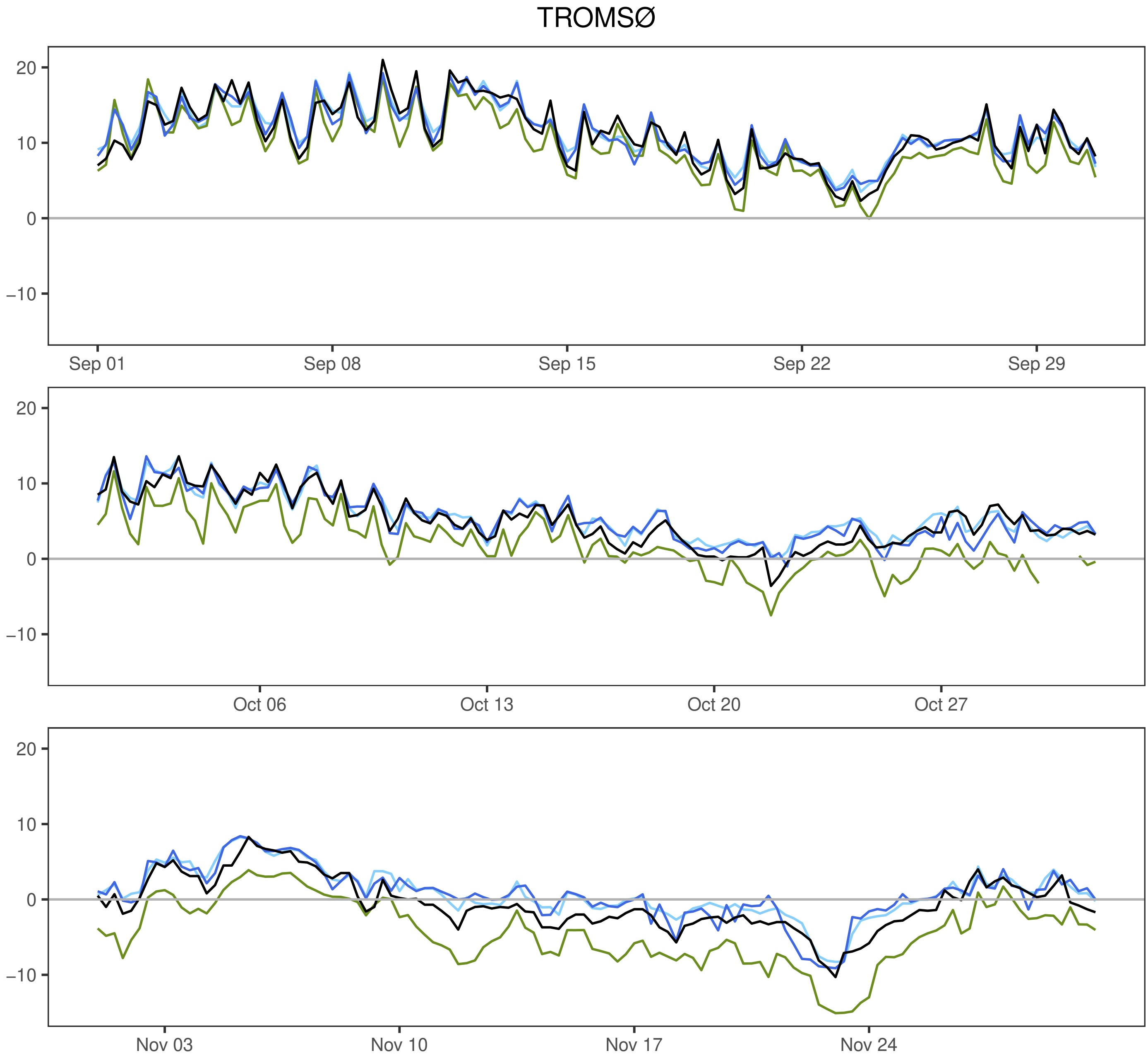
	Min	Mean	Max	Std	N
synop: 00,06,12,18	−15.0	−0.4	11.8	5.7	363
AA25: 12+18,+24,+30,+36	−11.9	−0.7	11.3	5.4	364
IFS: 12+18,+24,+30,+36	−15.6	−2.8	9.3	6.2	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
AA25 – synop	−0.2	1.6	1.6	1.3	4.9	359
IFS – synop	−2.3	1.6	2.8	2.4	8.3	359



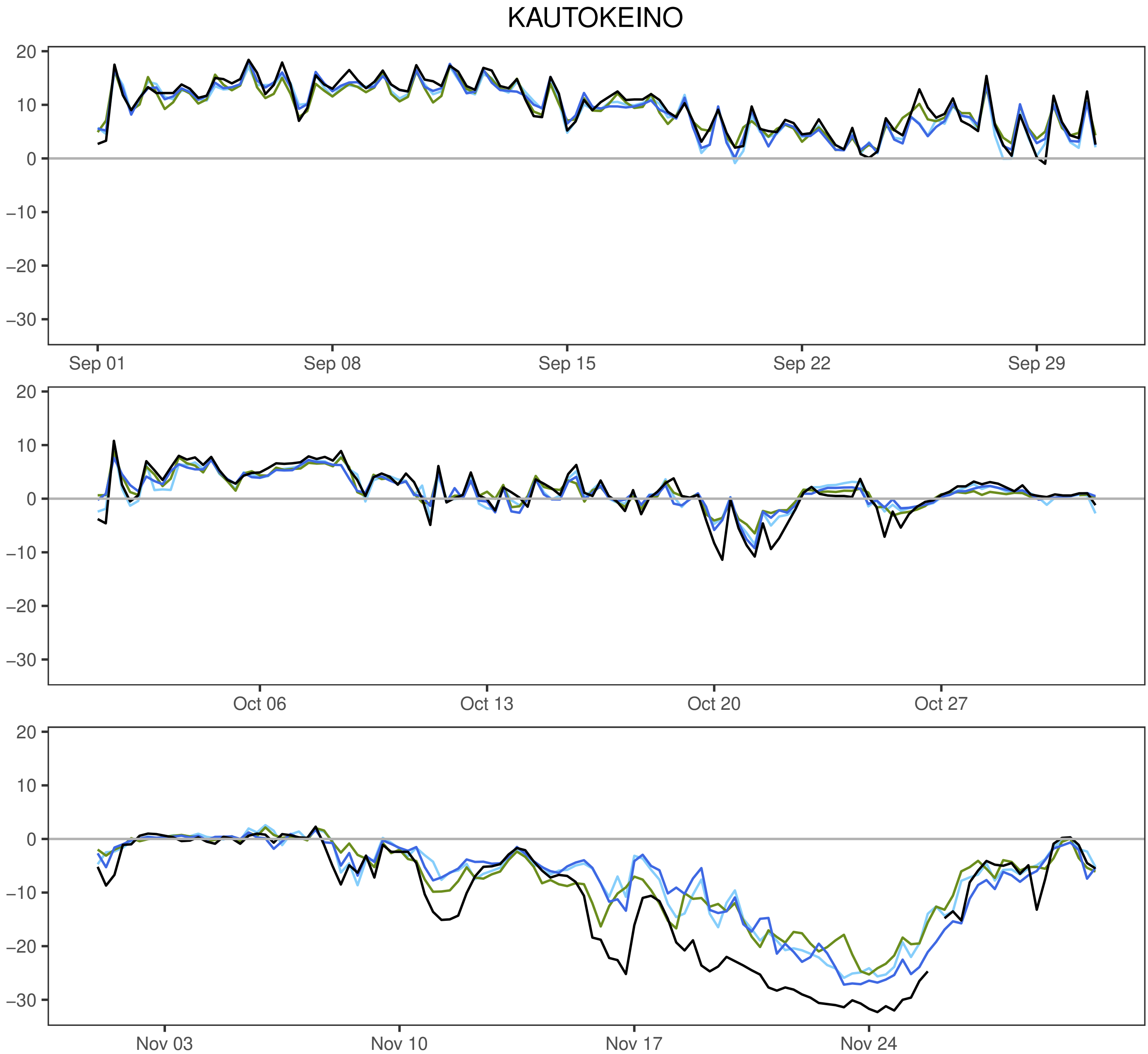
	Min	Mean	Max	Std	N
synop: 00,06,12,18	–11.0	2.8	12.2	4.4	364
MEPSctrl: 12+18,+24,+30,+36	–5.4	2.6	9.8	3.9	364
AA25: 12+18,+24,+30,+36	–7.5	2.6	10.3	4.0	364
IFS: 12+18,+24,+30,+36	–4.6	2.9	7.9	3.2	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	–0.2	1.2	1.2	0.9	6.9	360
AA25 – synop	–0.1	1.2	1.2	0.8	5.8	360
IFS – synop	0.2	1.9	1.9	1.3	8.6	360



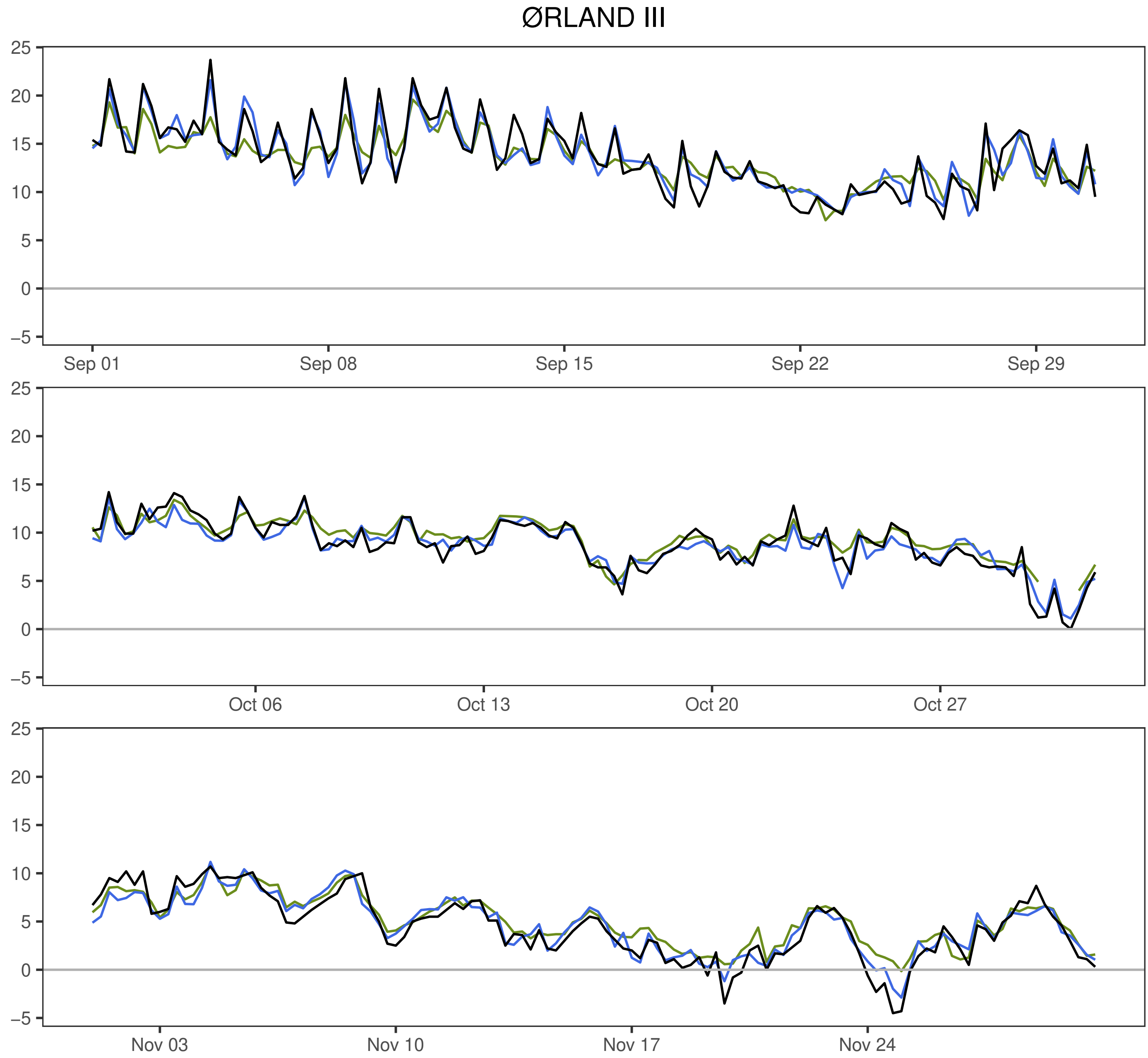
	Min	Mean	Max	Std	N
synop: 00,06,12,18	−10.3	5.3	21.0	6.0	364
MEPSctrl: 12+18,+24,+30,+36	−9.1	5.9	19.2	5.6	364
AA25: 12+18,+24,+30,+36	−8.3	6.1	19.3	5.5	364
IFS: 12+18,+24,+30,+36	−15.1	2.5	18.7	7.1	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.6	1.5	1.6	1.3	4.6	360
AA25 – synop	0.8	1.3	1.5	1.3	5.3	360
IFS – synop	−2.8	1.9	3.3	2.9	8.0	360



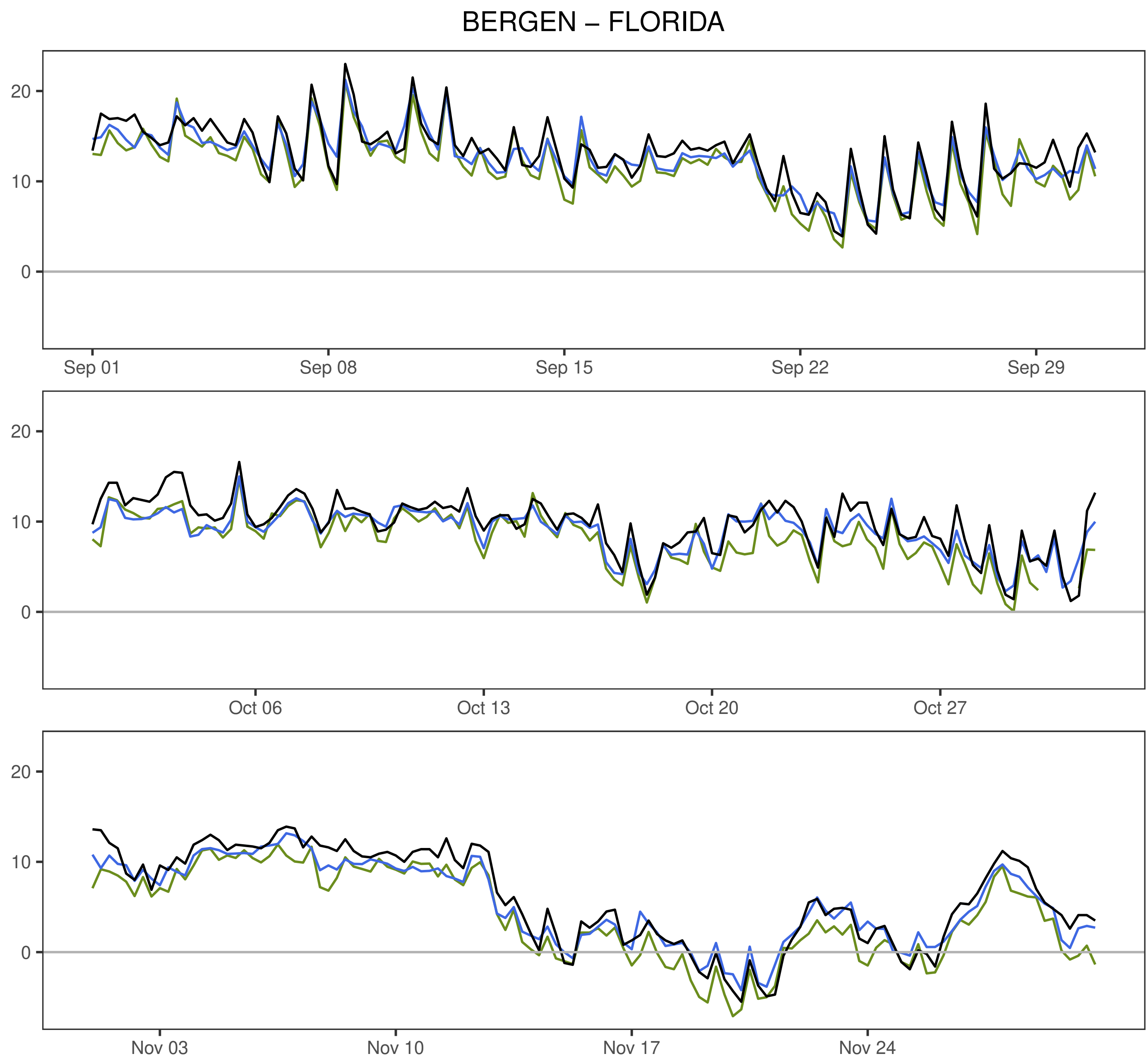
	Min	Mean	Max	Std	N
synop: 00,06,12,18	–32.3	0.0	18.4	11.3	363
MEPSctrl: 12+18,+24,+30,+36	–27.2	0.9	18.2	9.1	364
AA25: 12+18,+24,+30,+36	–25.9	0.9	17.1	8.8	364
IFS: 12+18,+24,+30,+36	–25.3	1.0	18.3	8.7	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	1.0	3.5	3.6	2.2	18.2	359
AA25 – synop	1.0	3.5	3.6	2.2	16.0	359
IFS – synop	1.1	3.5	3.7	2.2	16.2	359



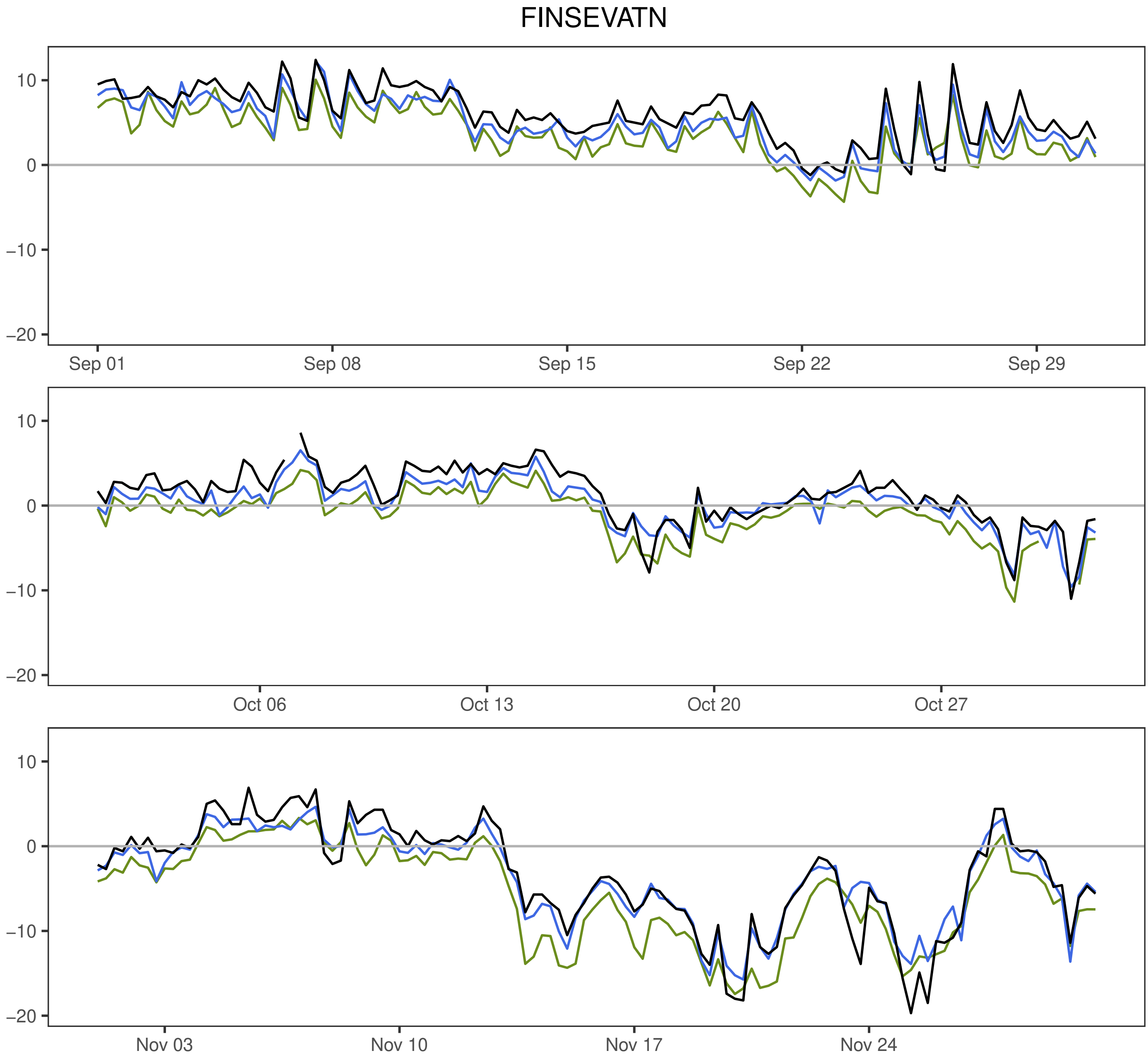
	Min	Mean	Max	Std	N
synop: 00,06,12,18	−4.5	9.0	23.7	5.0	364
MEPSctrl: 12+18,+24,+30,+36	−2.9	9.0	21.6	4.6	364
IFS: 12+18,+24,+30,+36	−0.1	9.3	19.6	4.1	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.0	1.1	1.1	0.9	4.2	360
IFS – synop	0.3	1.4	1.5	1.1	5.9	360



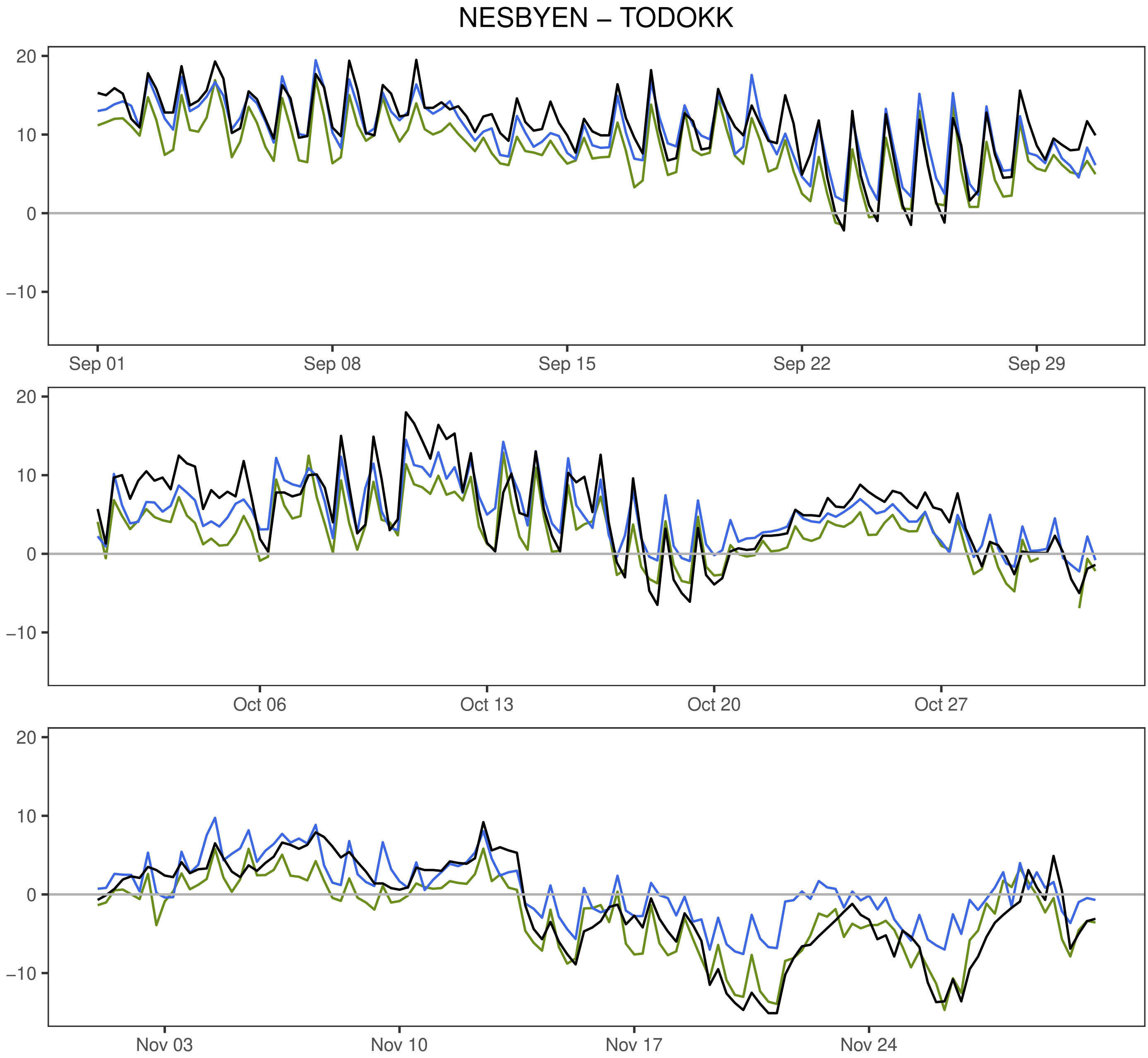
	Min	Mean	Max	Std	N
synop: 00,06,12,18	–5.5	9.6	23.0	4.9	364
MEPSctrl: 12+18,+24,+30,+36	–4.2	8.9	21.3	4.5	364
IFS: 12+18,+24,+30,+36	–7.1	7.9	21.0	5.0	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	–0.7	1.4	1.5	1.2	4.5	360
IFS – synop	–1.7	1.3	2.1	1.8	6.5	360



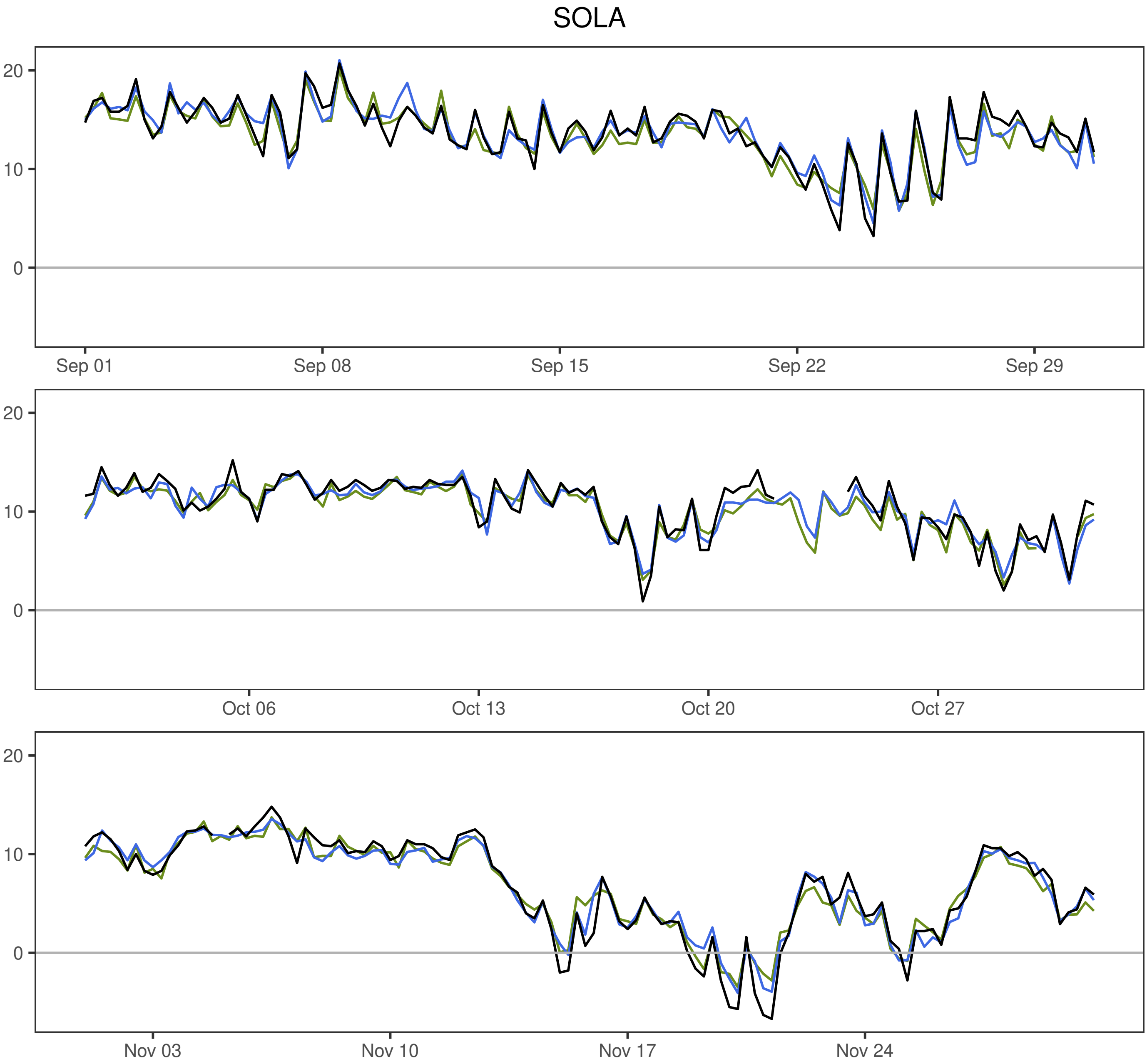
	Min	Mean	Max	Std	N
synop: 00,06,12,18	−19.7	1.2	12.4	5.9	363
MEPSctrl: 12+18,+24,+30,+36	−15.7	0.4	12.2	5.2	364
IFS: 12+18,+24,+30,+36	−17.4	−1.1	10.1	5.6	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	−0.8	1.5	1.7	1.3	9.7	359
IFS – synop	−2.3	1.5	2.8	2.6	7.3	359



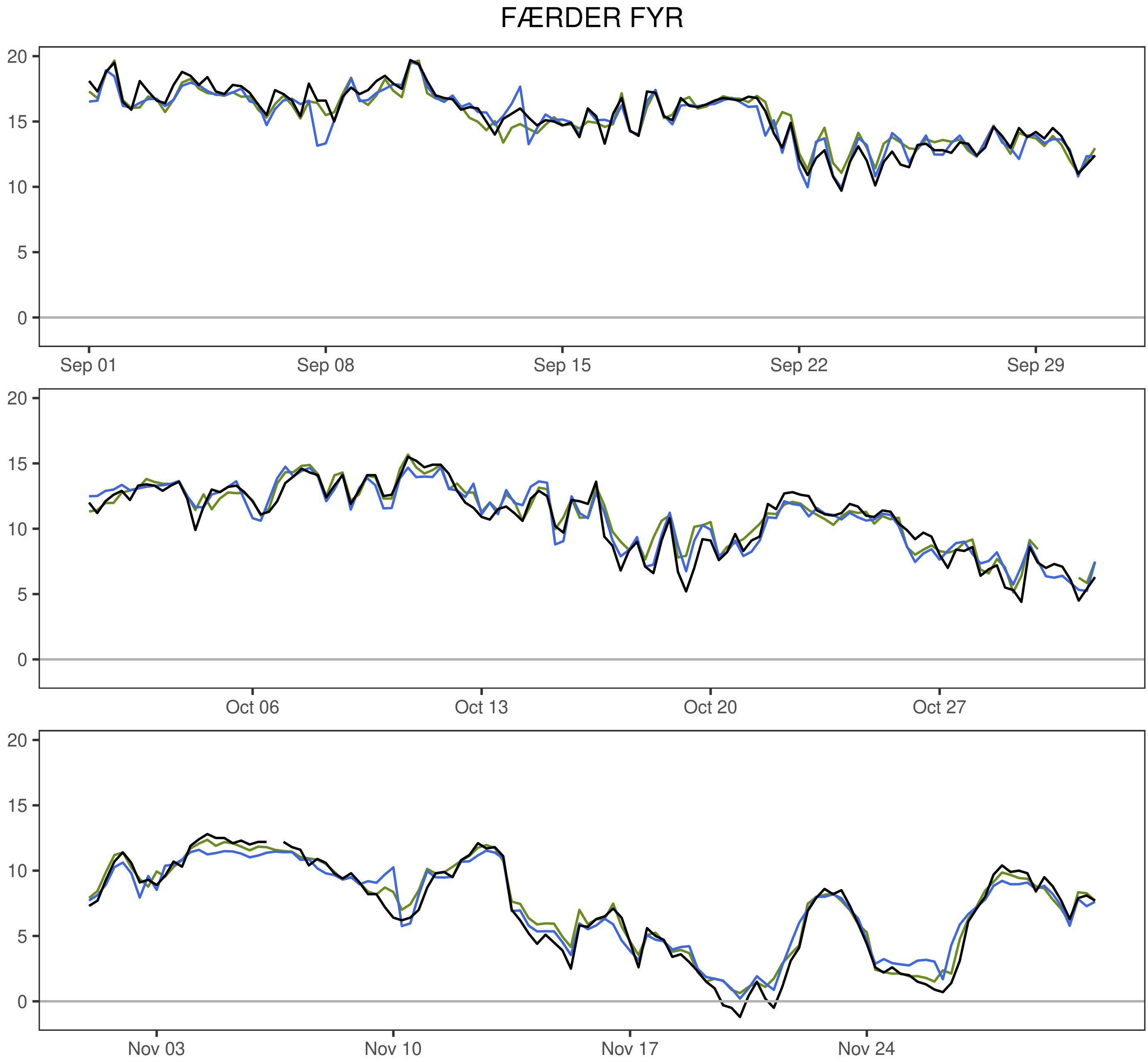
	Min	Mean	Max	Std	N
synop: 00,06,12,18	−15.1	4.8	19.5	7.4	364
MEPSctrl: 12+18,+24,+30,+36	−7.6	5.3	19.5	5.6	364
IFS: 12+18,+24,+30,+36	−14.7	2.7	17.1	6.1	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.5	3.0	3.0	2.4	9.9	360
IFS – synop	−2.1	2.4	3.2	2.8	7.8	360



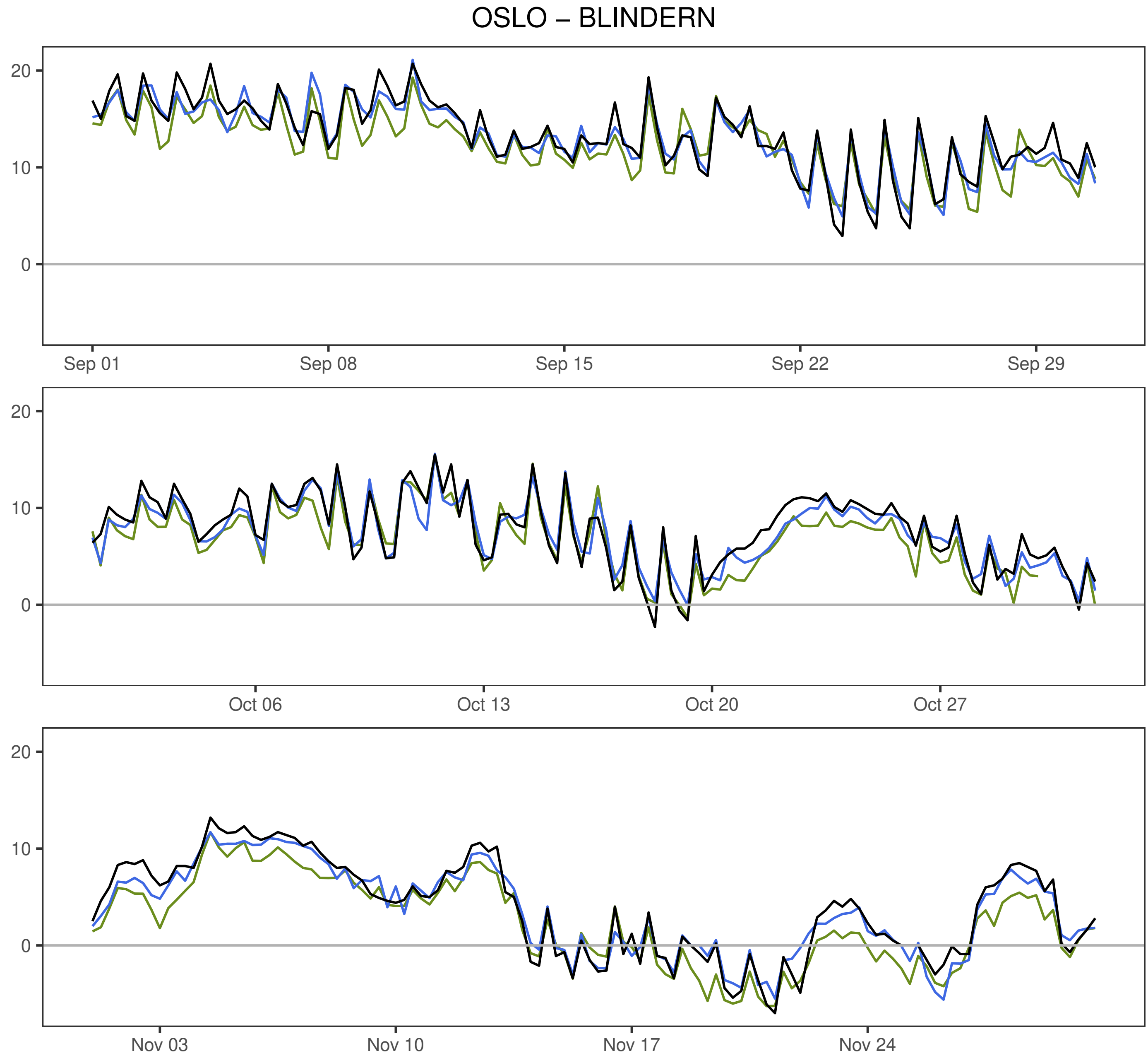
	Min	Mean	Max	Std	N
synop: 00,06,12,18	–6.7	10.3	20.7	4.8	355
MEPSctrl: 12+18,+24,+30,+36	–4.1	10.2	21.0	4.4	364
IFS: 12+18,+24,+30,+36	–3.5	10.1	20.1	4.3	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.0	1.1	1.1	0.8	4.0	351
IFS – synop	–0.2	1.1	1.2	0.9	4.2	351



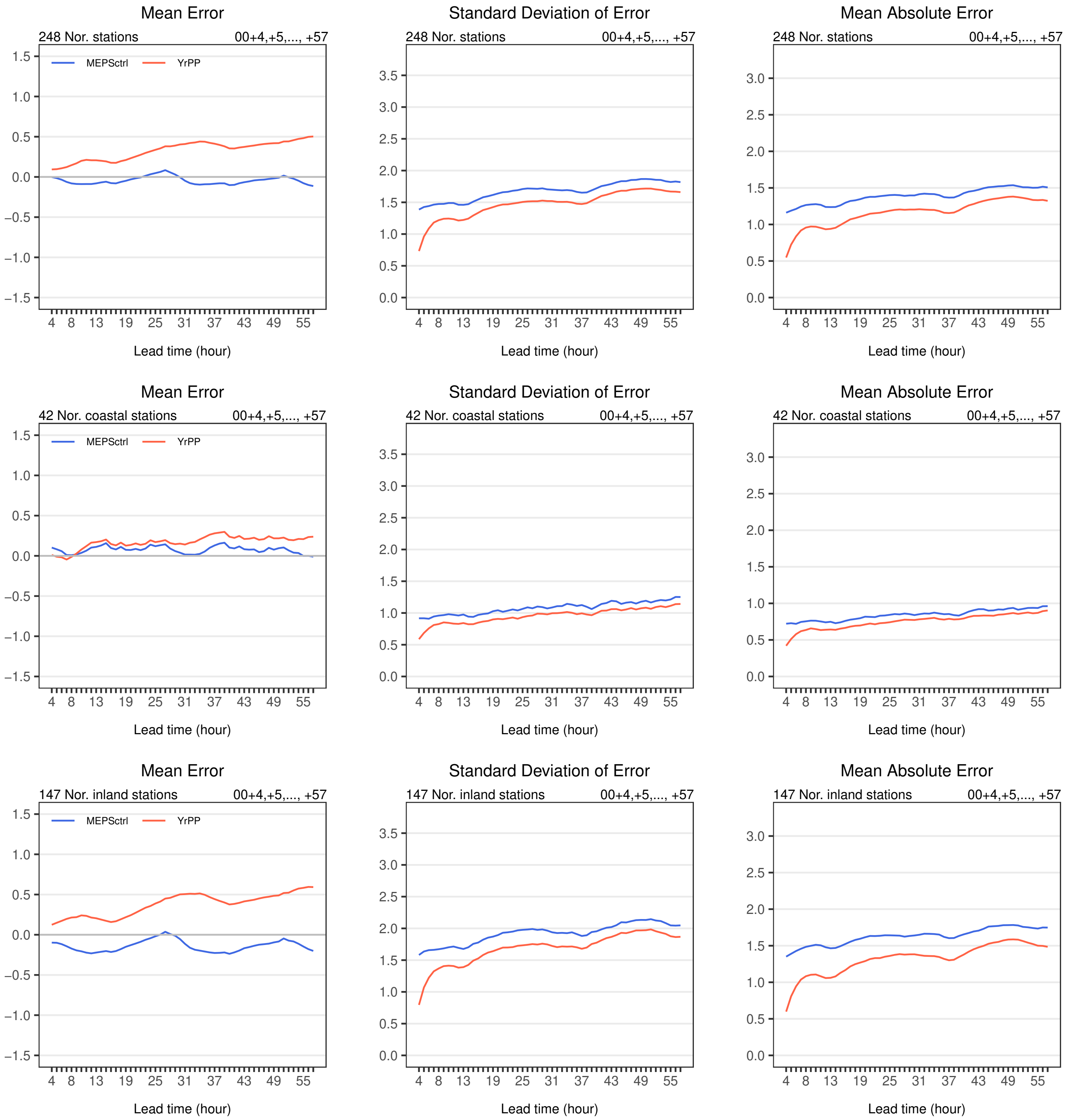
	Min	Mean	Max	Std	N
synop: 00,06,12,18	–1.2	11.1	19.7	4.5	363
MEPSctrl: 12+18,+24,+30,+36	0.2	11.1	19.6	4.2	364
IFS: 12+18,+24,+30,+36	0.6	11.3	19.7	4.2	360

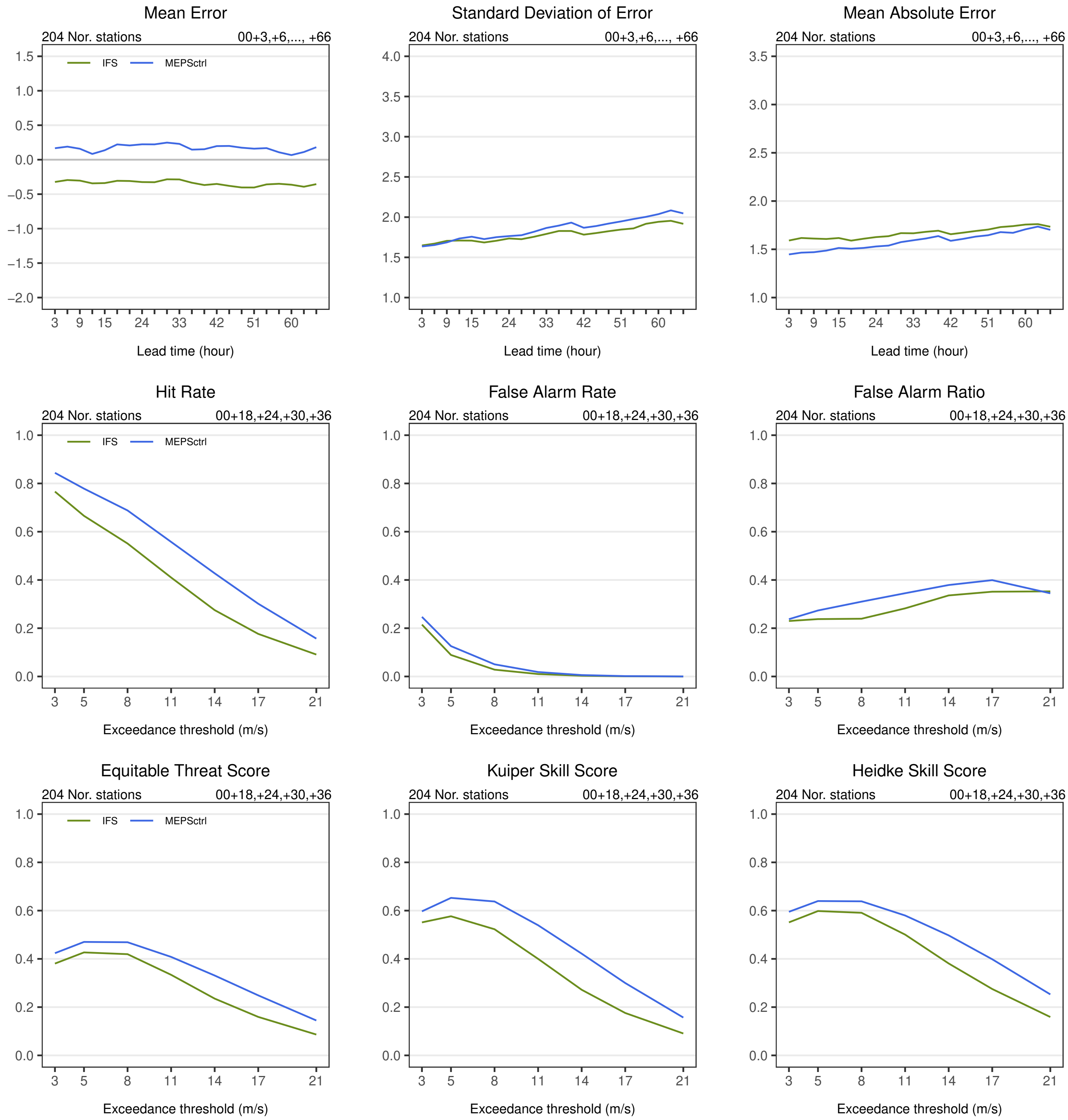
	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.0	0.9	0.9	0.7	3.8	359
IFS – synop	0.2	0.8	0.8	0.6	3.2	359

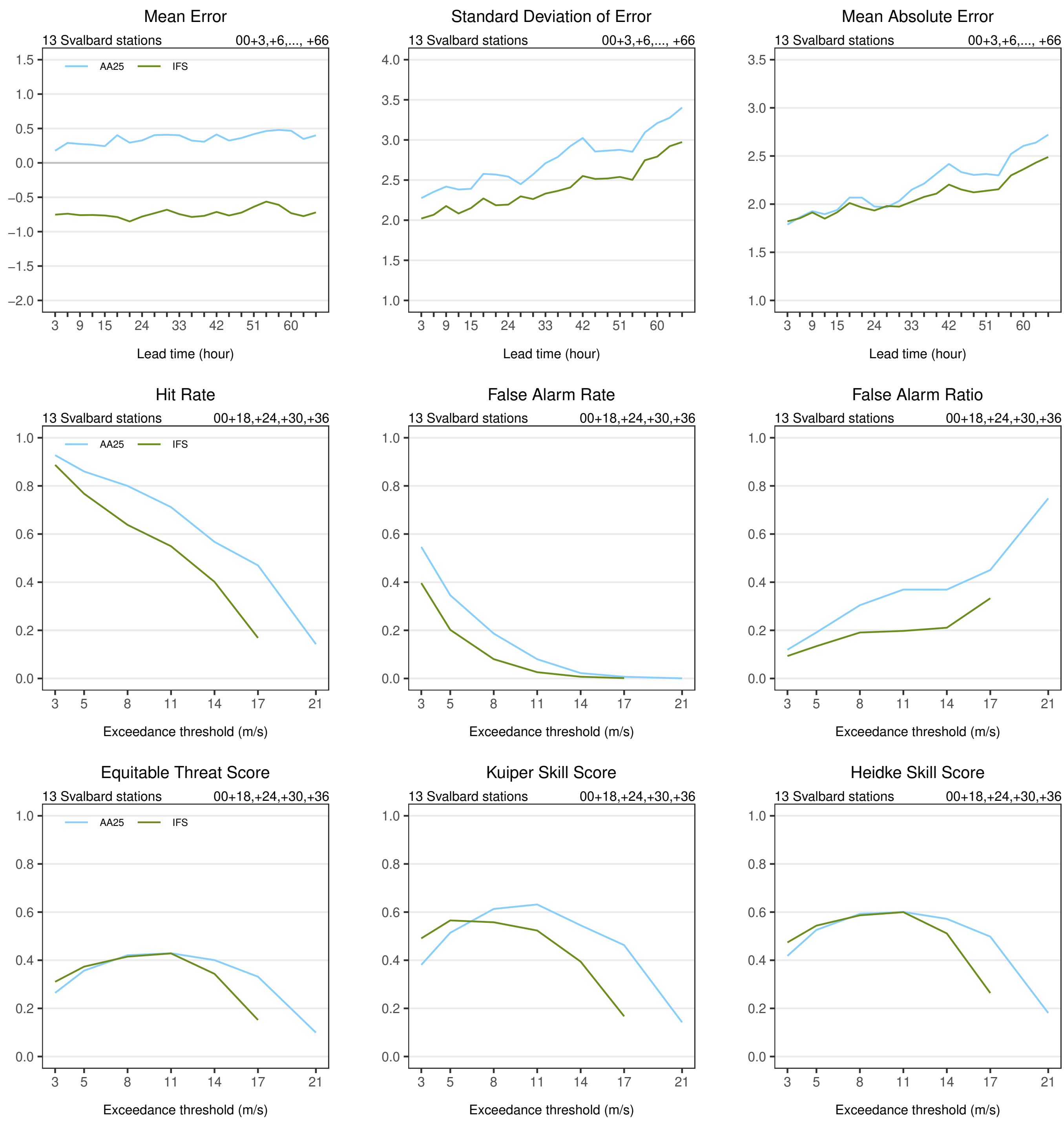


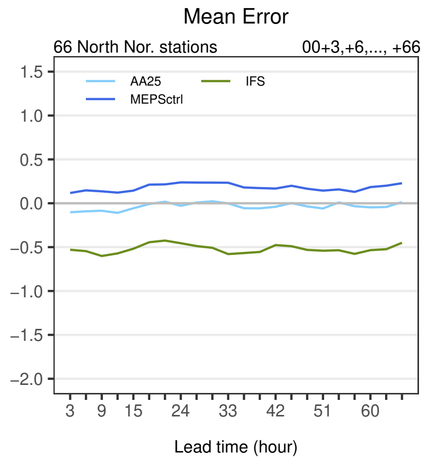
	Min	Mean	Max	Std	N
synop: 00,06,12,18	–7.0	8.3	20.7	5.7	364
MEPSctrl: 12+18,+24,+30,+36	–5.6	8.0	21.1	5.4	364
IFS: 12+18,+24,+30,+36	–6.3	7.1	19.3	5.6	360

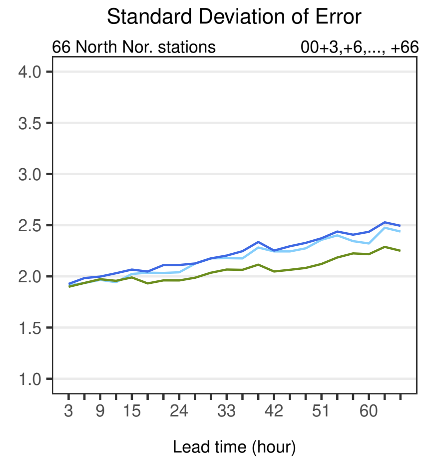
	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	–0.3	1.2	1.3	1.0	4.6	360
IFS – synop	–1.2	1.4	1.9	1.6	4.4	360

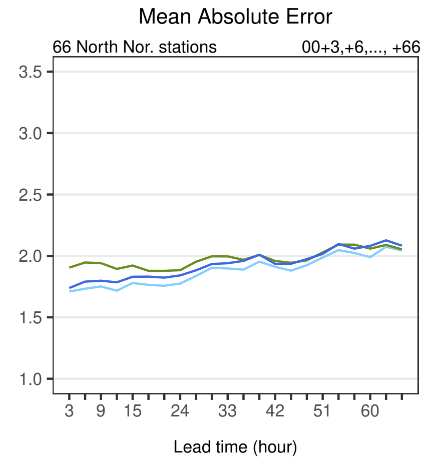

Mean Error
248 Nor. stations
00+4,+5,..., +57
MEPSctrl
YrPP
Lead time (hour)
Standard Deviation of Error
248 Nor. stations
00+4,+5,..., +57
Lead time (hour)
Mean Absolute Error
248 Nor. stations
00+4,+5,..., +57
Lead time (hour)
Mean Error
42 Nor. coastal stations
00+4,+5,..., +57
MEPSctrl
YrPP
Lead time (hour)
Standard Deviation of Error
42 Nor. coastal stations
00+4,+5,..., +57
Lead time (hour)
Mean Absolute Error
42 Nor. coastal stations
00+4,+5,..., +57
Lead time (hour)
Mean Error
147 Nor. inland stations
00+4,+5,..., +57
MEPSctrl
YrPP
Lead time (hour)
Standard Deviation of Error
147 Nor. inland stations
00+4,+5,..., +57
Lead time (hour)
Mean Absolute Error
147 Nor. inland stations
00+4,+5,..., +57
Lead time (hour)

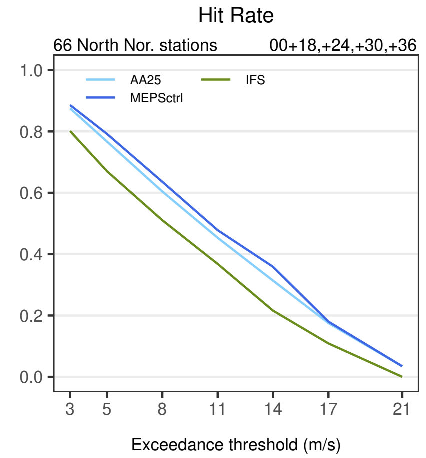

Mean Error
204 Nor. stations
00+3,+6,..., +66
IFS
MEPSctrl
Lead time (hour)
Standard Deviation of Error
204 Nor. stations
00+3,+6,..., +66
Lead time (hour)
Mean Absolute Error
204 Nor. stations
00+3,+6,..., +66
Lead time (hour)
Hit Rate
204 Nor. stations
00+18,+24,+30,+36
IFS
MEPSctrl
Exceedance threshold (m/s)
False Alarm Rate
204 Nor. stations
00+18,+24,+30,+36
Exceedance threshold (m/s)
False Alarm Ratio
204 Nor. stations
00+18,+24,+30,+36
Exceedance threshold (m/s)
Equitable Threat Score
204 Nor. stations
00+18,+24,+30,+36
IFS
MEPSctrl
Exceedance threshold (m/s)
Kuiper Skill Score
204 Nor. stations
00+18,+24,+30,+36
Exceedance threshold (m/s)
Heidke Skill Score
204 Nor. stations
00+18,+24,+30,+36
Exceedance threshold (m/s)

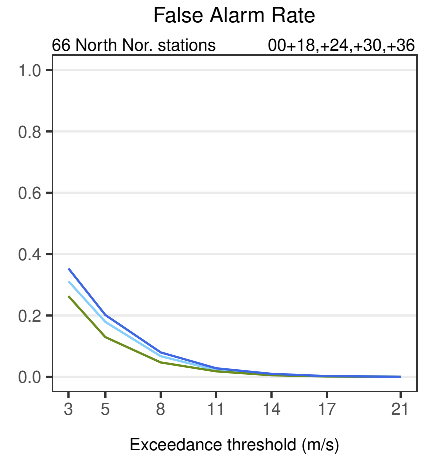

Mean Error
13 Svalbard stations
00+3,+6,..., +66
AA25
IFS
Lead time (hour)
Standard Deviation of Error
13 Svalbard stations
00+3,+6,..., +66
Lead time (hour)
Mean Absolute Error
13 Svalbard stations
00+3,+6,..., +66
Lead time (hour)
Hit Rate
13 Svalbard stations
00+18,+24,+30,+36
AA25
IFS
Exceedance threshold (m/s)
False Alarm Rate
13 Svalbard stations
00+18,+24,+30,+36
Exceedance threshold (m/s)
False Alarm Ratio
13 Svalbard stations
00+18,+24,+30,+36
Exceedance threshold (m/s)
Equitable Threat Score
13 Svalbard stations
00+18,+24,+30,+36
AA25
IFS
Exceedance threshold (m/s)
Kuiper Skill Score
13 Svalbard stations
00+18,+24,+30,+36
Exceedance threshold (m/s)
Heidke Skill Score
13 Svalbard stations
00+18,+24,+30,+36
Exceedance threshold (m/s)

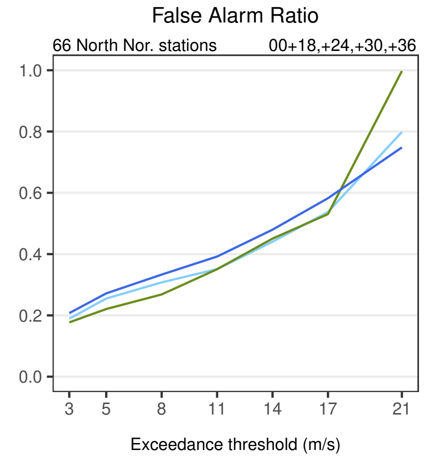

Mean Error
66 North Nor. stations
00+3,+6,..., +66
AA25
MEPSctrl
IFS
Lead time (hour)

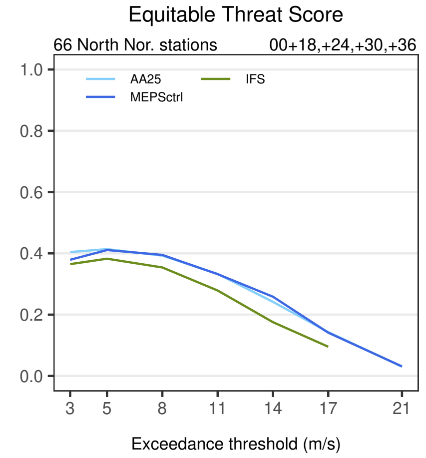

Standard Deviation of Error
66 North Nor. stations
00+3,+6,..., +66
Lead time (hour)

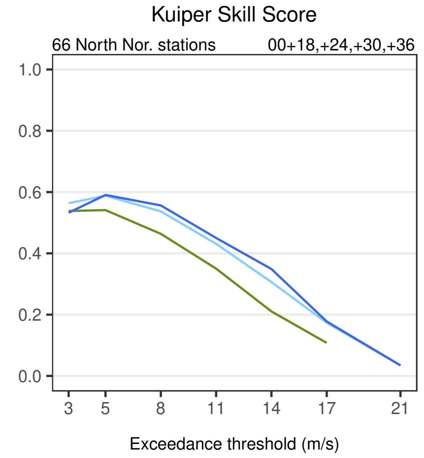

Mean Absolute Error
66 North Nor. stations
00+3,+6,..., +66
Lead time (hour)

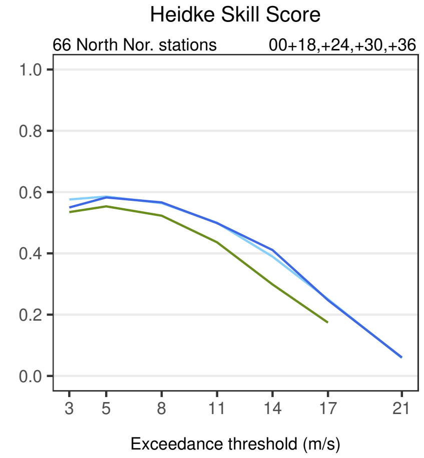

Hit Rate
66 North Nor. stations
00+18,+24,+30,+36
AA25
MEPSctrl
IFS
Exceedance threshold (m/s)

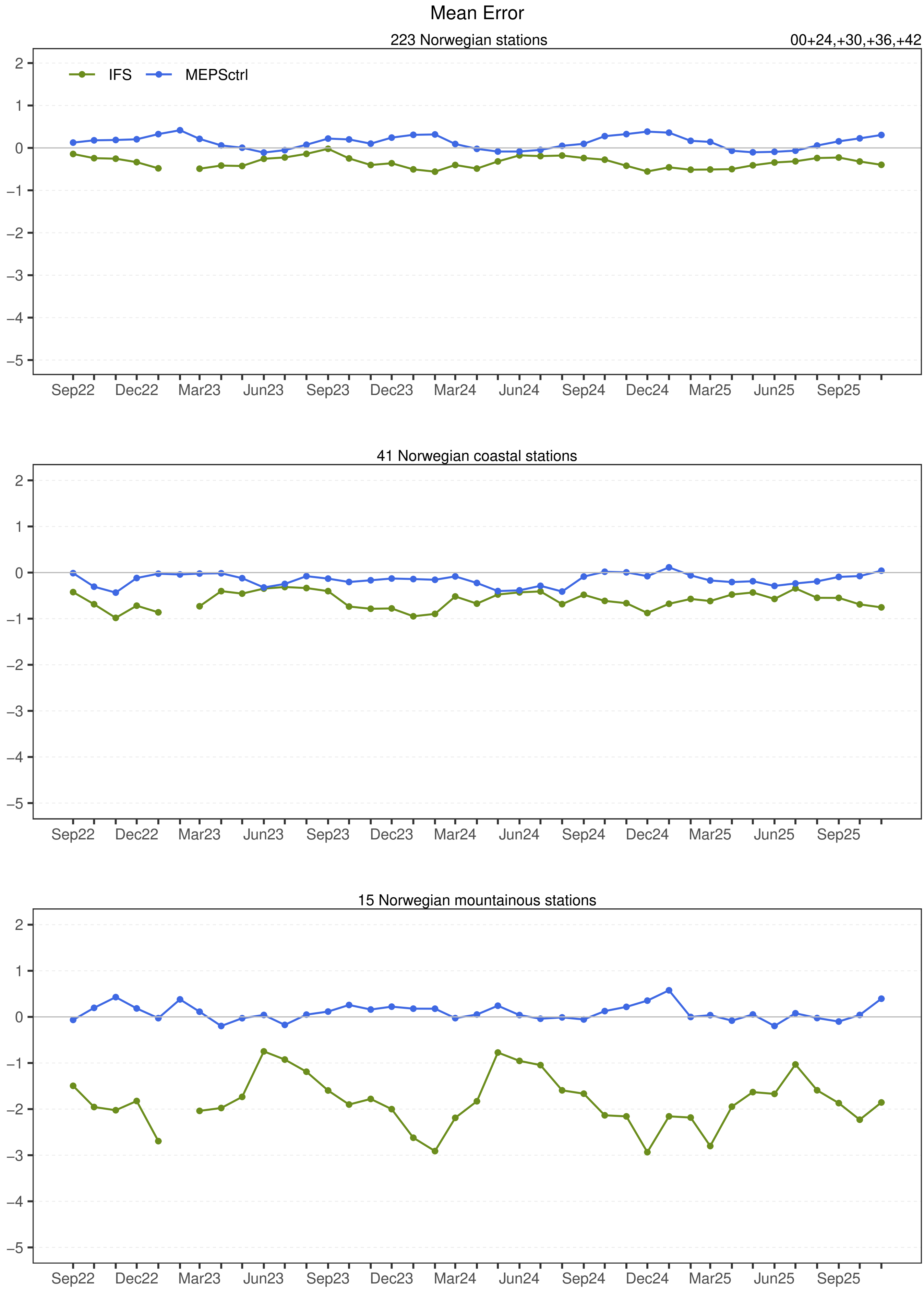

False Alarm Rate
66 North Nor. stations
00+18,+24,+30,+36
Exceedance threshold (m/s)

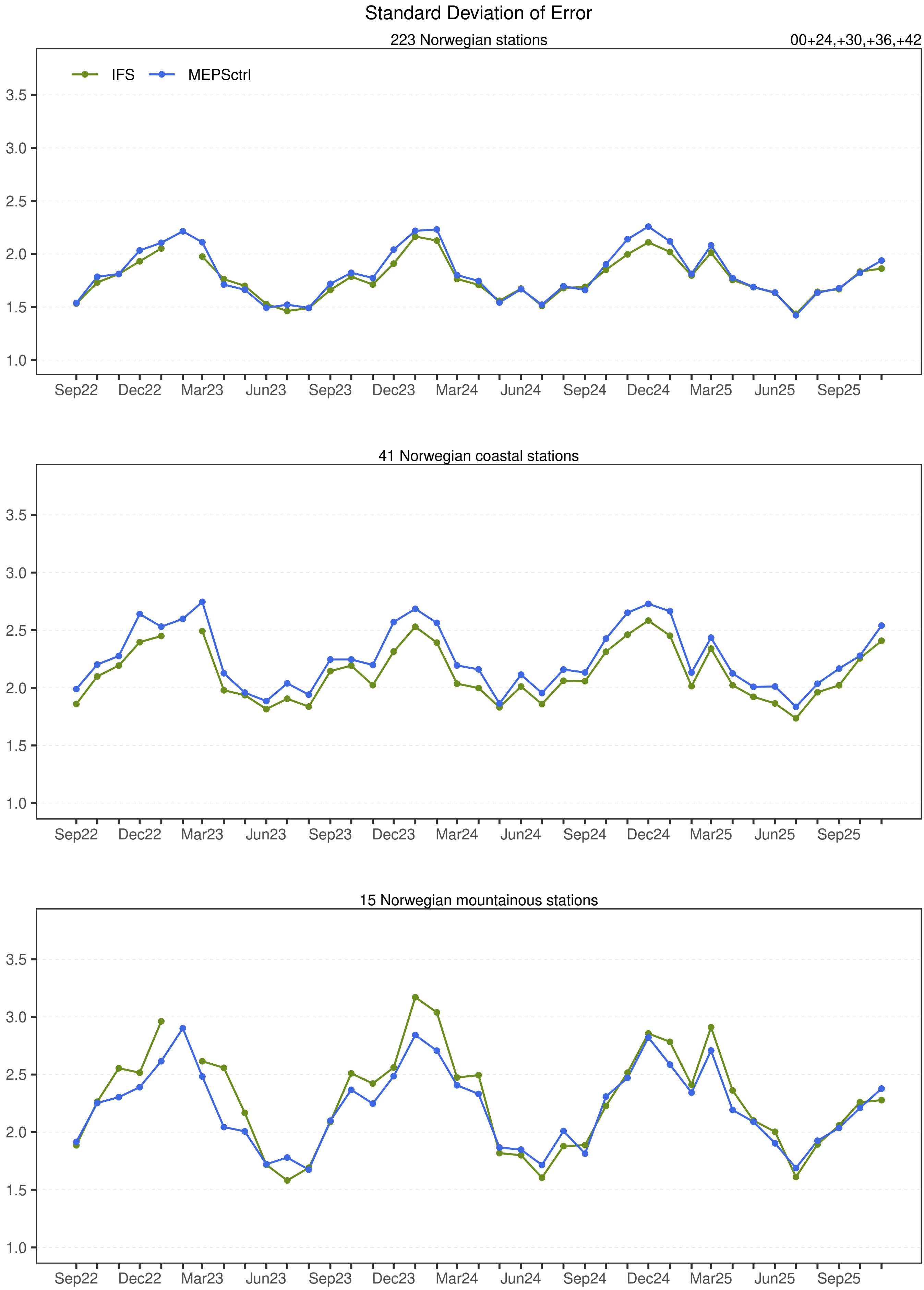

False Alarm Ratio
66 North Nor. stations
00+18,+24,+30,+36
Exceedance threshold (m/s)


Equitable Threat Score
66 North Nor. stations
00+18,+24,+30,+36
AA25
MEPSctrl
IFS
Exceedance threshold (m/s)


Kuiper Skill Score
66 North Nor. stations
00+18,+24,+30,+36
Exceedance threshold (m/s)

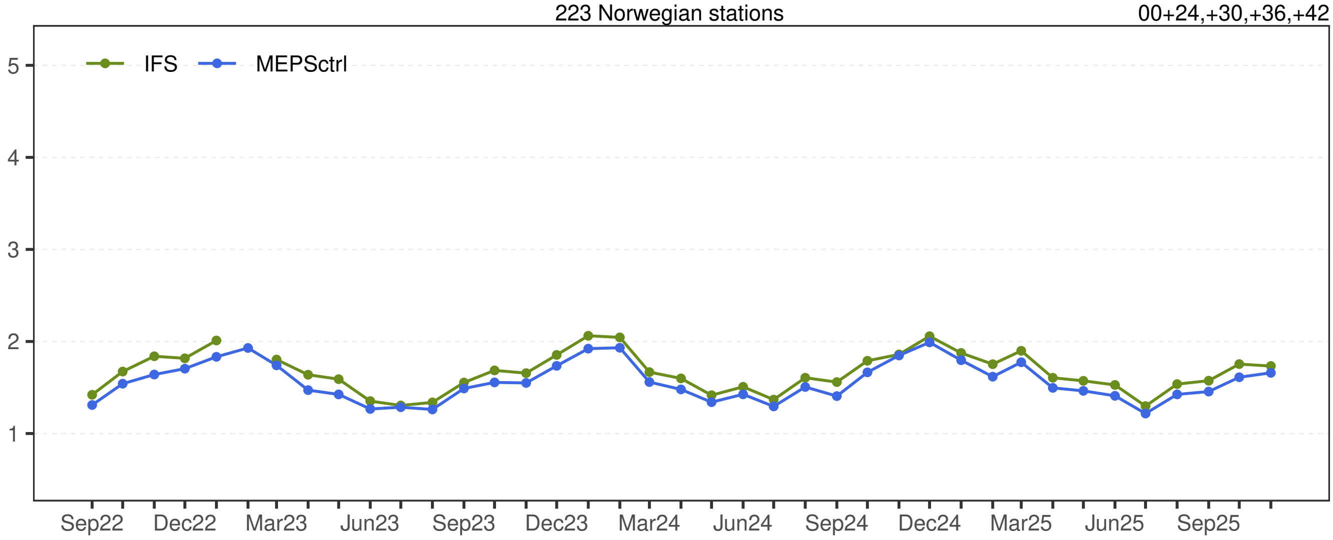

Heidke Skill Score
66 North Nor. stations
00+18,+24,+30,+36
Exceedance threshold (m/s)


Mean Error
223 Norwegian stations
00+24,+30,+36,+42
IFS
MEPSctrl
2
1
0
−1
−2
−3
−4
−5
Sep22 Dec22 Mar23 Jun23 Sep23 Dec23 Mar24 Jun24 Sep24 Dec24 Mar25 Jun25 Sep25
41 Norwegian coastal stations
15 Norwegian mountainous stations

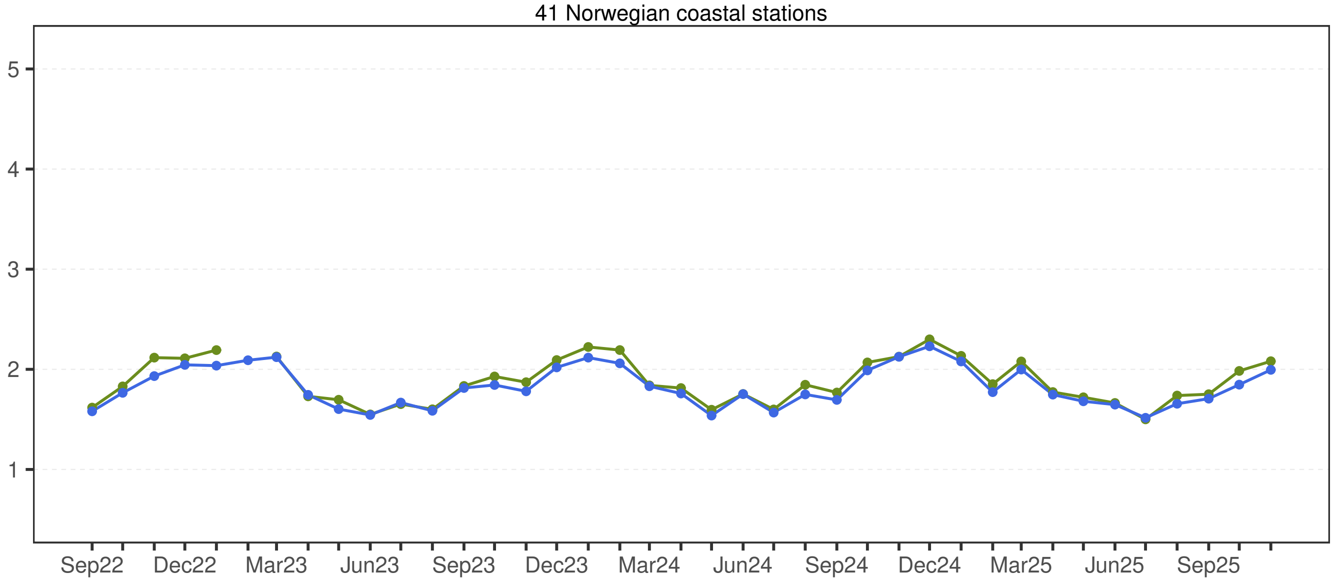

Standard Deviation of Error
223 Norwegian stations
00+24,+30,+36,+42
IFS
MEPSctrl
3.5
3.0
2.5
2.0
1.5
1.0
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25
41 Norwegian coastal stations
15 Norwegian mountainous stations

Mean Absolute Error

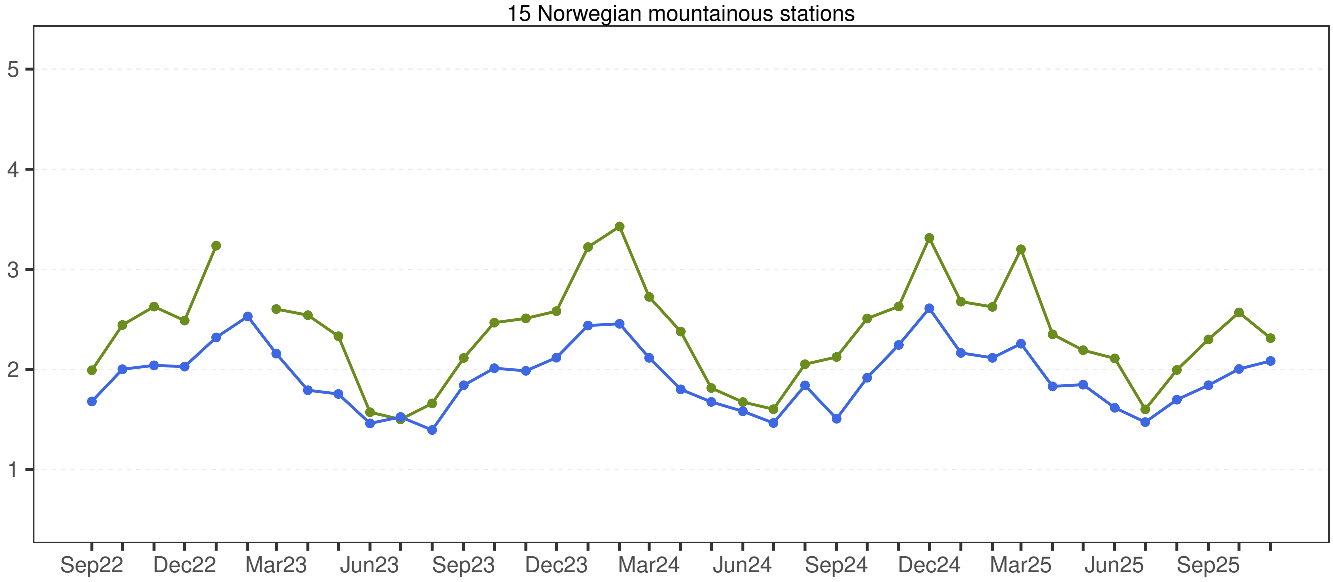
223 Norwegian stations 00+24,+30,+36,+42

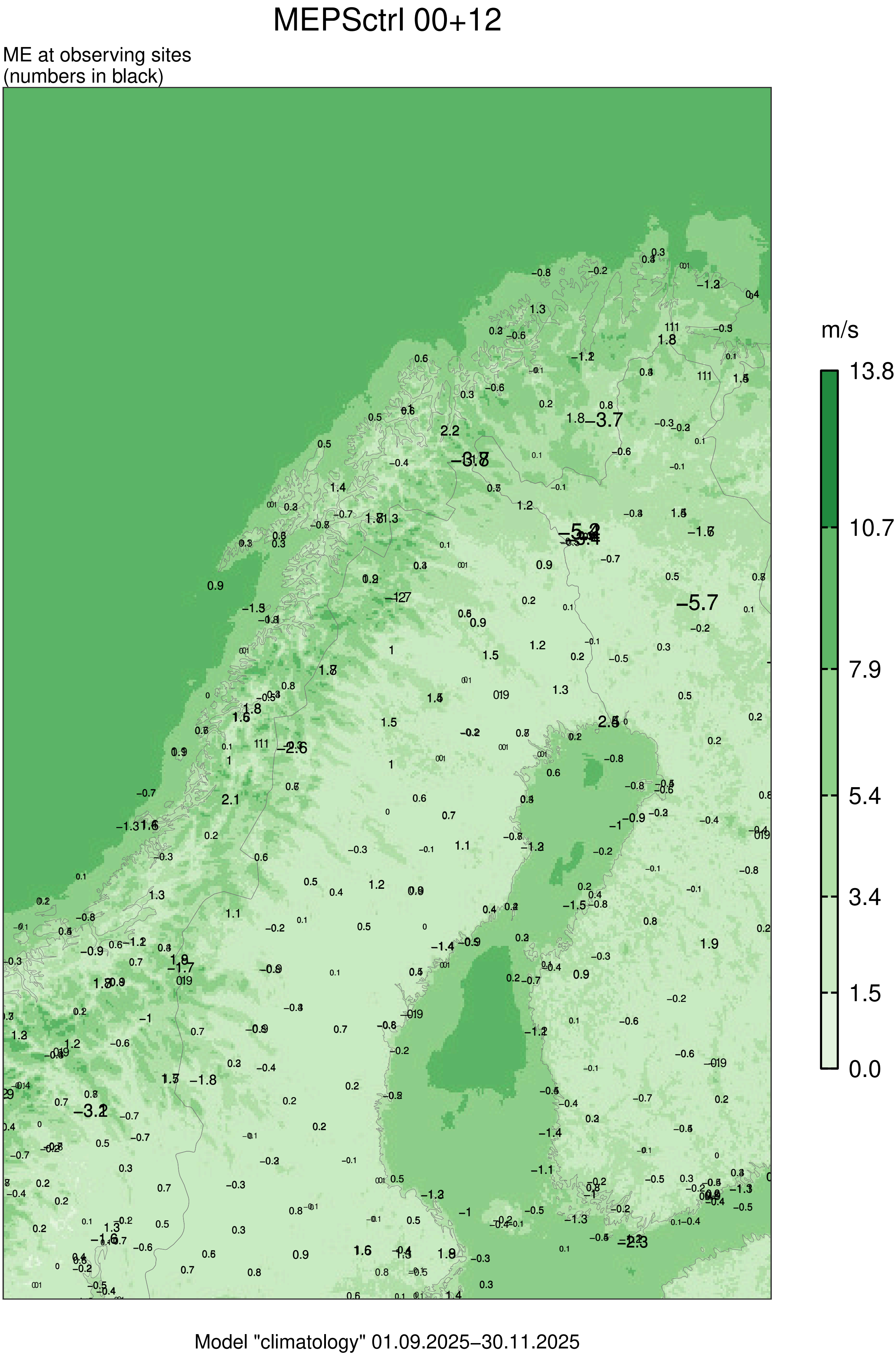


41 Norwegian coastal stations



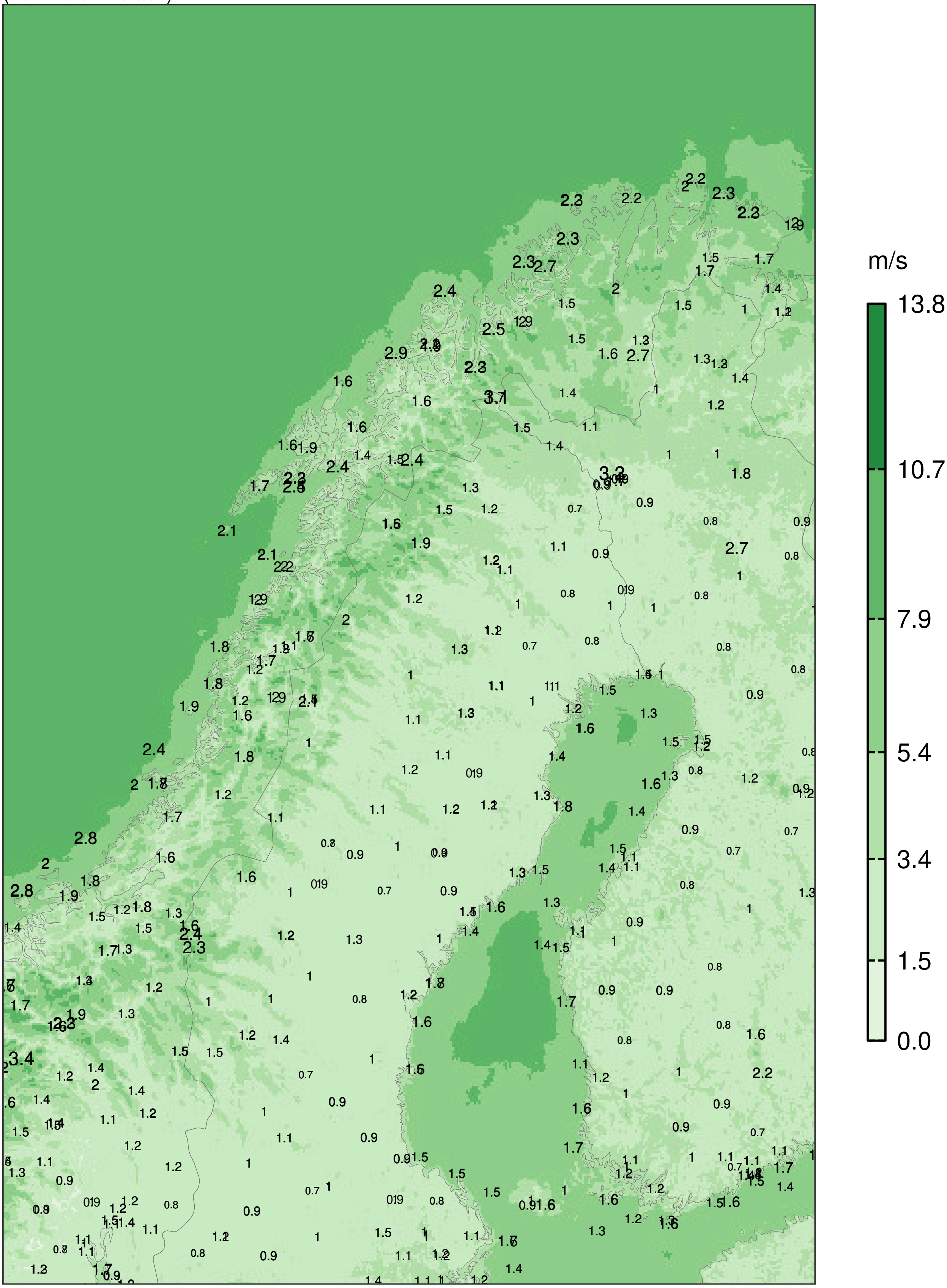
15 Norwegian mountainous stations




MEPSctrl 00+12
ME at observing sites
(numbers in black)
m/s
13.8
10.7
7.9
5.4
3.4
1.5
0.0
Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+12

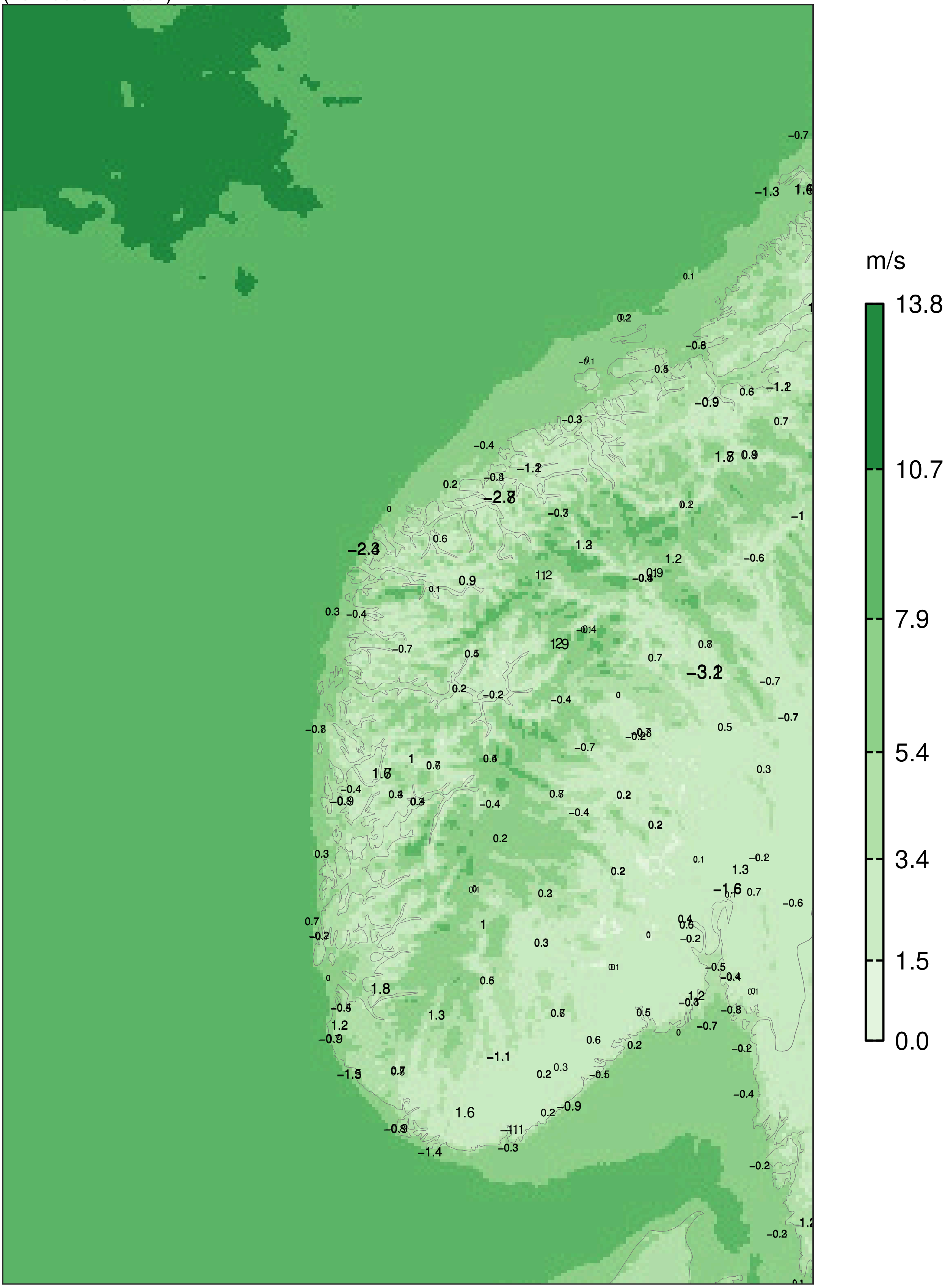
SDE at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+12

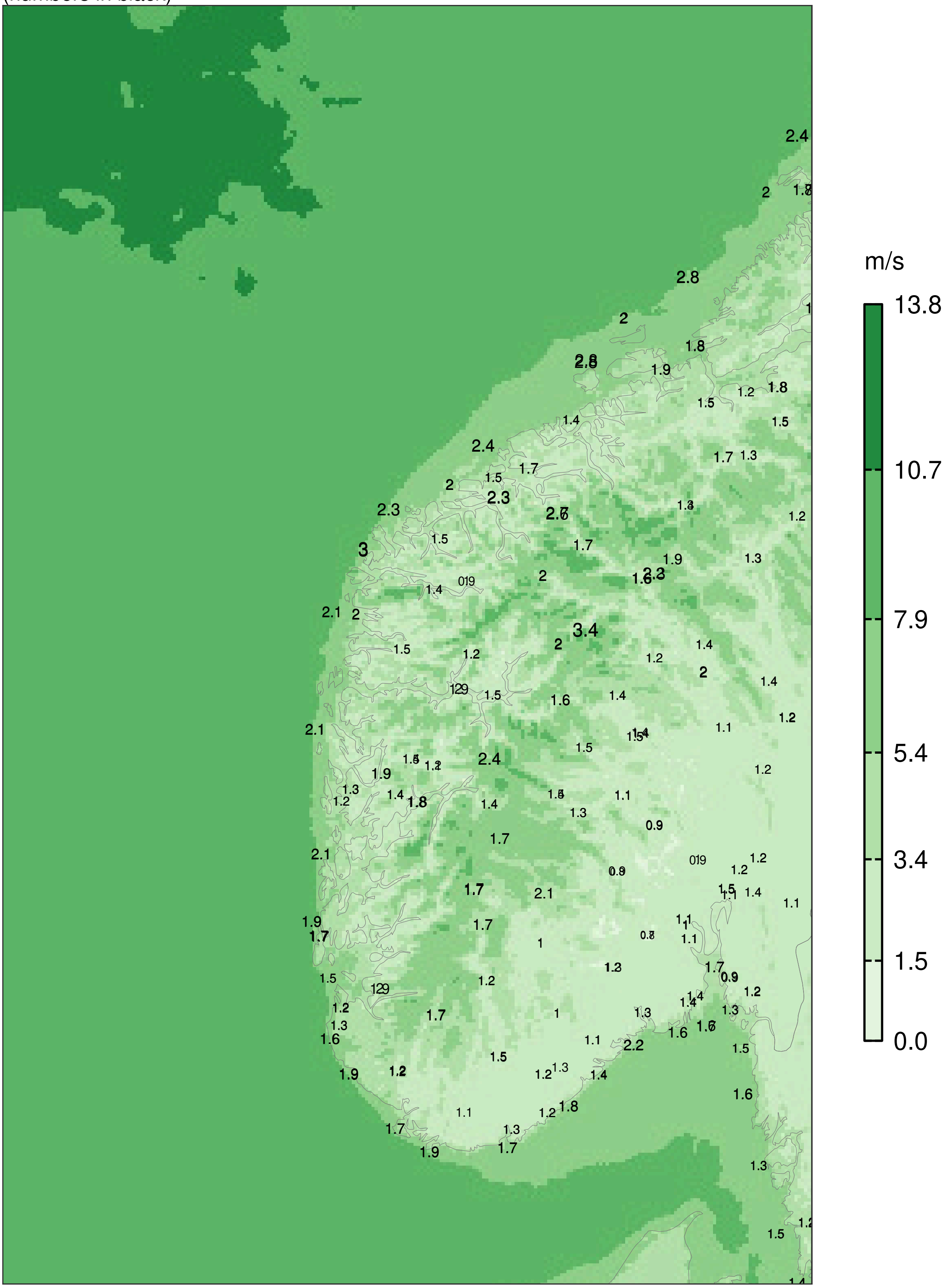
ME at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+12

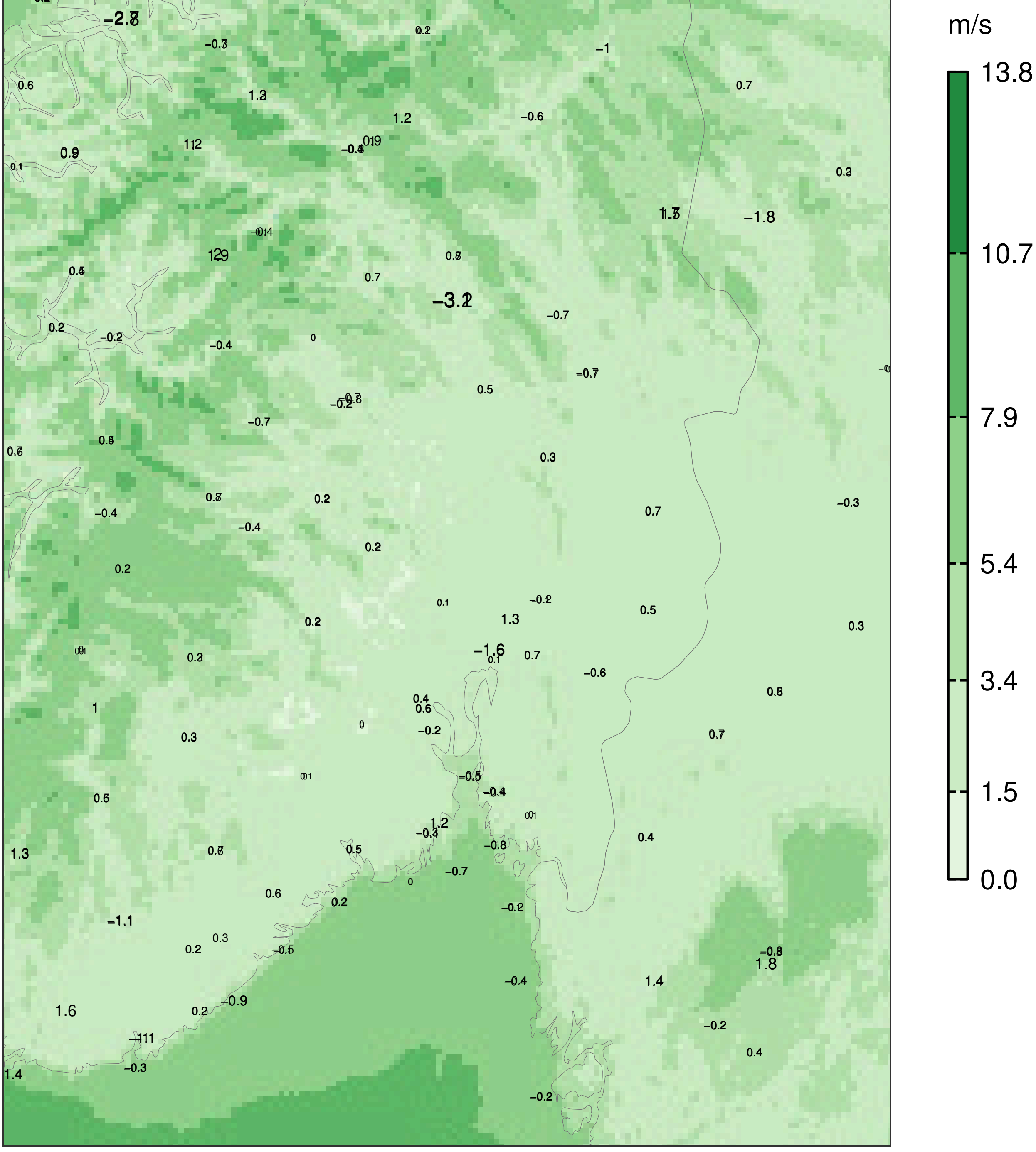
SDE at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+12

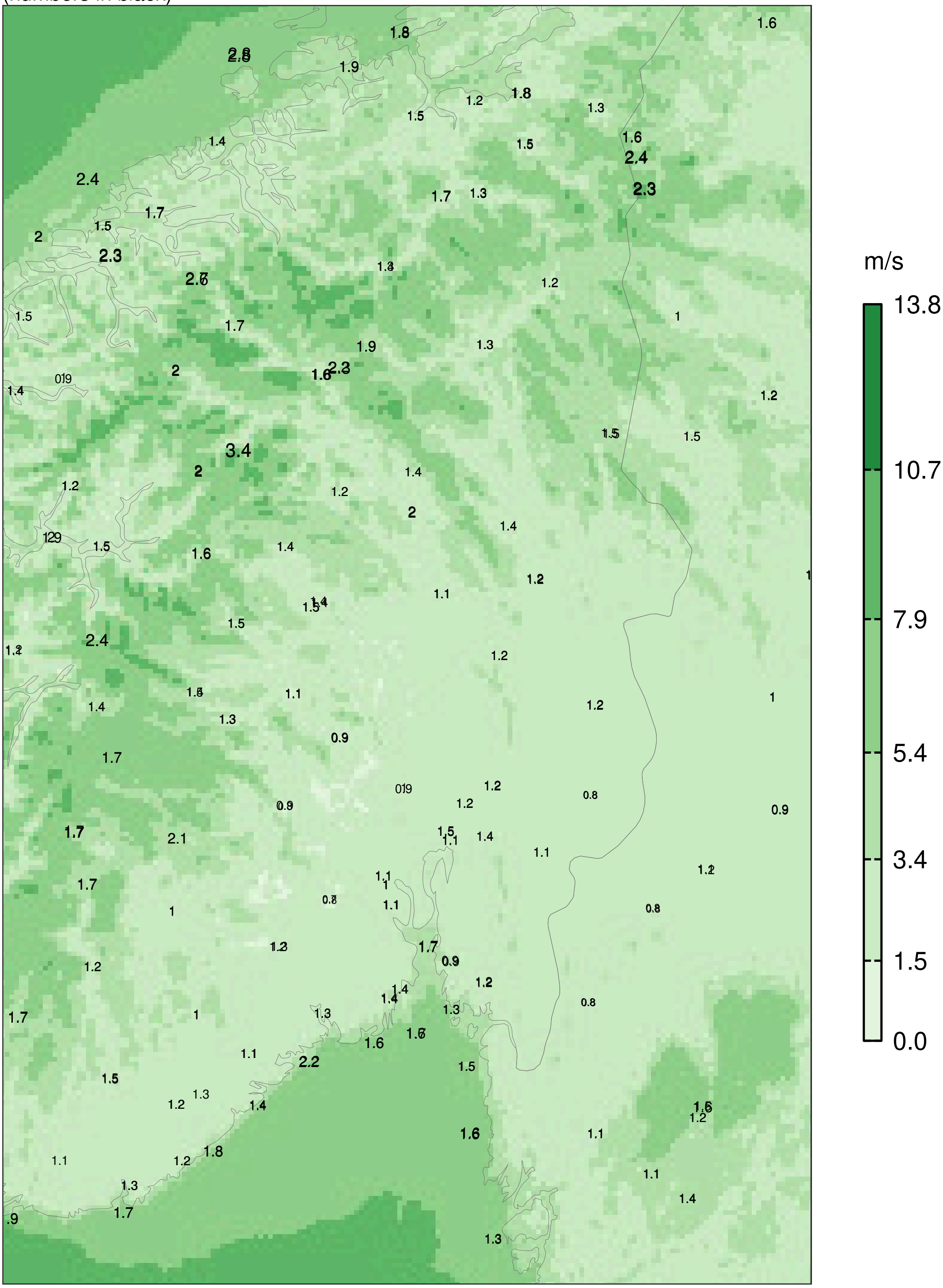
ME at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

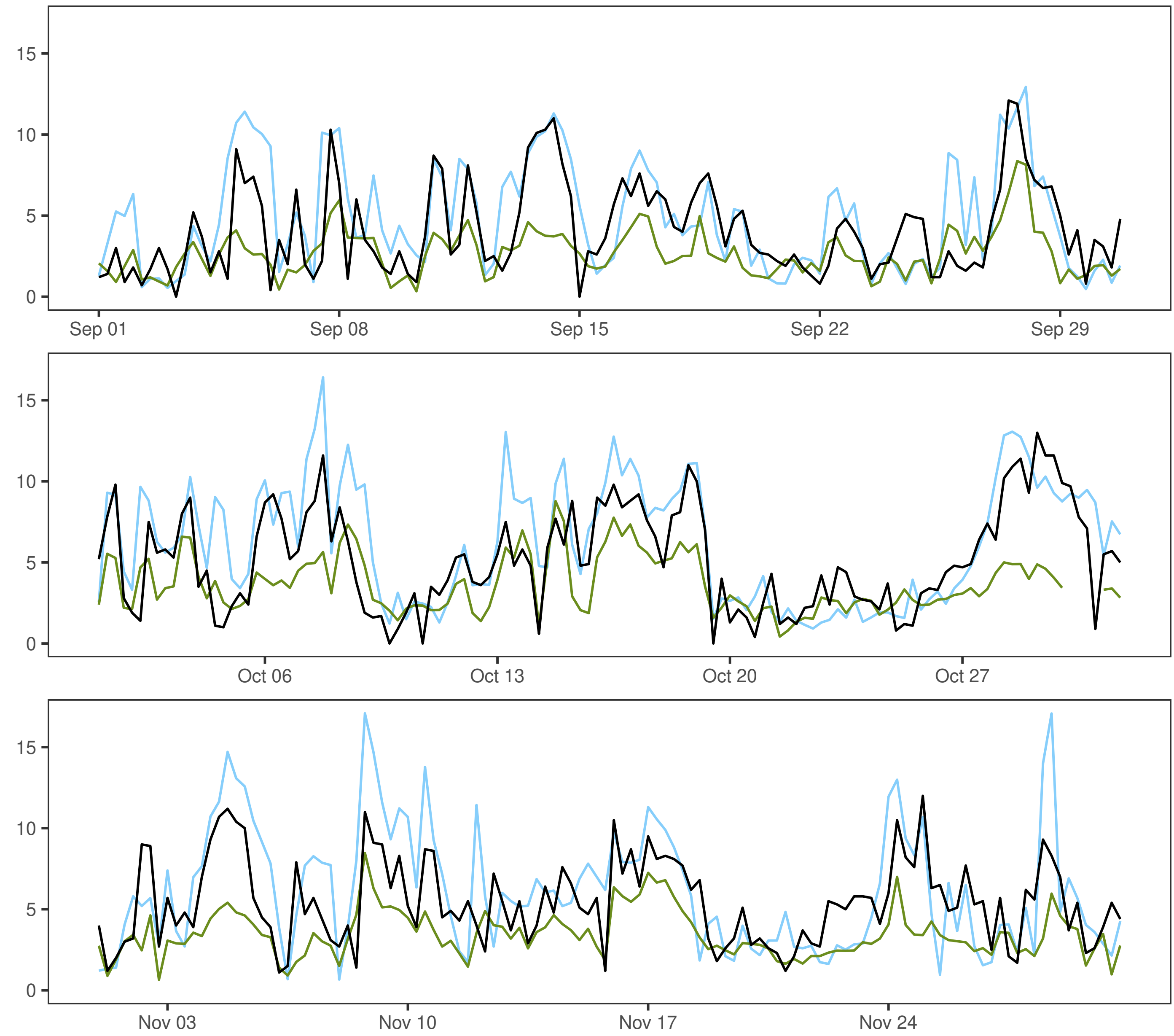
MEPSctrl 00+12

SDE at observing sites
(numbers in black)



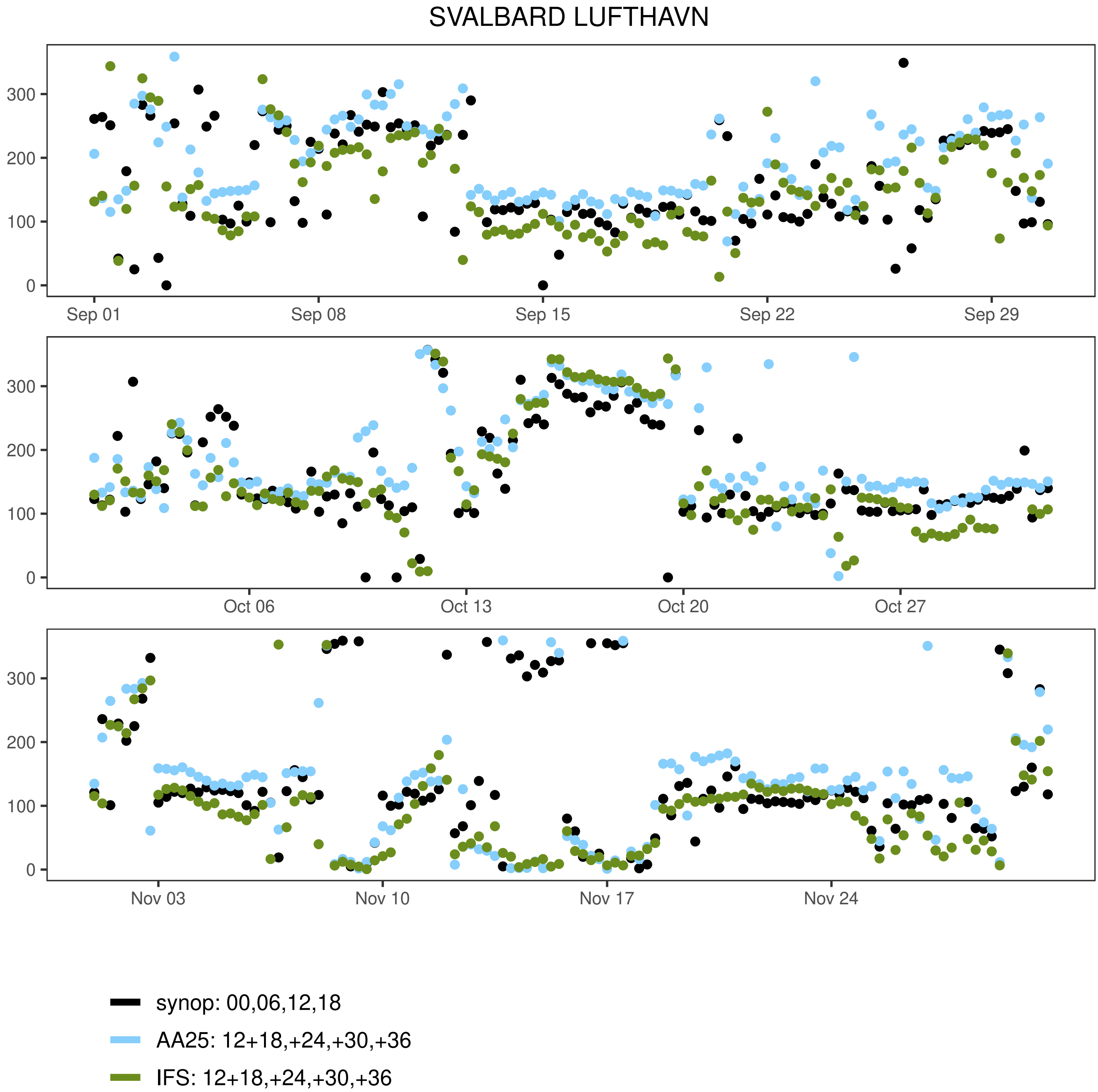
Model "climatology" 01.09.2025–30.11.2025

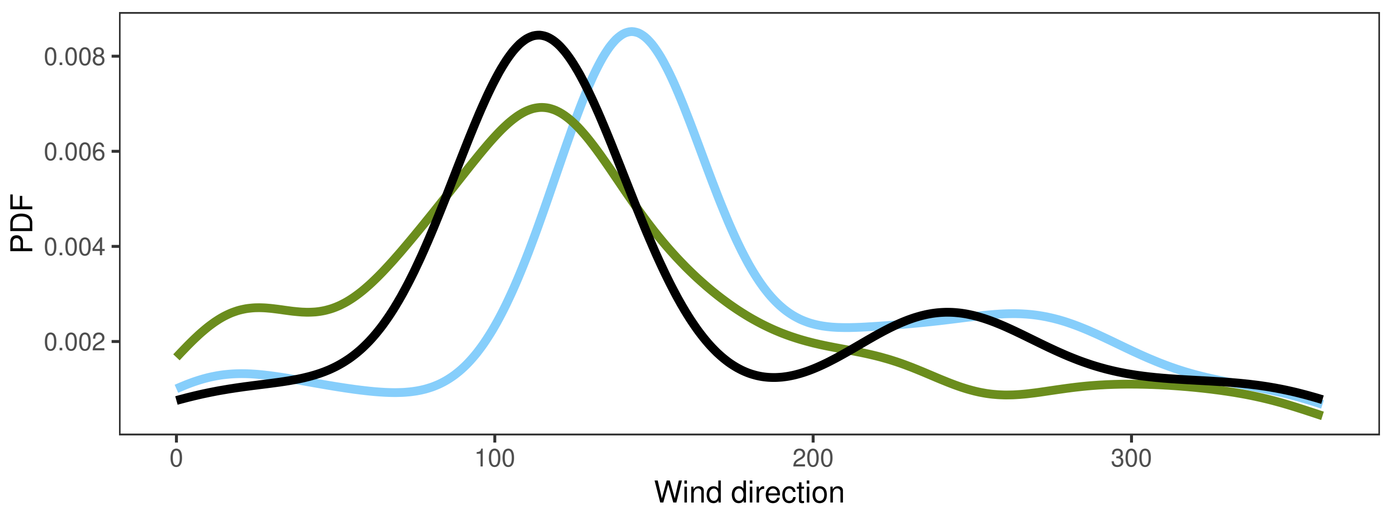
SVALBARD LUFTHAVN



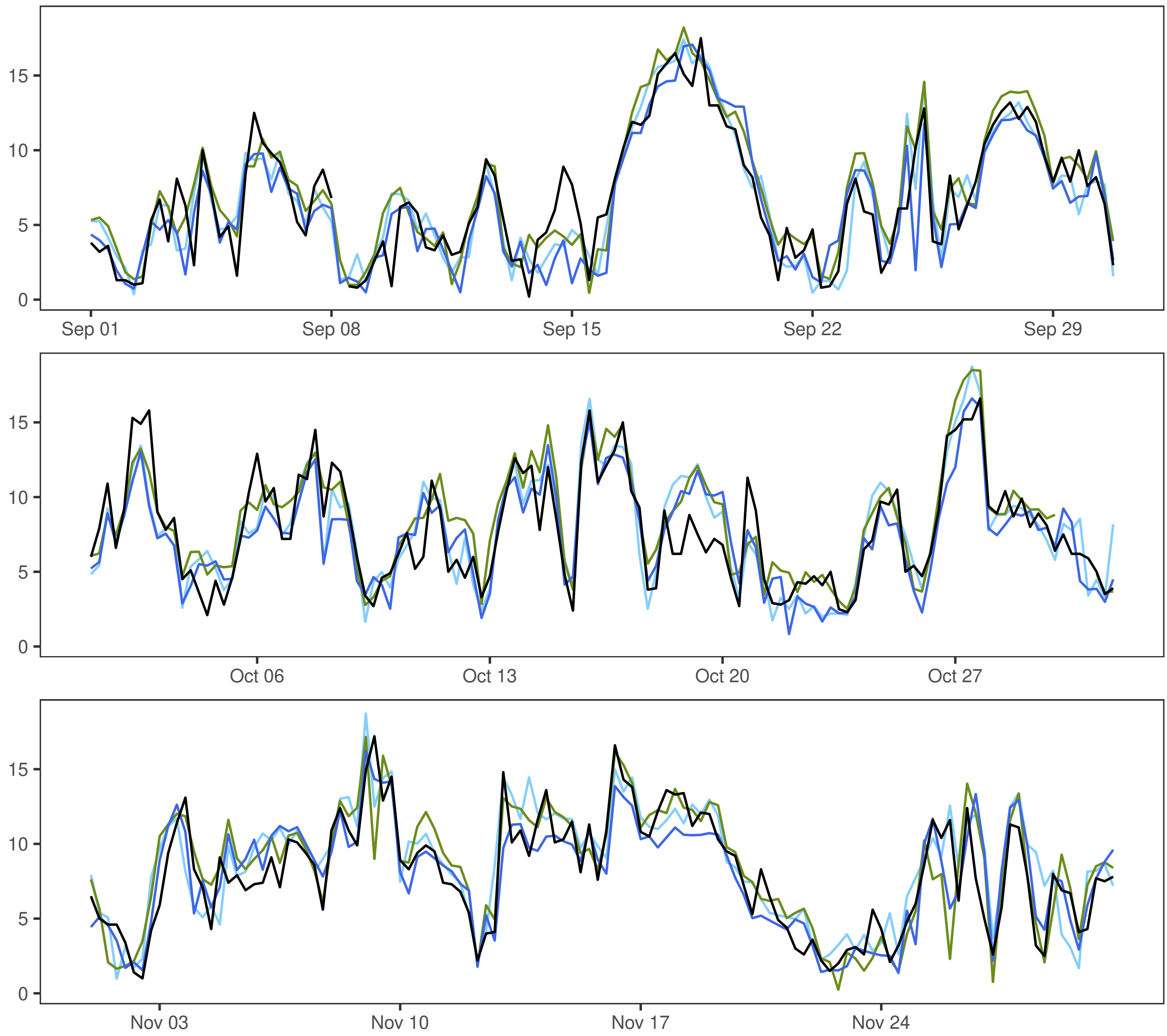
	Min	Mean	Max	Std	N
synop: 00,06,12,18	0.0	4.9	13.0	2.9	364
AA25: 12+18,+24,+30,+36	0.5	5.8	17.1	3.6	364
IFS: 12+18,+24,+30,+36	0.3	3.3	8.8	1.6	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
AA25 – synop	0.8	2.6	2.7	2.0	8.9	360
IFS – synop	−1.6	2.1	2.7	2.1	8.6	360


SVALBARD LUFTHAVN
300
200
100
0
Sep 01
Sep 08
Sep 15
Sep 22
Sep 29
Oct 06
Oct 13
Oct 20
Oct 27
Nov 03
Nov 10
Nov 17
Nov 24
synop: 00,06,12,18
AA25: 12+18,+24,+30,+36
IFS: 12+18,+24,+30,+36

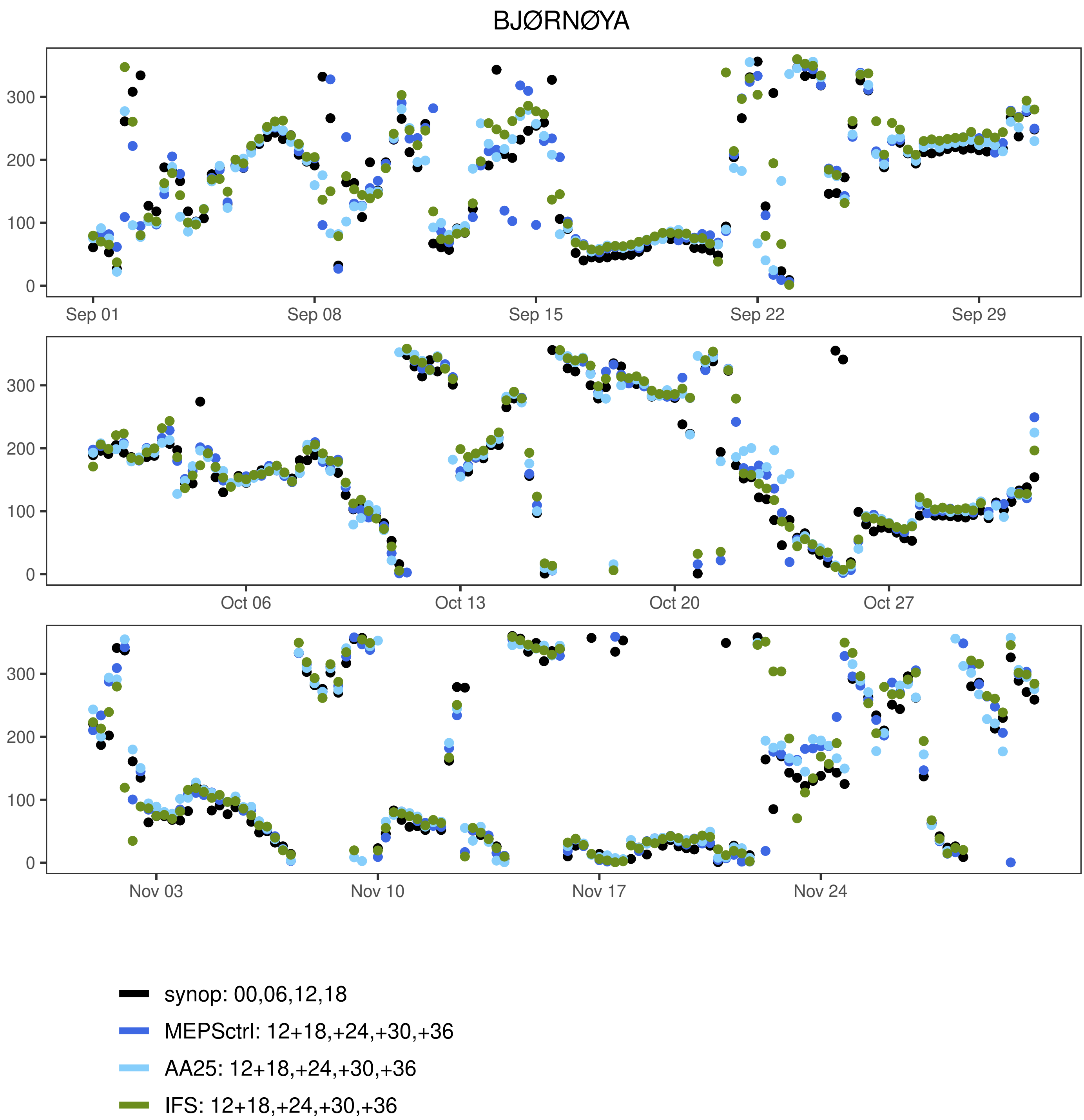

PDF
0.008
0.006
0.004
0.002
0
100
200
300
Wind direction

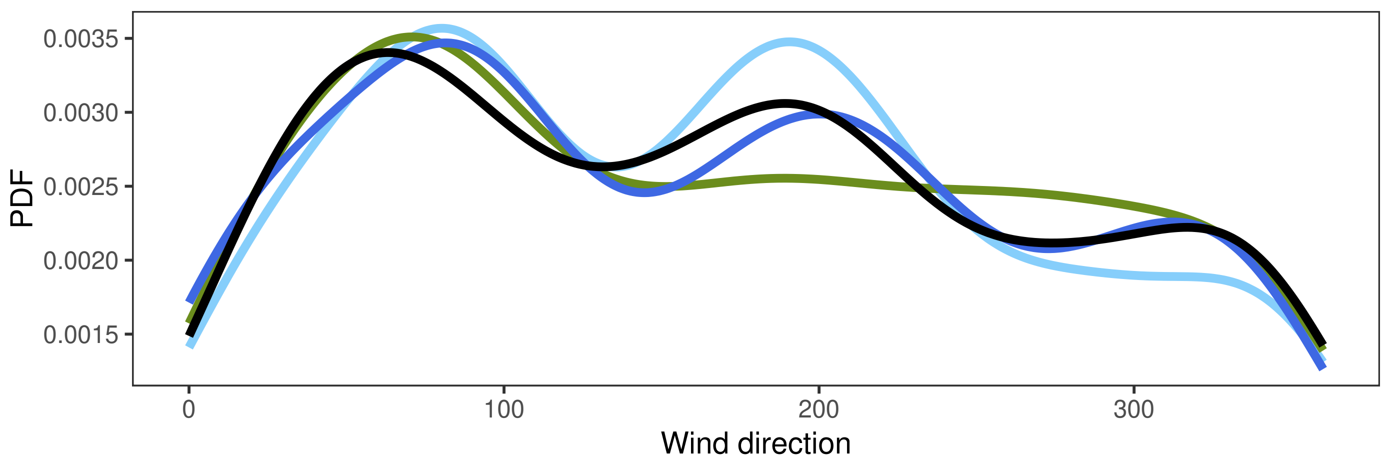
BJØRNØYA

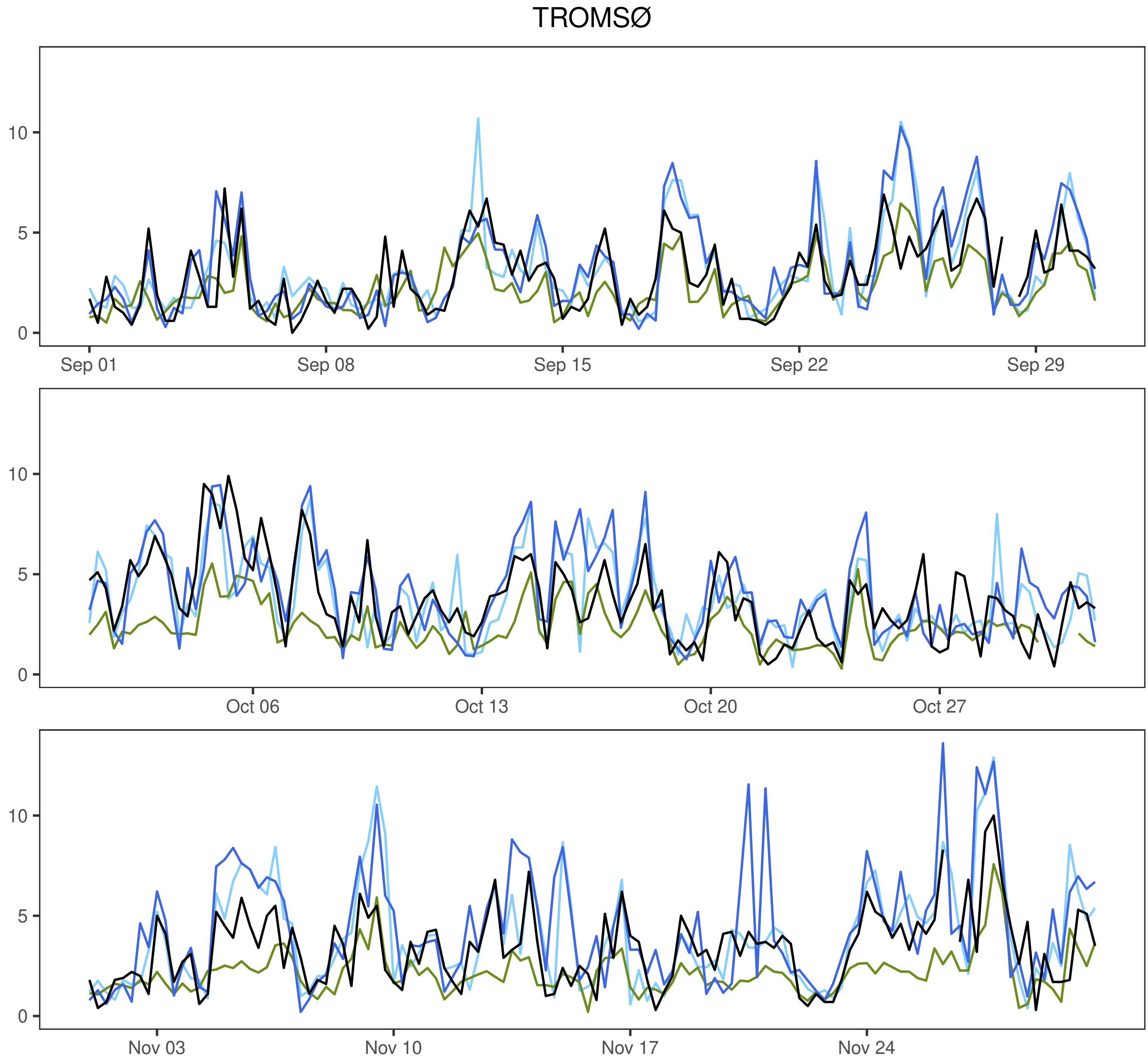


	Min	Mean	Max	Std	N
synop: 00,06,12,18	0.2	7.5	17.5	3.8	363
MEPSctrl: 12+18,+24,+30,+36	0.5	7.2	17.1	3.7	364
AA25: 12+18,+24,+30,+36	0.4	7.7	18.7	3.9	364
IFS: 12+18,+24,+30,+36	0.2	8.1	18.5	3.9	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	–0.3	1.9	2.0	1.5	8.2	359
AA25 – synop	0.2	2.0	2.0	1.5	6.3	359
IFS – synop	0.6	1.8	1.9	1.4	9.3	359

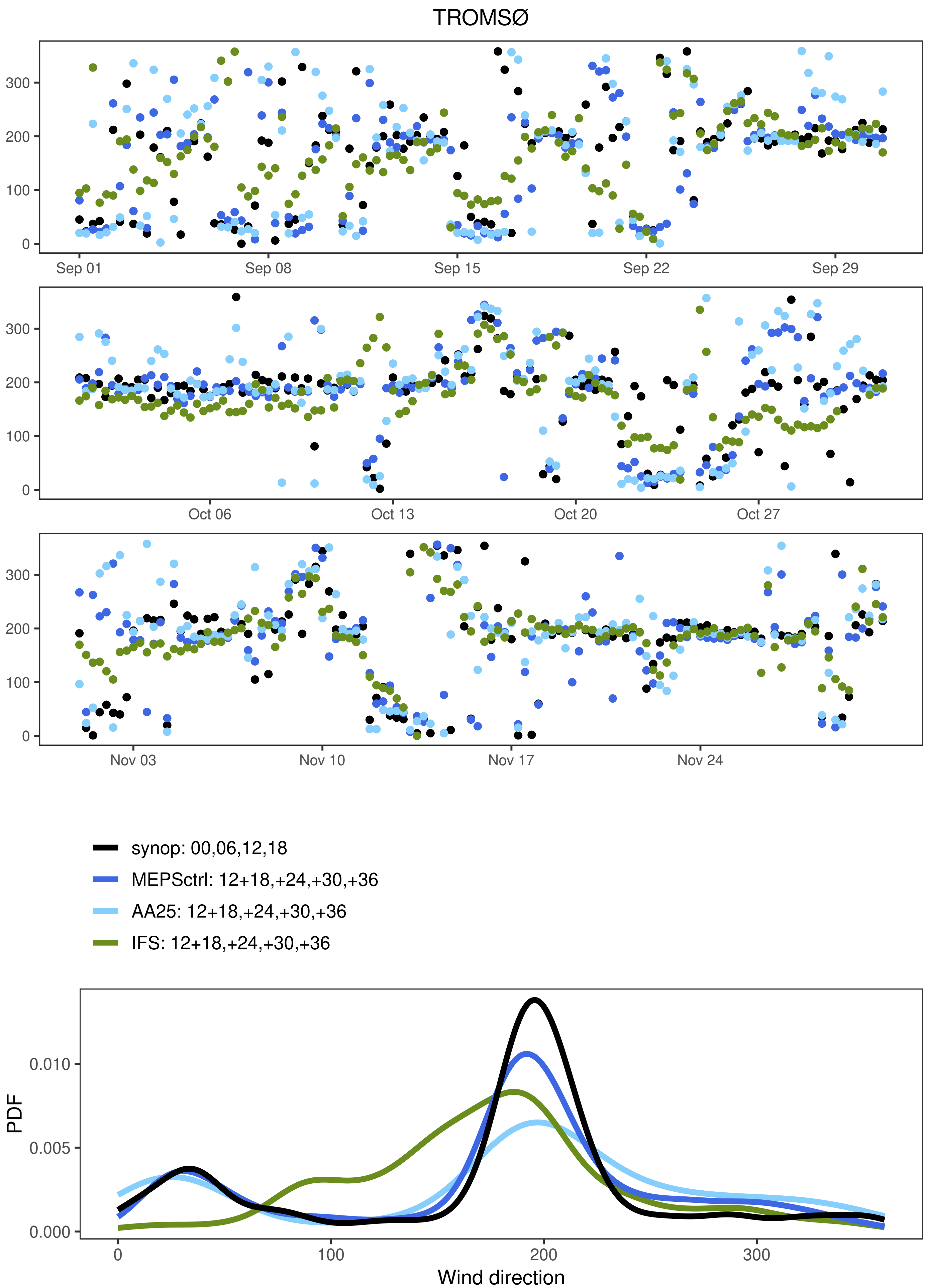

BJØRNØYA
300
200
100
0
Sep 01
Sep 08
Sep 15
Sep 22
Sep 29
Oct 06
Oct 13
Oct 20
Oct 27
Nov 03
Nov 10
Nov 17
Nov 24
synop: 00,06,12,18
MEPSctrl: 12+18,+24,+30,+36
AA25: 12+18,+24,+30,+36
IFS: 12+18,+24,+30,+36

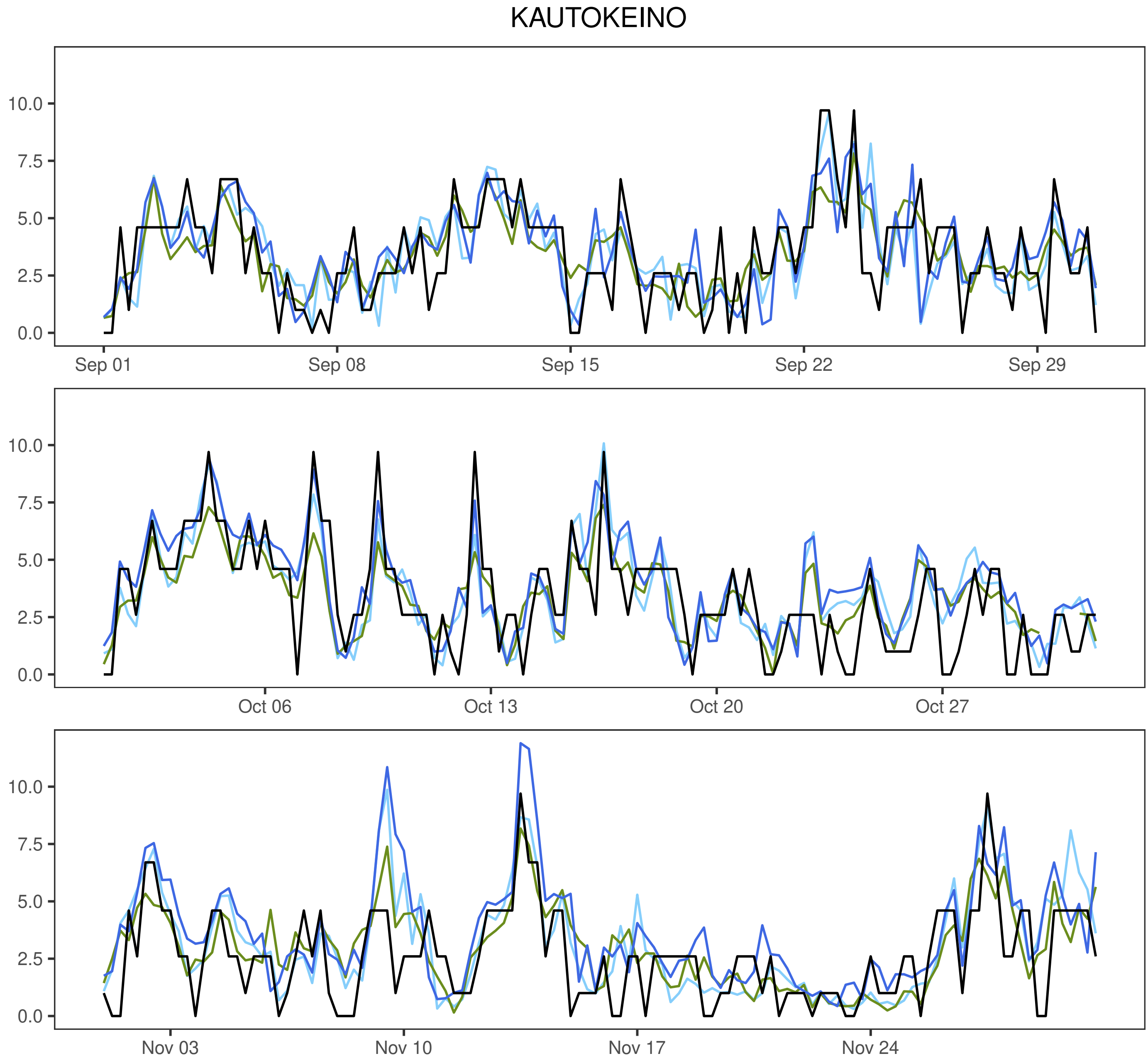

PDF
0.0035
0.0030
0.0025
0.0020
0.0015
0
100
200
300
Wind direction



	Min	Mean	Max	Std	N
synop: 00,06,12,18	0.0	3.3	10.0	1.9	362
MEPSctrl: 12+18,+24,+30,+36	0.2	3.9	13.6	2.5	364
AA25: 12+18,+24,+30,+36	0.4	3.7	12.9	2.3	364
IFS: 12+18,+24,+30,+36	0.2	2.3	7.6	1.2	360

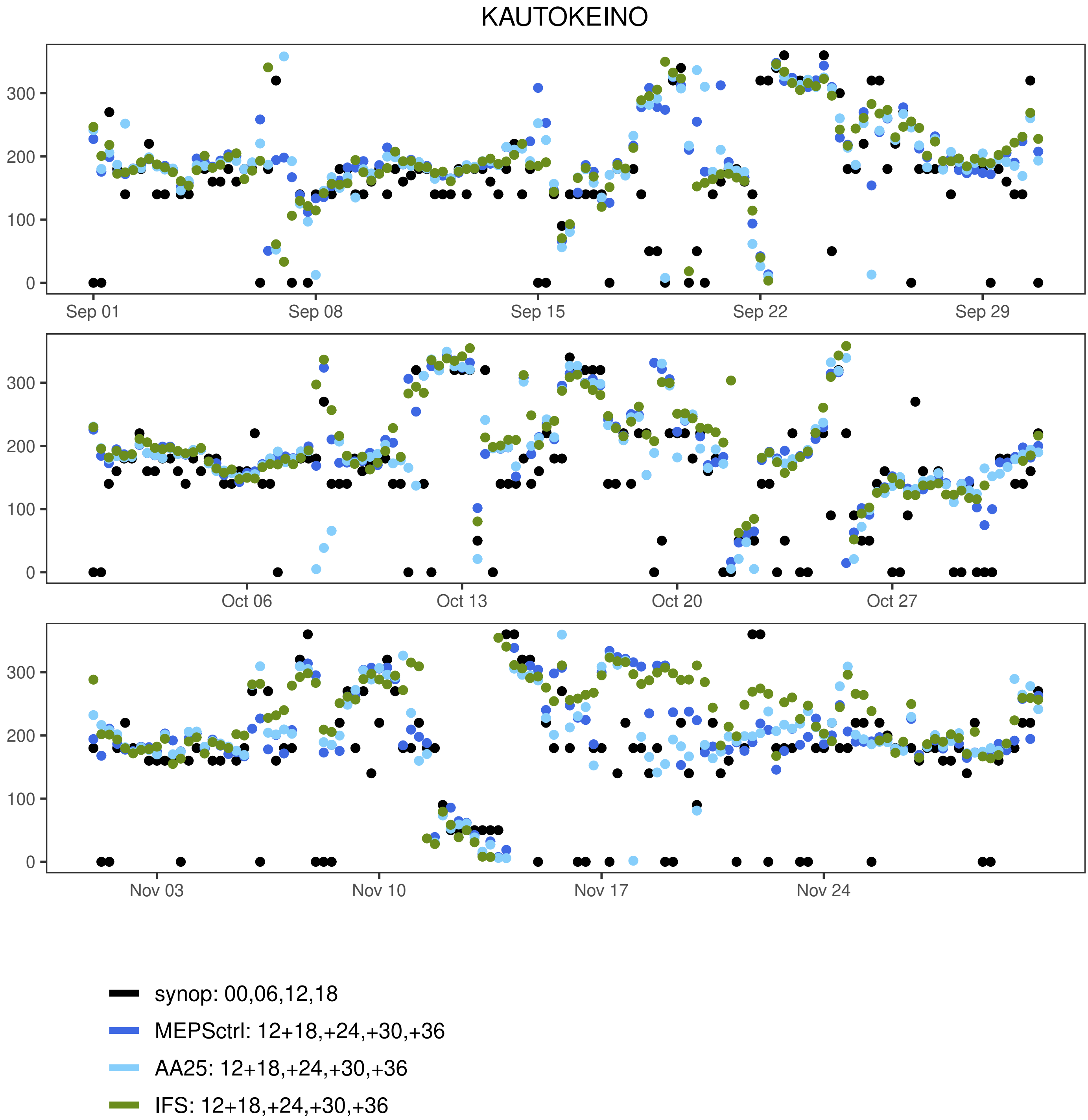
	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.6	1.9	2.0	1.5	9.2	358
AA25 – synop	0.4	1.8	1.8	1.3	7.3	358
IFS – synop	−1.1	1.5	1.8	1.5	6.0	358

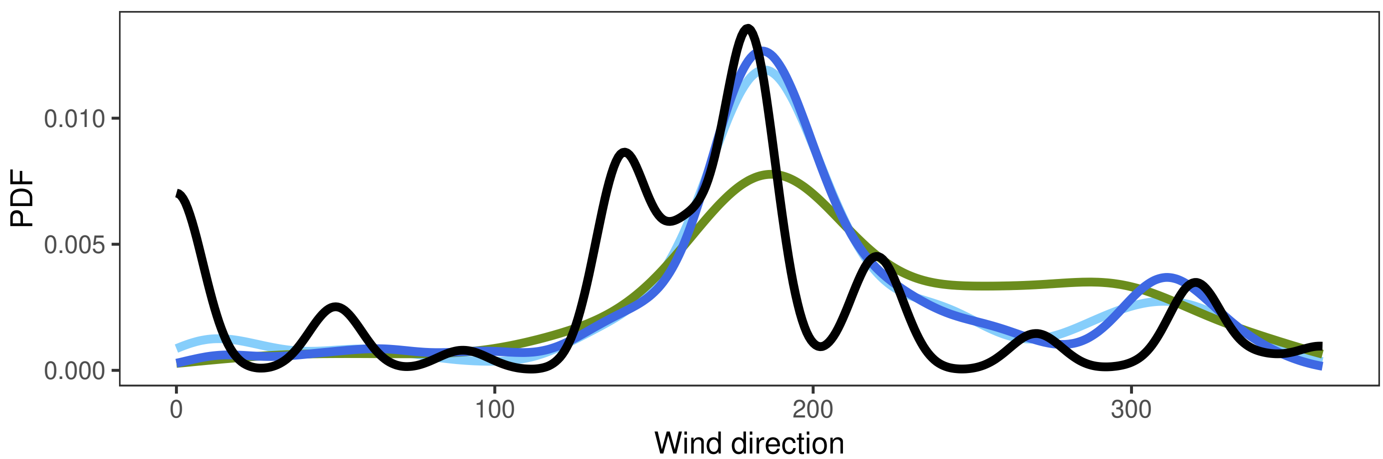

TROMSØ
300
200
100
0
Sep 01
Sep 08
Sep 15
Sep 22
Sep 29
Oct 06
Oct 13
Oct 20
Oct 27
Nov 03
Nov 10
Nov 17
Nov 24
synop: 00,06,12,18
MEPSctrl: 12+18,+24,+30,+36
AA25: 12+18,+24,+30,+36
IFS: 12+18,+24,+30,+36
PDF
0.010
0.005
0.000
0
100
200
300
Wind direction

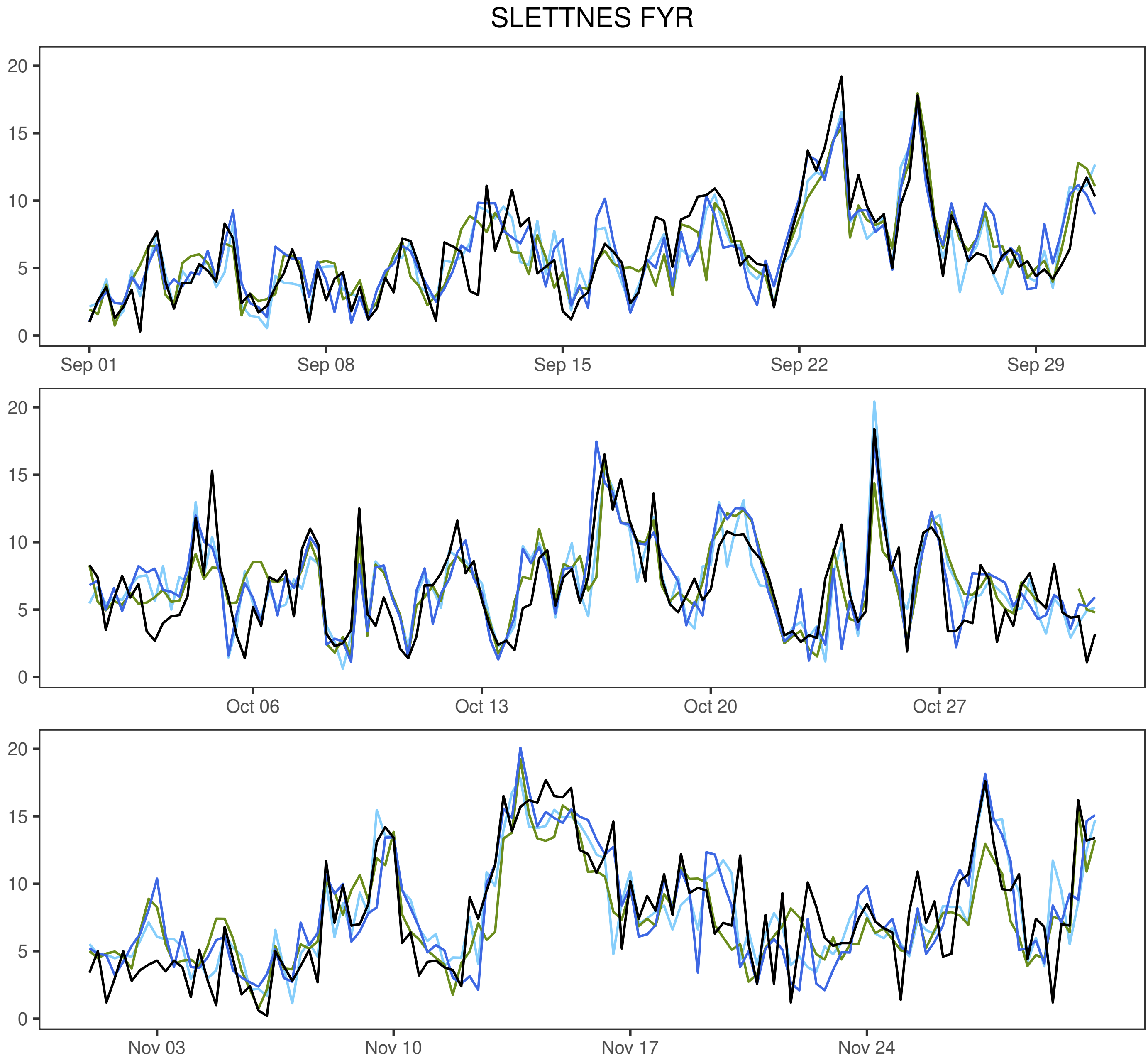


	Min	Mean	Max	Std	N
synop: 00,06,12,18	0.0	3.1	9.7	2.2	364
MEPSctrl: 12+18,+24,+30,+36	0.4	3.7	11.9	2.1	364
AA25: 12+18,+24,+30,+36	0.2	3.4	10.1	2.1	364
IFS: 12+18,+24,+30,+36	0.0	3.3	8.2	1.6	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.6	1.7	1.9	1.4	6.9	360
AA25 – synop	0.3	1.6	1.7	1.3	6.3	360
IFS – synop	0.1	1.6	1.6	1.3	4.4	360

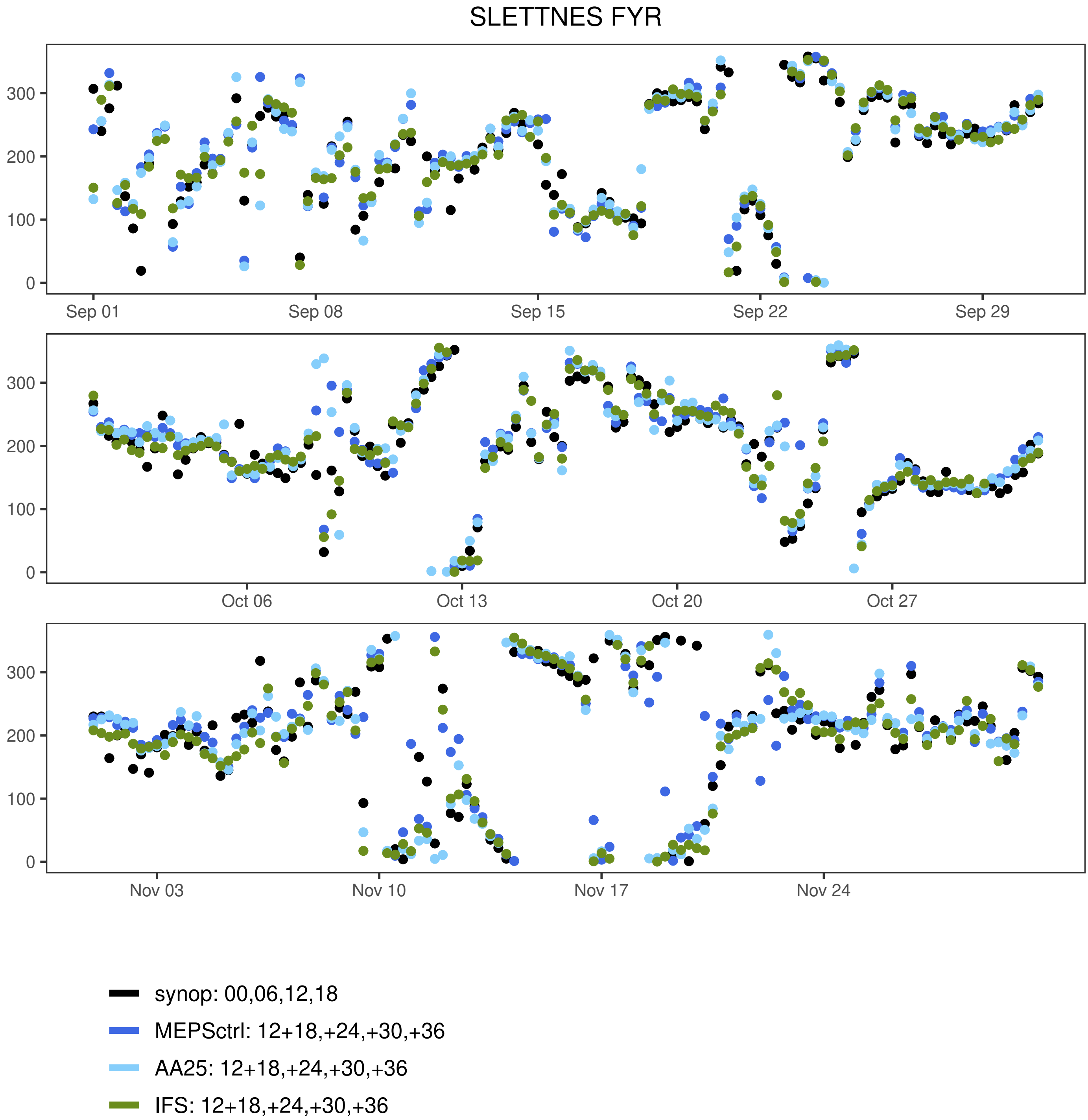

KAUTOKEINO
0
100
200
300
Sep 01
Sep 08
Sep 15
Sep 22
Sep 29
Oct 06
Oct 13
Oct 20
Oct 27
Nov 03
Nov 10
Nov 17
Nov 24
synop: 00,06,12,18
MEPSctrl: 12+18,+24,+30,+36
AA25: 12+18,+24,+30,+36
IFS: 12+18,+24,+30,+36

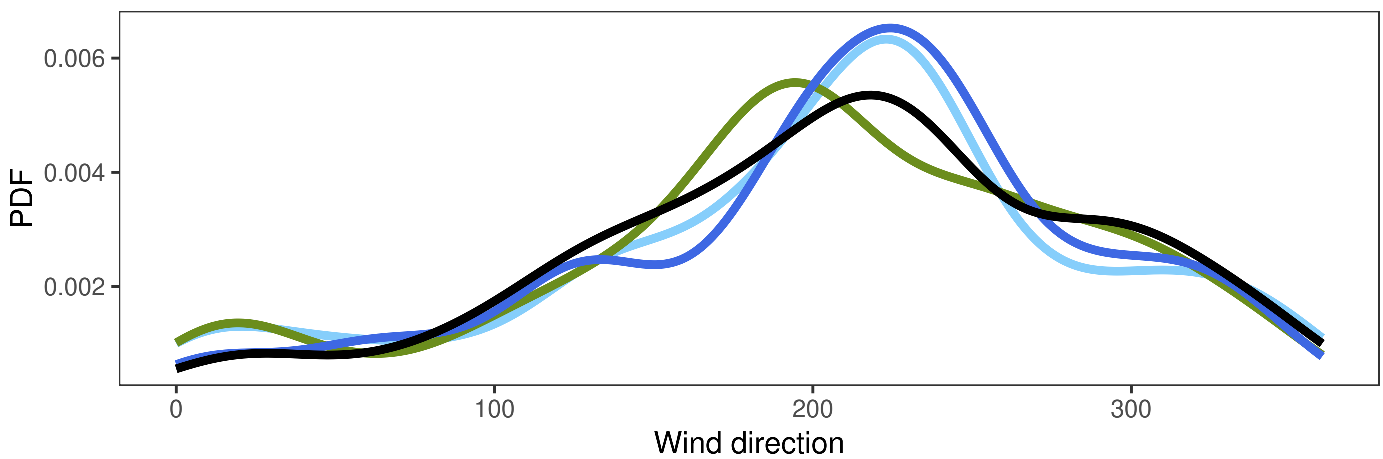

PDF
0.000
0.005
0.010
0
100
200
300
Wind direction

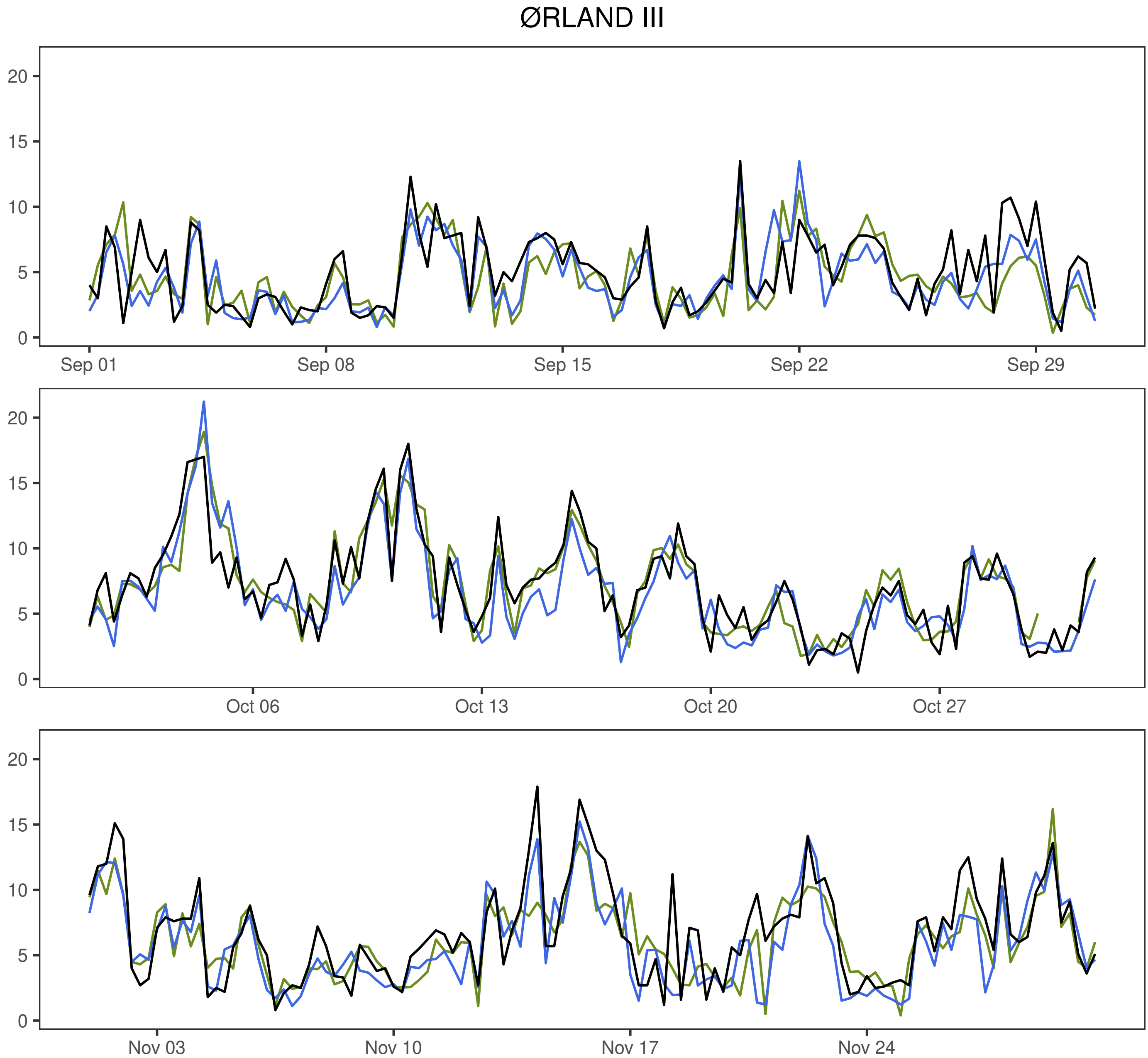


	Min	Mean	Max	Std	N
synop: 00,06,12,18	0.2	6.9	19.2	3.9	364
MEPSctrl: 12+18,+24,+30,+36	0.9	7.1	20.1	3.6	364
AA25: 12+18,+24,+30,+36	0.5	7.0	20.4	3.5	364
IFS: 12+18,+24,+30,+36	0.7	6.9	19.2	3.2	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.2	2.4	2.4	1.8	9.2	360
AA25 – synop	0.1	2.3	2.3	1.7	10.5	360
IFS – synop	0.0	2.2	2.2	1.7	7.2	360

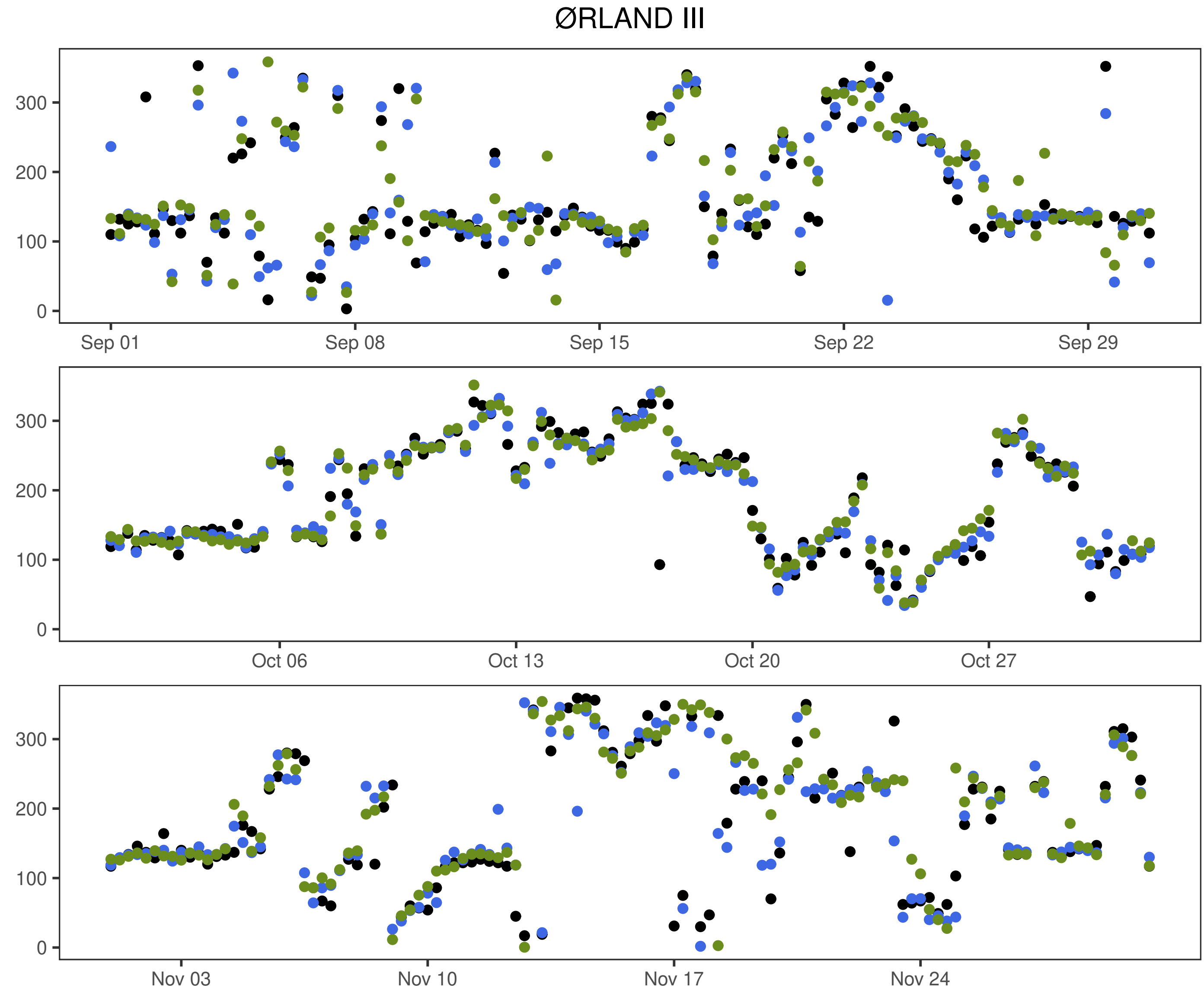

SLETTNES FYR
300
200
100
0
Sep 01
Sep 08
Sep 15
Sep 22
Sep 29
Oct 06
Oct 13
Oct 20
Oct 27
Nov 03
Nov 10
Nov 17
Nov 24
synop: 00,06,12,18
MEPSctrl: 12+18,+24,+30,+36
AA25: 12+18,+24,+30,+36
IFS: 12+18,+24,+30,+36

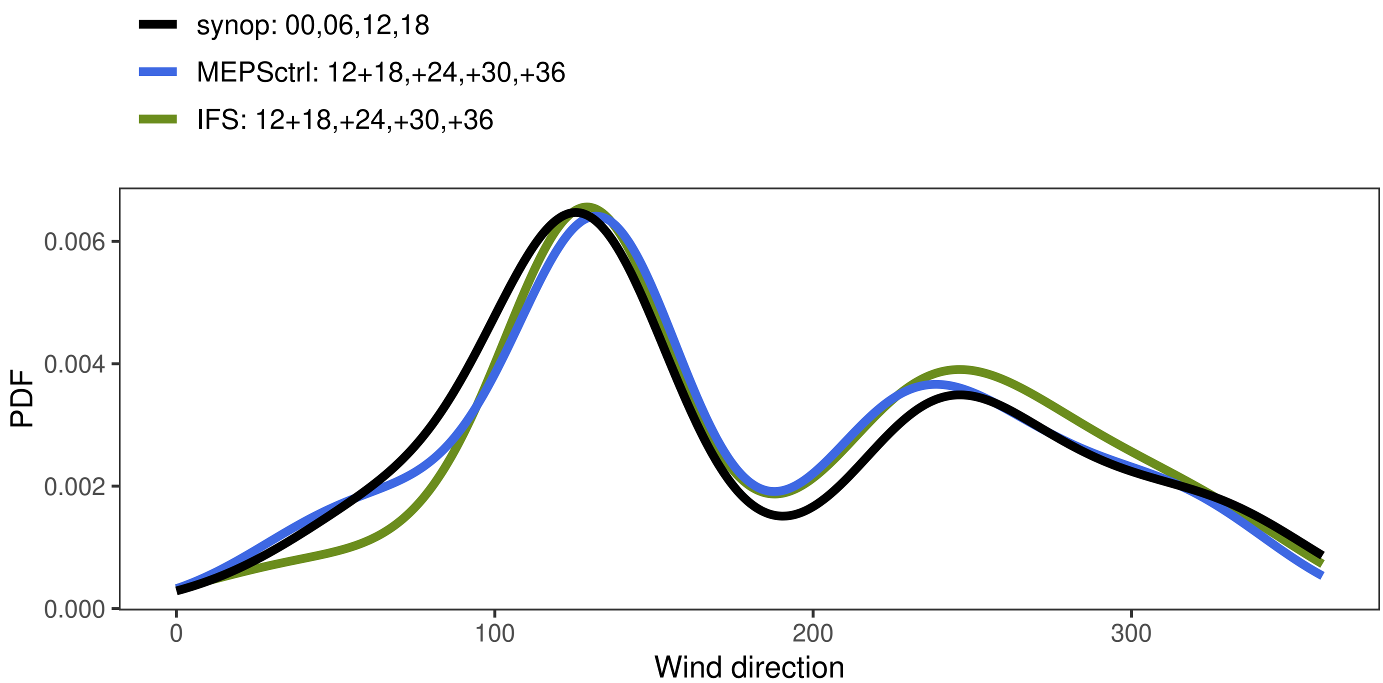

PDF
0.006
0.004
0.002
0
100
200
300
Wind direction

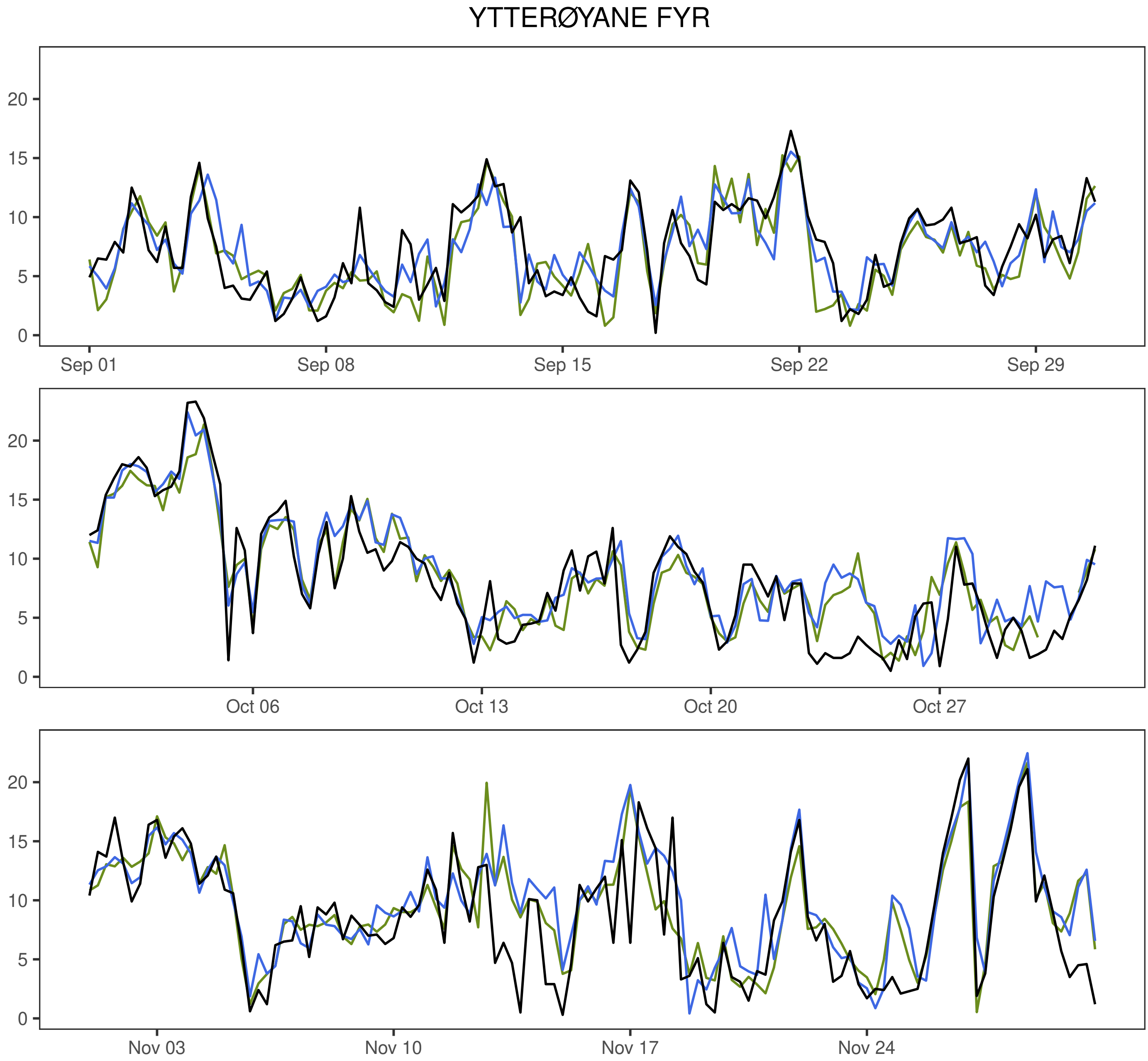


	Min	Mean	Max	Std	N
synop: 00,06,12,18	0.5	6.3	18.0	3.5	364
MEPSctrl: 12+18,+24,+30,+36	0.8	5.6	21.2	3.3	364
IFS: 12+18,+24,+30,+36	0.4	6.0	18.9	3.2	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	–0.7	2.0	2.1	1.6	9.2	360
IFS – synop	–0.3	2.1	2.1	1.6	9.2	360

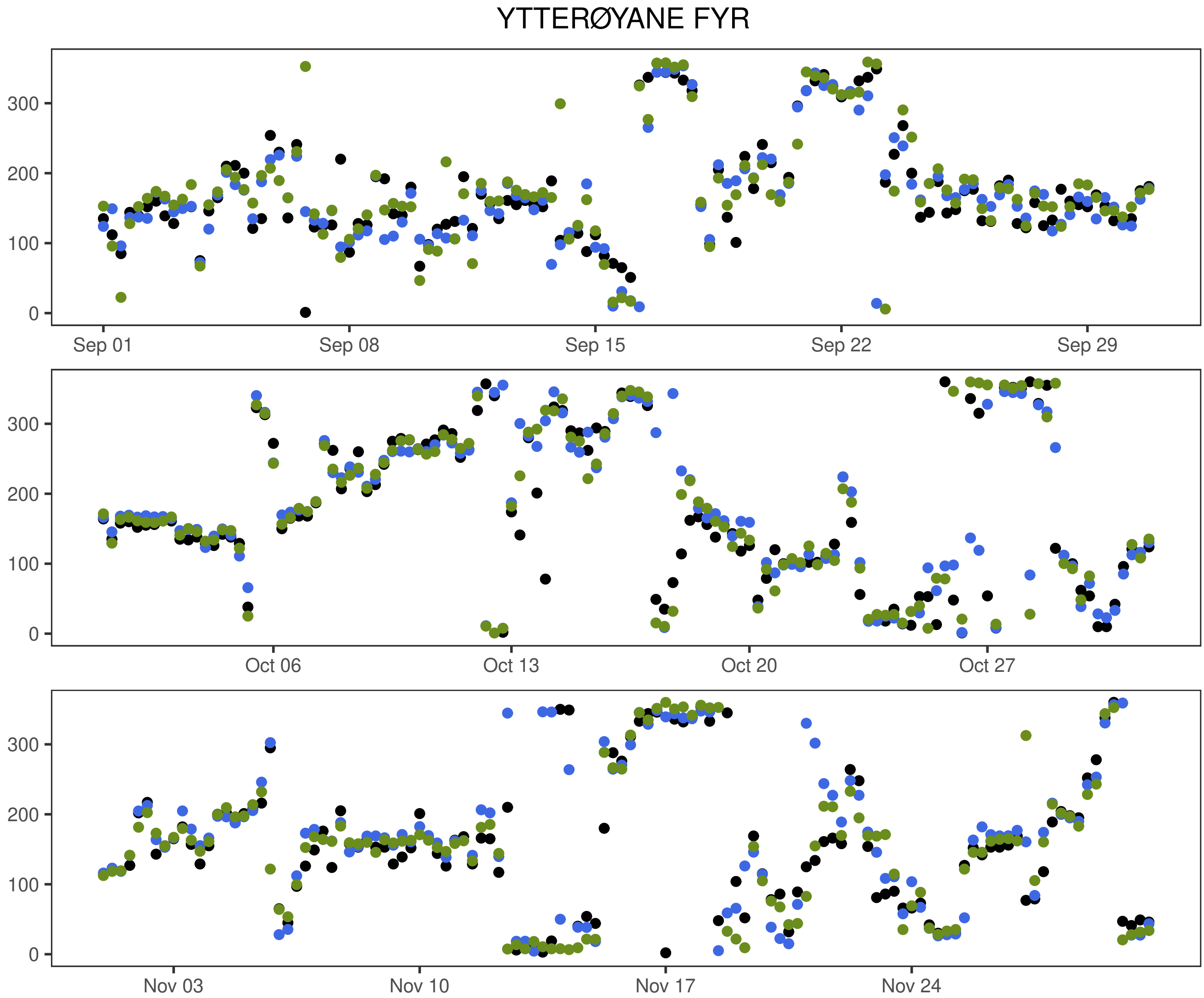

ØRLAND III
300
200
100
0
Sep 01
Sep 08
Sep 15
Sep 22
Sep 29
Oct 06
Oct 13
Oct 20
Oct 27
Nov 03
Nov 10
Nov 17
Nov 24

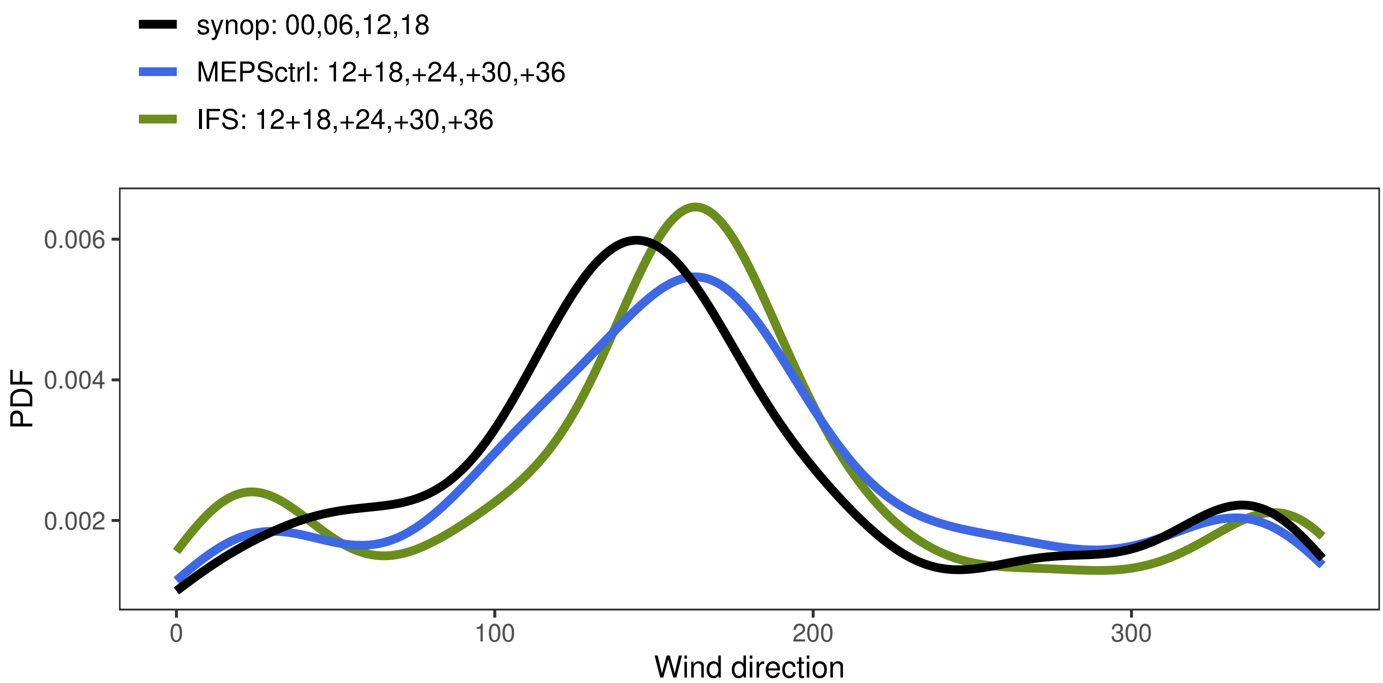

synop: 00,06,12,18
MEPSctrl: 12+18,+24,+30,+36
IFS: 12+18,+24,+30,+36
PDF
0.006
0.004
0.002
0.000
0
100
200
300
Wind direction

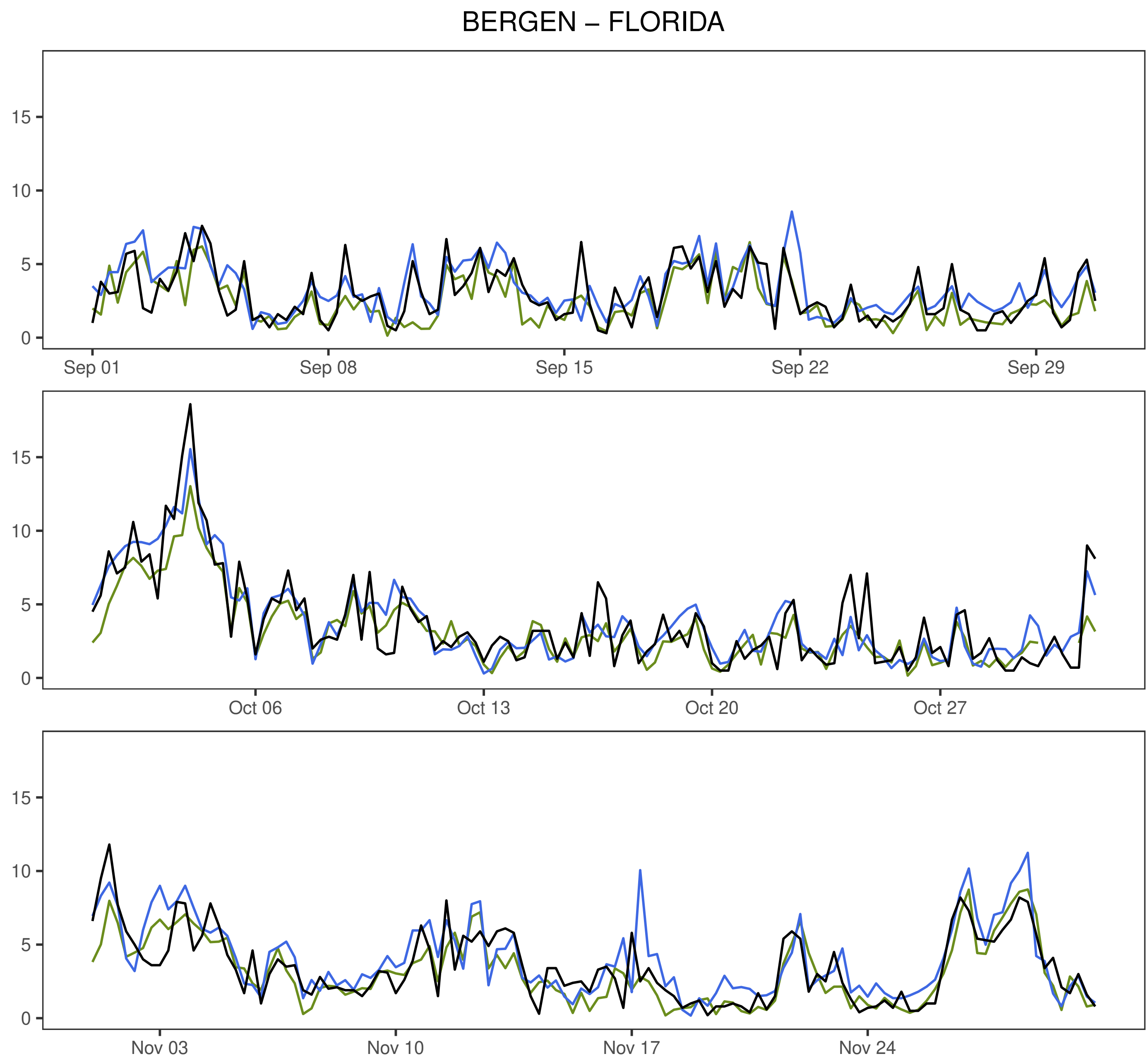


	Min	Mean	Max	Std	N
synop: 00,06,12,18	0.2	8.0	23.3	4.8	364
MEPSctrl: 12+18,+24,+30,+36	0.4	8.7	22.5	4.2	364
IFS: 12+18,+24,+30,+36	0.5	8.2	21.6	4.3	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.7	2.7	2.8	2.1	13.4	360
IFS – synop	0.2	2.7	2.7	2.0	13.1	360

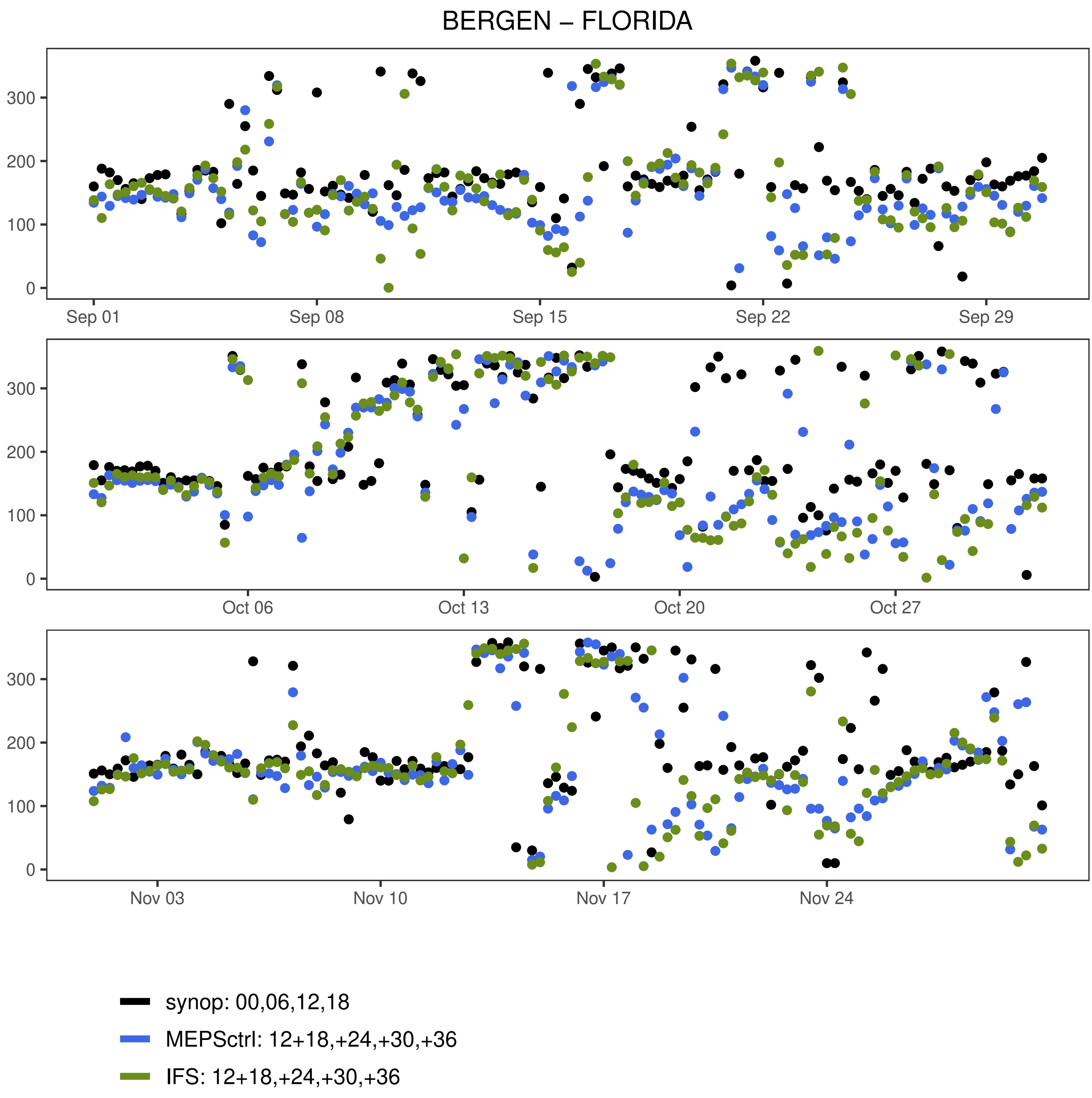

YTTERØYANE FYR
300
200
100
0
Sep 01
Sep 08
Sep 15
Sep 22
Sep 29
Oct 06
Oct 13
Oct 20
Oct 27
Nov 03
Nov 10
Nov 17
Nov 24

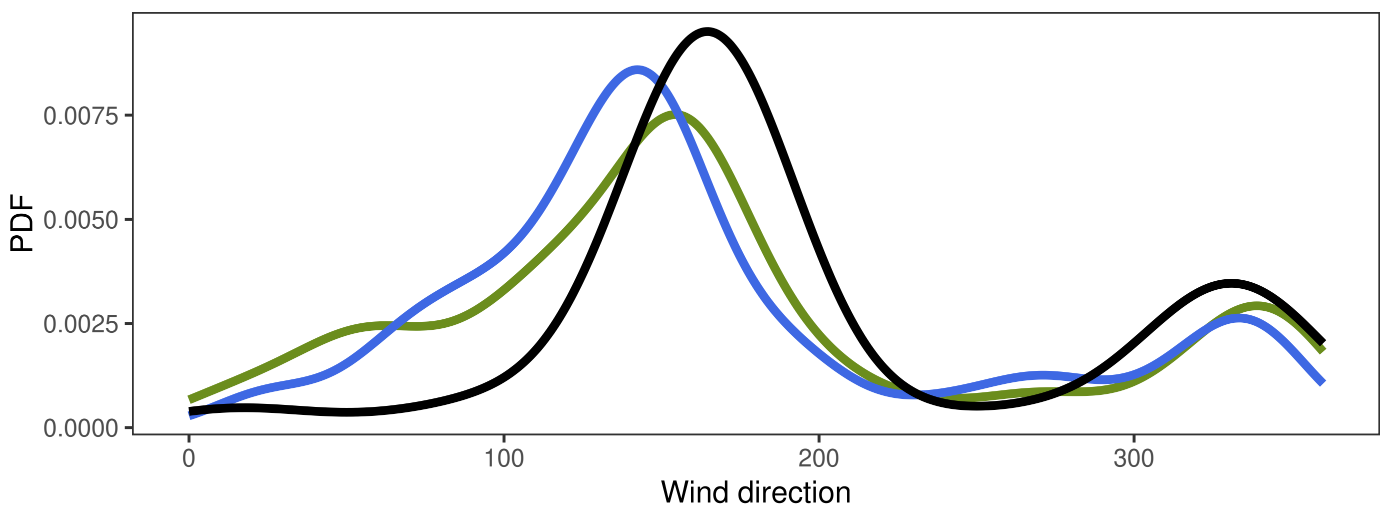

synop: 00,06,12,18
MEPSctrl: 12+18,+24,+30,+36
IFS: 12+18,+24,+30,+36
PDF
0.006
0.004
0.002
0
100
200
300
Wind direction



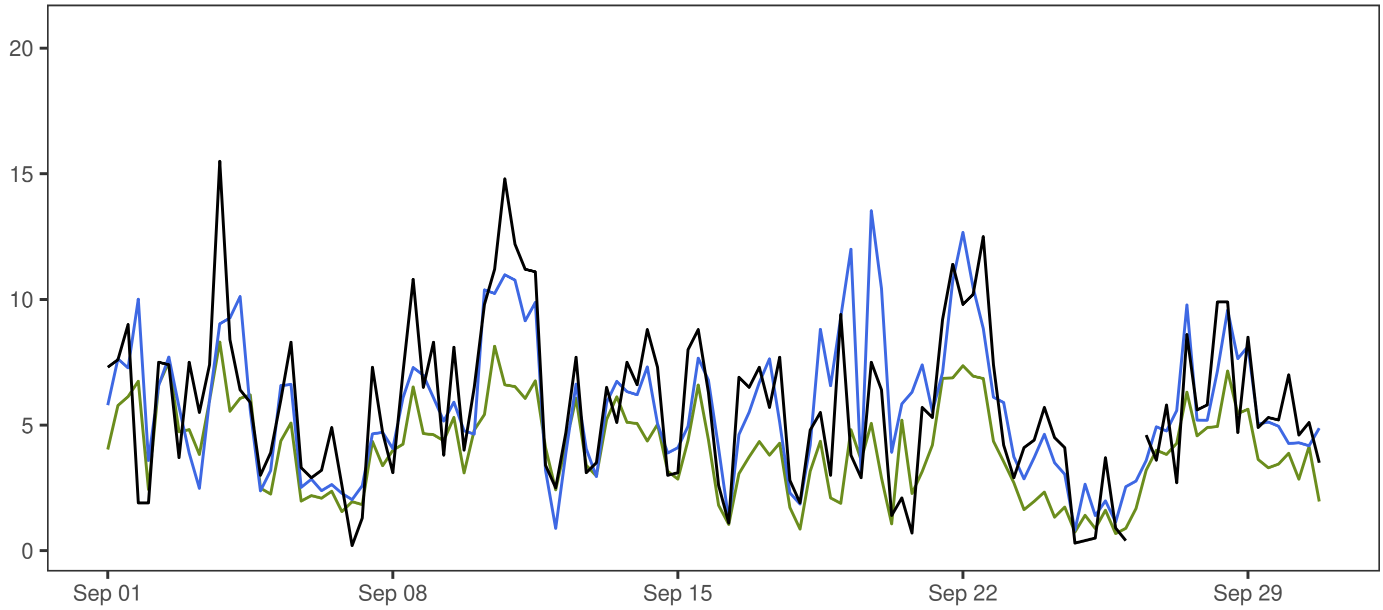
	Min	Mean	Max	Std	N
synop: 00,06,12,18	0.2	3.4	18.6	2.5	364
MEPSctrl: 12+18,+24,+30,+36	0.2	3.8	15.6	2.4	364
IFS: 12+18,+24,+30,+36	0.1	3.0	13.0	2.1	360

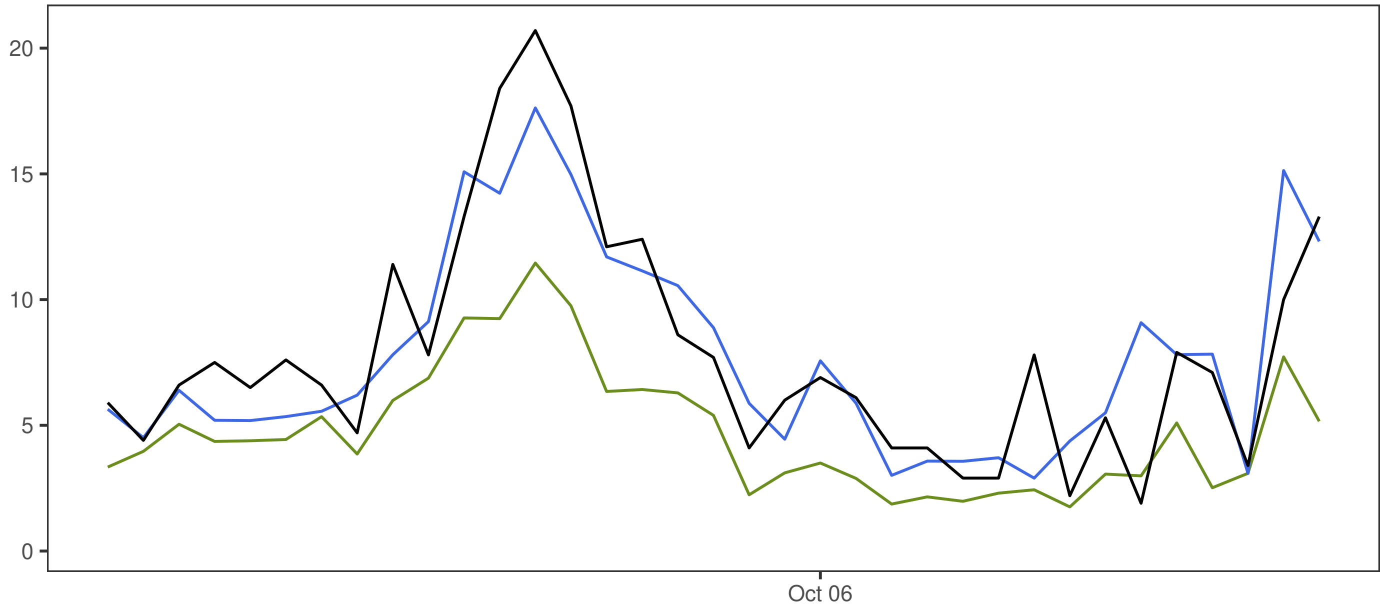
	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.4	1.6	1.6	1.2	7.6	360
IFS – synop	−0.5	1.4	1.5	1.1	5.6	360


BERGEN – FLORIDA
300
200
100
0
Sep 01
Sep 08
Sep 15
Sep 22
Sep 29
Oct 06
Oct 13
Oct 20
Oct 27
Nov 03
Nov 10
Nov 17
Nov 24
synop: 00,06,12,18
MEPSctrl: 12+18,+24,+30,+36
IFS: 12+18,+24,+30,+36


PDF
0.0075
0.0050
0.0025
0.0000
0
100
200
300
Wind direction

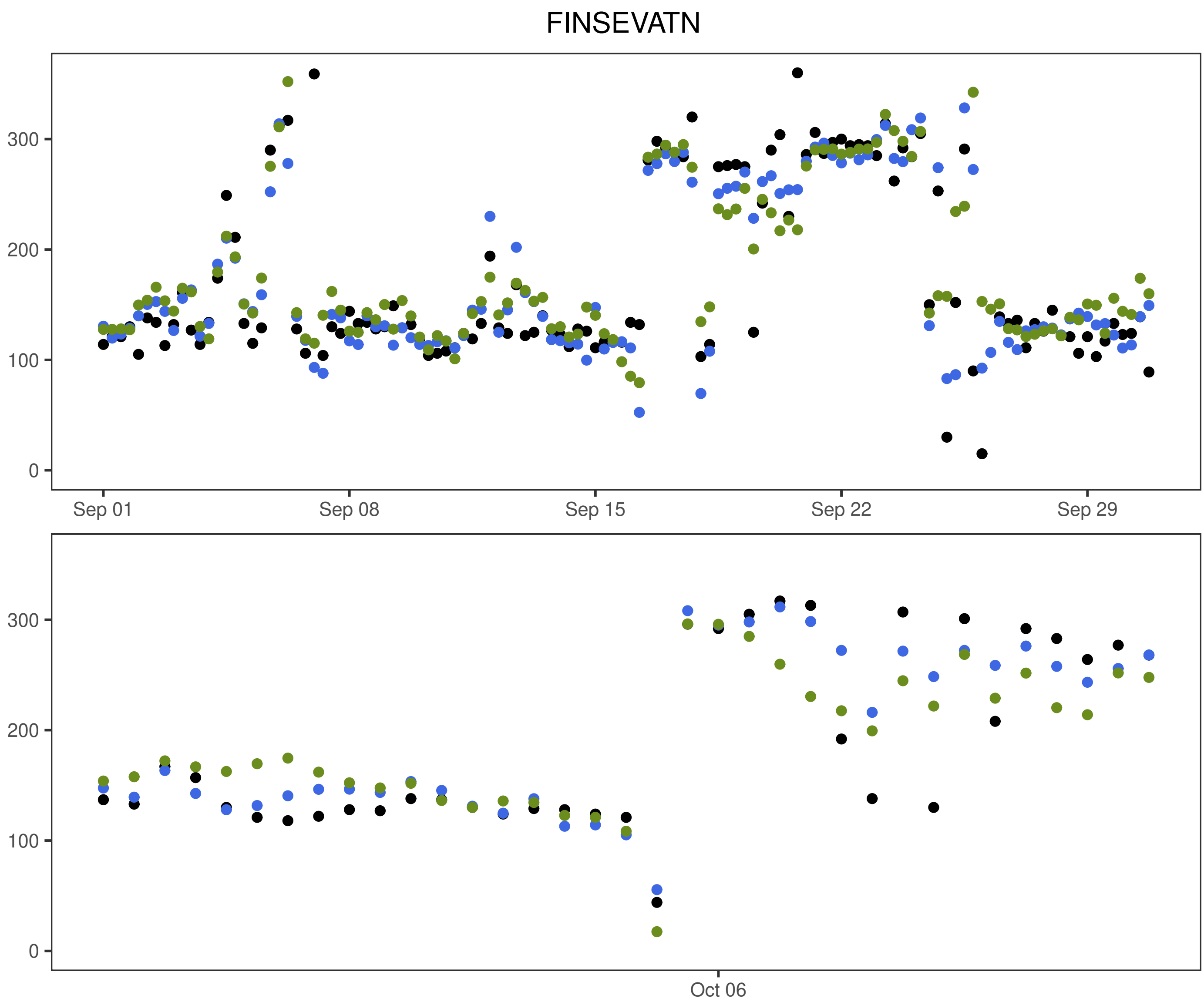
FINSEVATN

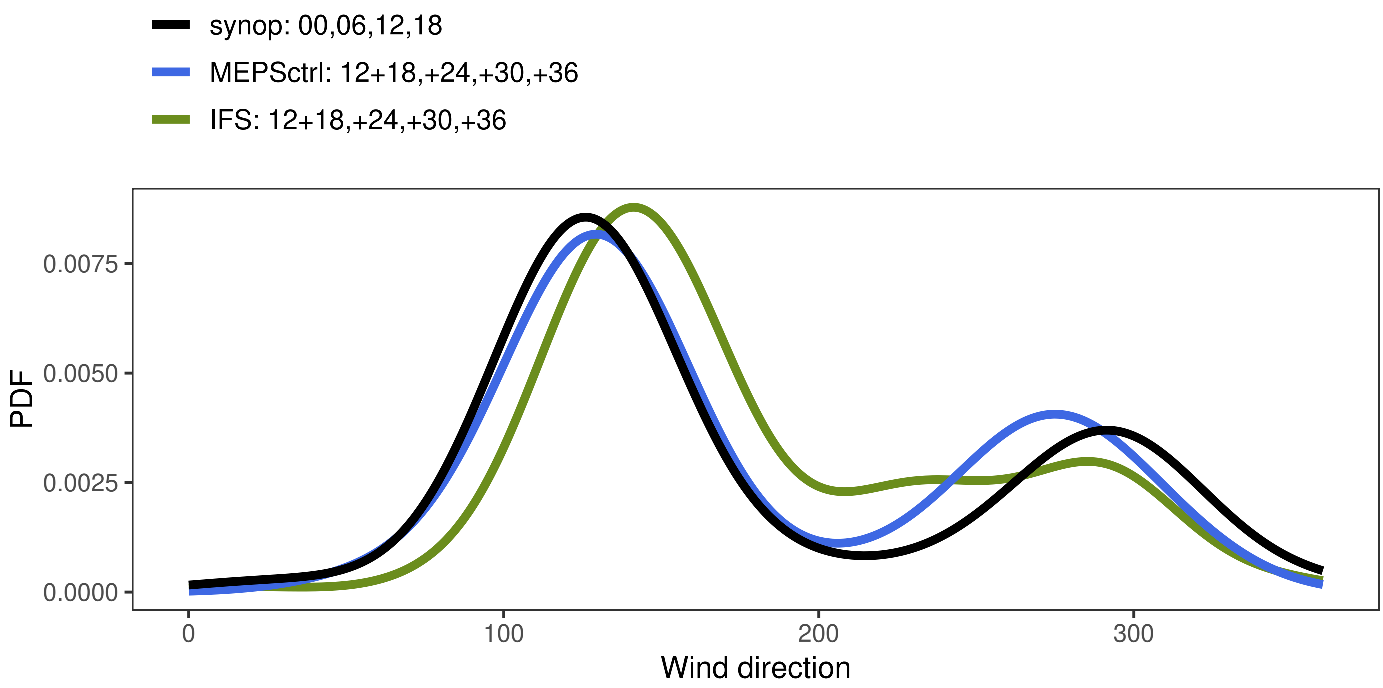


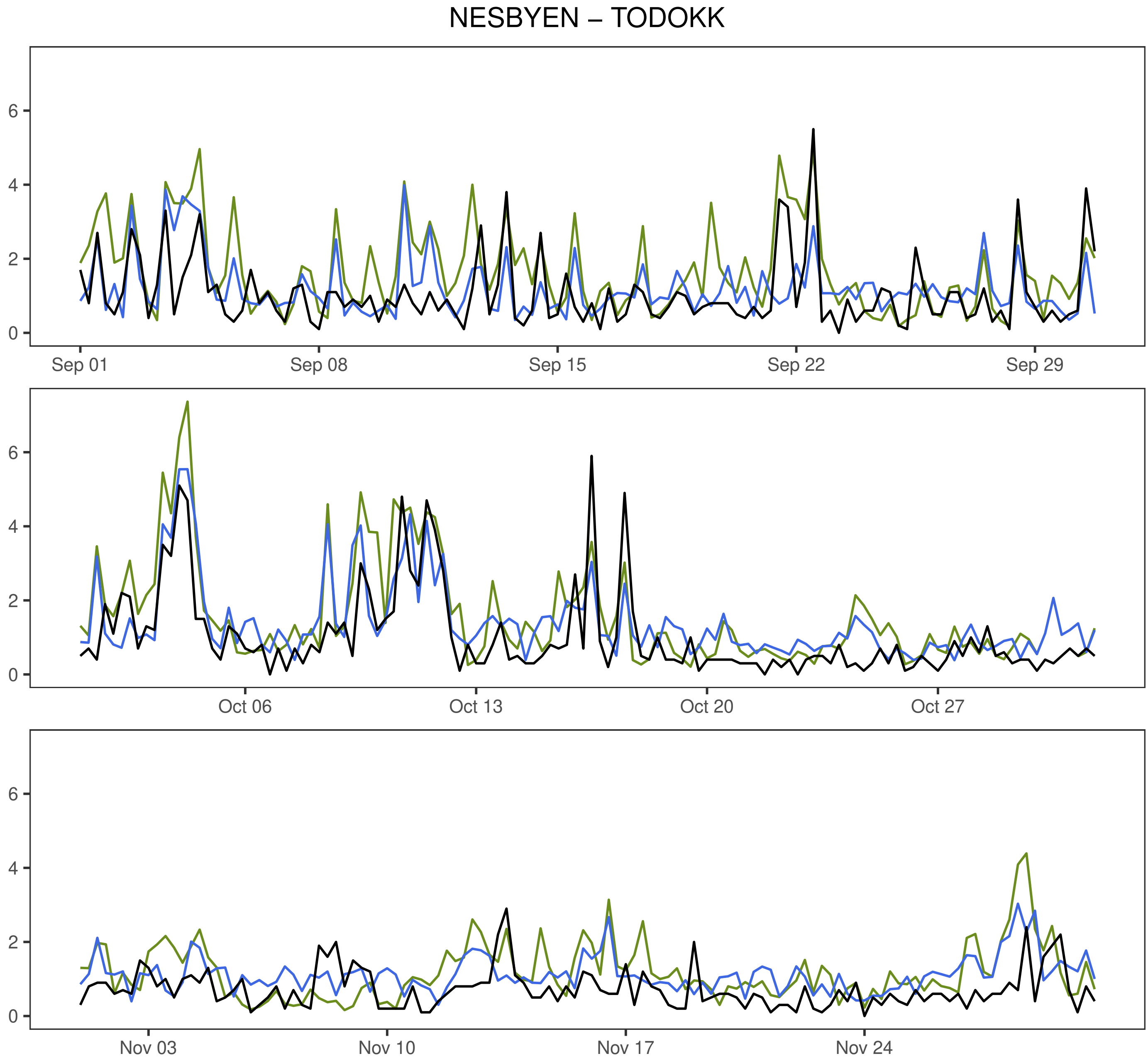


	Min	Mean	Max	Std	N
synop: 00,06,12,18	0.2	6.2	20.7	3.6	154
MEPSctrl: 12+18,+24,+30,+36	0.8	6.1	17.6	3.2	155
IFS: 12+18,+24,+30,+36	0.7	4.2	11.5	2.0	155

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	–0.1	2.2	2.2	1.6	8.2	154
IFS – synop	–2.0	2.2	3.0	2.3	9.2	154

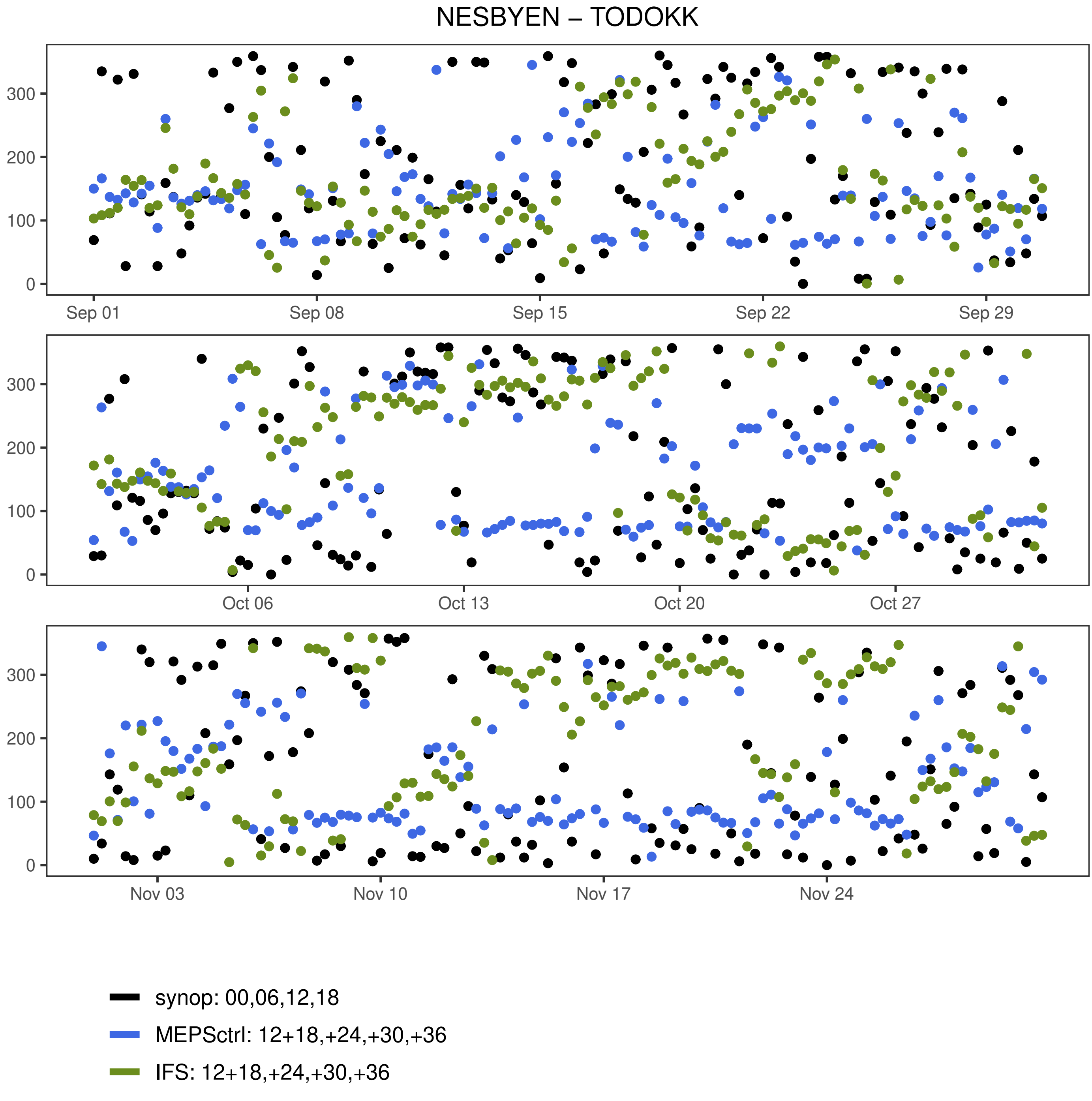

FINSEVATN
300
200
100
0
Sep 01
Sep 08
Sep 15
Sep 22
Sep 29
300
200
100
0
Oct 06

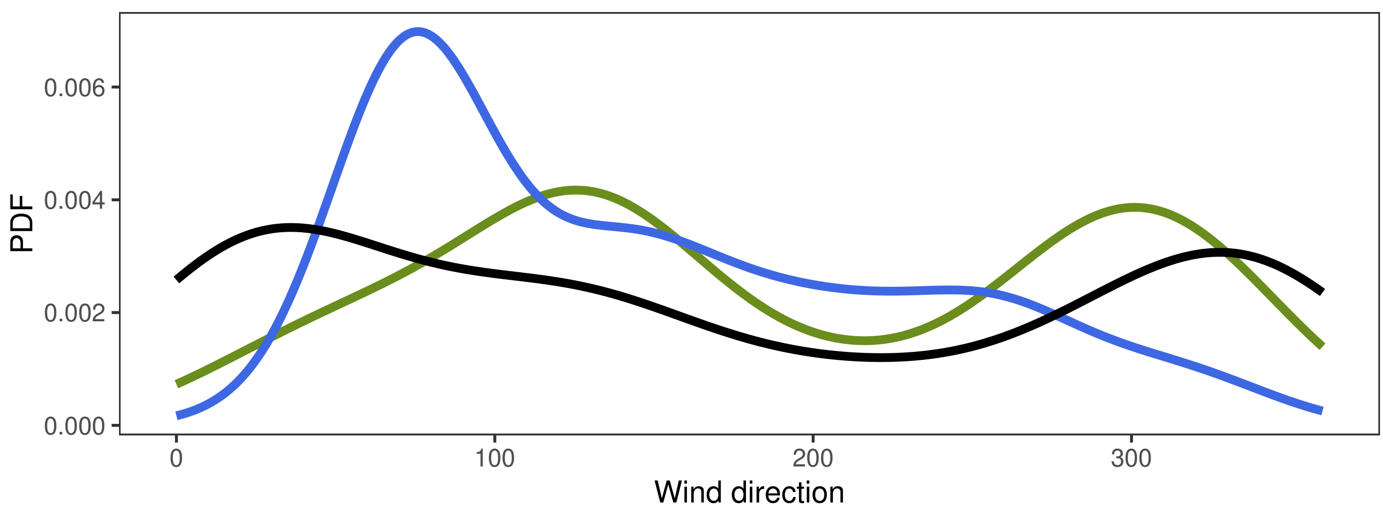

synop: 00,06,12,18
MEPSctrl: 12+18,+24,+30,+36
IFS: 12+18,+24,+30,+36
PDF
0.0075
0.0050
0.0025
0.0000
0
100
200
300
Wind direction

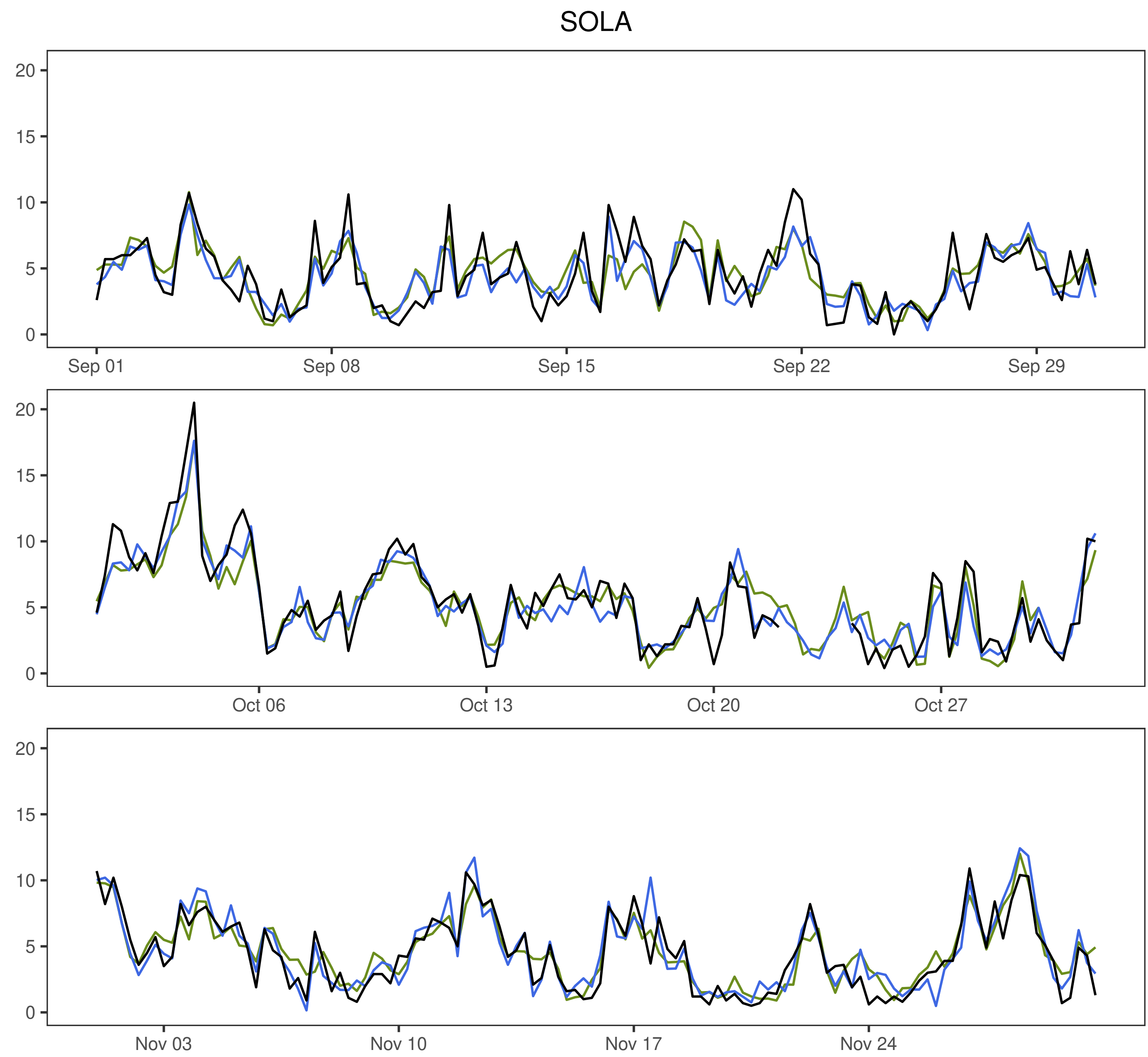


	Min	Mean	Max	Std	N
synop: 00,06,12,18	0.0	0.9	5.9	0.9	364
MEPSctrl: 12+18,+24,+30,+36	0.3	1.2	5.5	0.8	364
IFS: 12+18,+24,+30,+36	0.2	1.5	7.4	1.2	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.3	0.8	0.9	0.7	3.0	360
IFS – synop	0.5	0.9	1.0	0.8	3.4	360

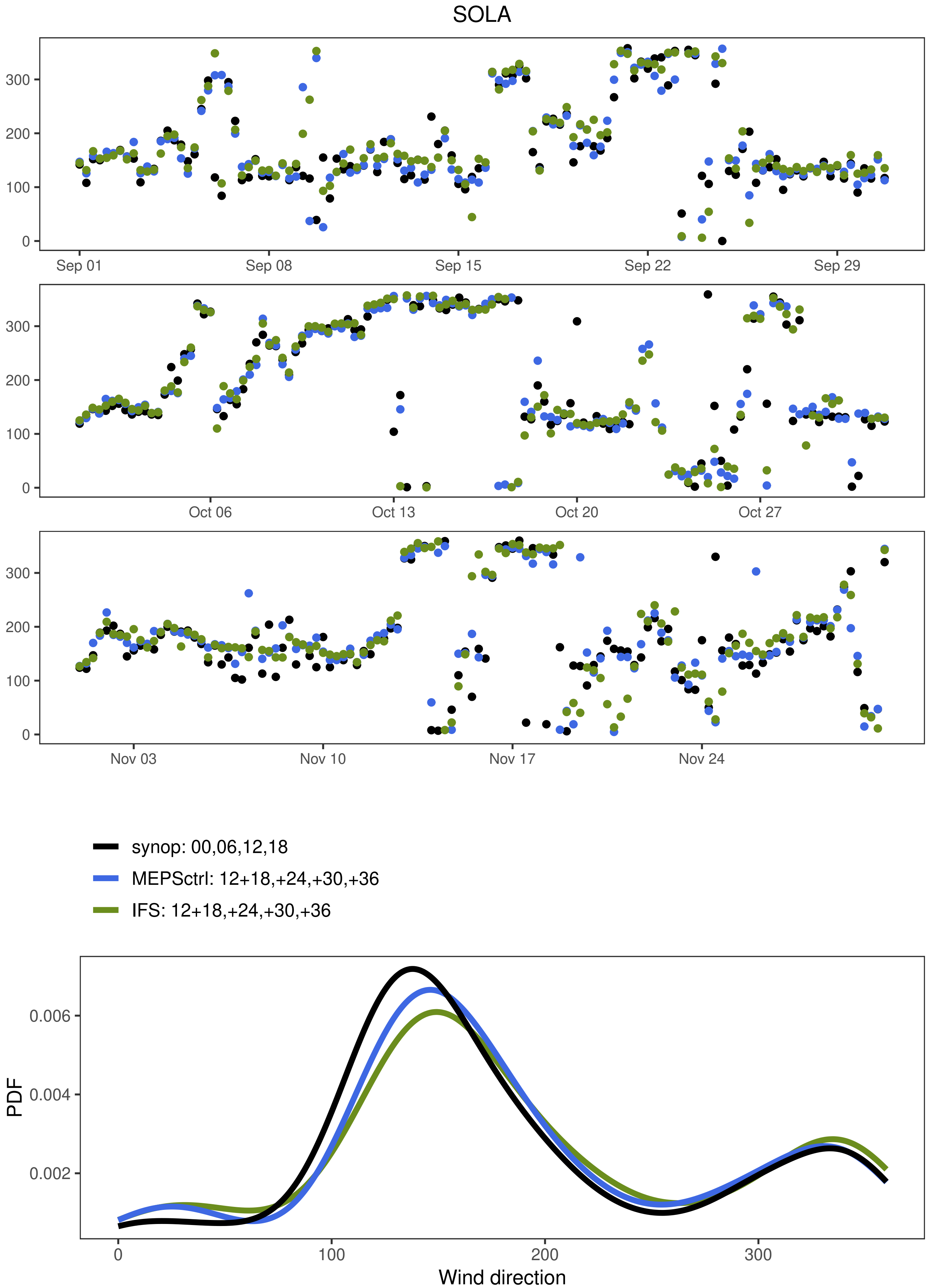

NESBYEN – TODOKK
300
200
100
0
Sep 01
Sep 08
Sep 15
Sep 22
Sep 29
Oct 06
Oct 13
Oct 20
Oct 27
Nov 03
Nov 10
Nov 17
Nov 24
synop: 00,06,12,18
MEPSctrl: 12+18,+24,+30,+36
IFS: 12+18,+24,+30,+36

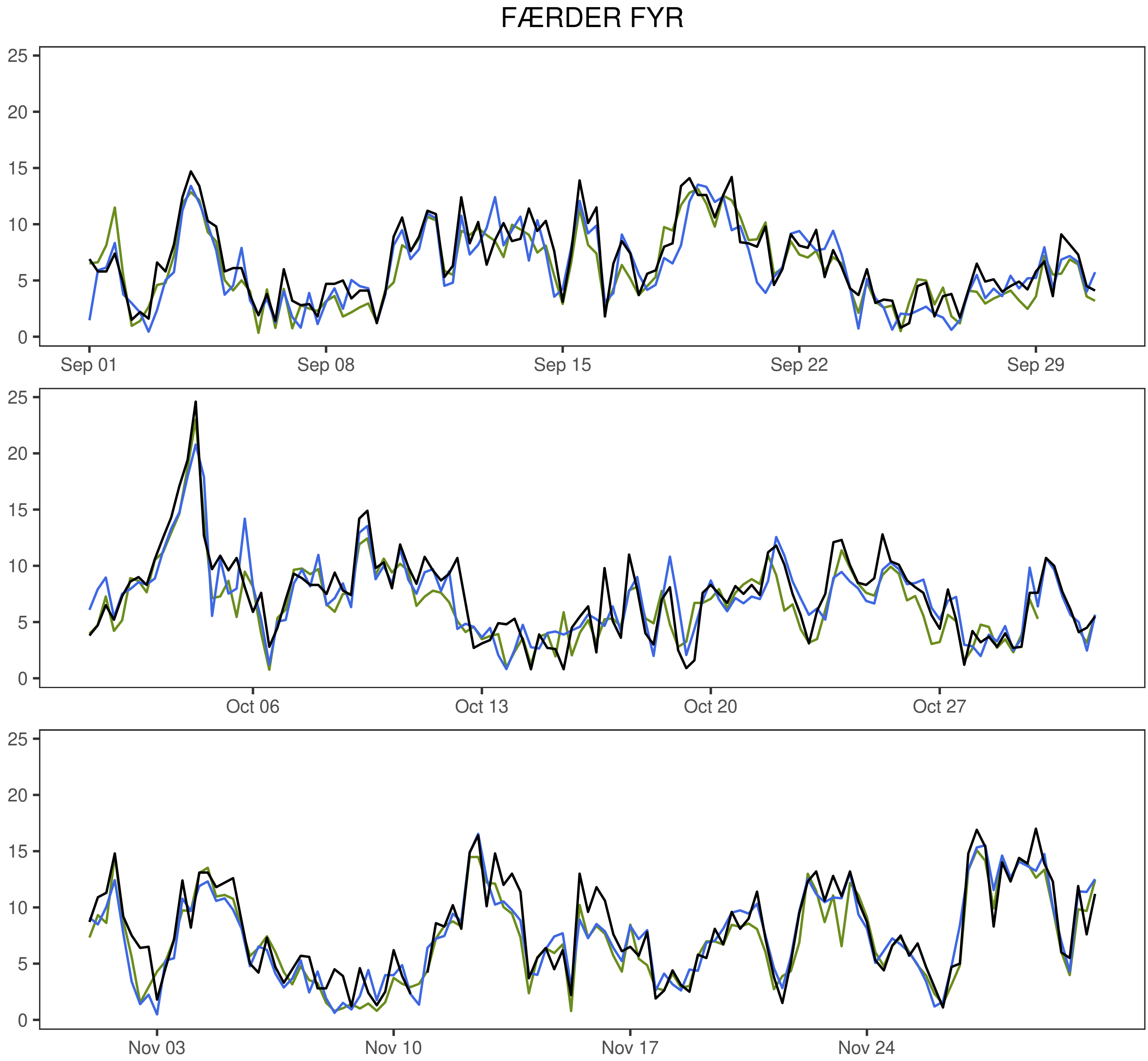

PDF
0.006
0.004
0.002
0.000
0
100
200
300
Wind direction



		Min	Mean	Max	Std	N
	synop: 00,06,12,18	0.0	4.8	20.5	3.0	356
	MEPSctrl: 12+18,+24,+30,+36	0.2	4.7	17.6	2.7	364
	IFS: 12+18,+24,+30,+36	0.4	4.9	17.5	2.4	360

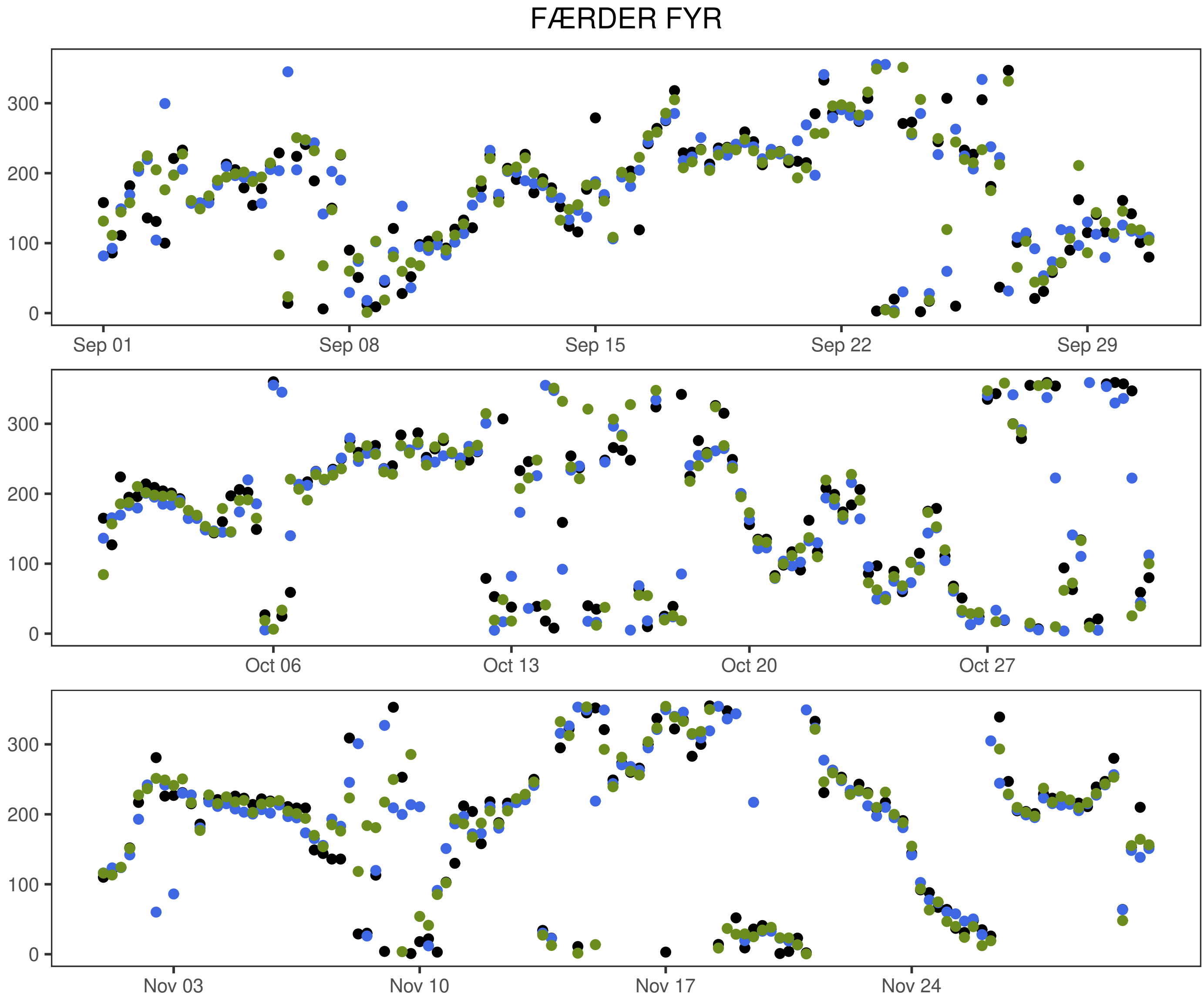
	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	–0.1	1.4	1.4	1.1	6.5	352
IFS – synop	0.0	1.5	1.5	1.1	4.4	352

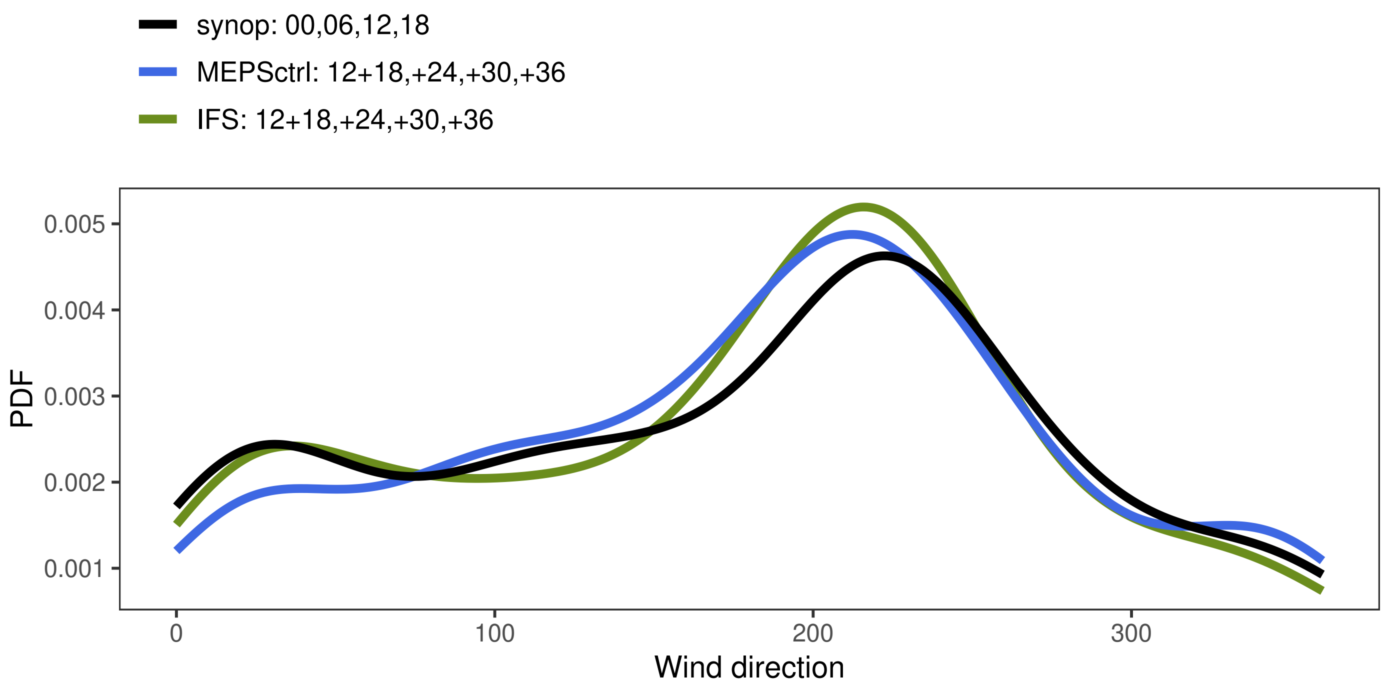

SOLA
300
200
100
0
Sep 01
Sep 08
Sep 15
Sep 22
Sep 29
Oct 06
Oct 13
Oct 20
Oct 27
Nov 03
Nov 10
Nov 17
Nov 24
synop: 00,06,12,18
MEPSctrl: 12+18,+24,+30,+36
IFS: 12+18,+24,+30,+36
PDF
0.006
0.004
0.002
0
100
200
300
Wind direction

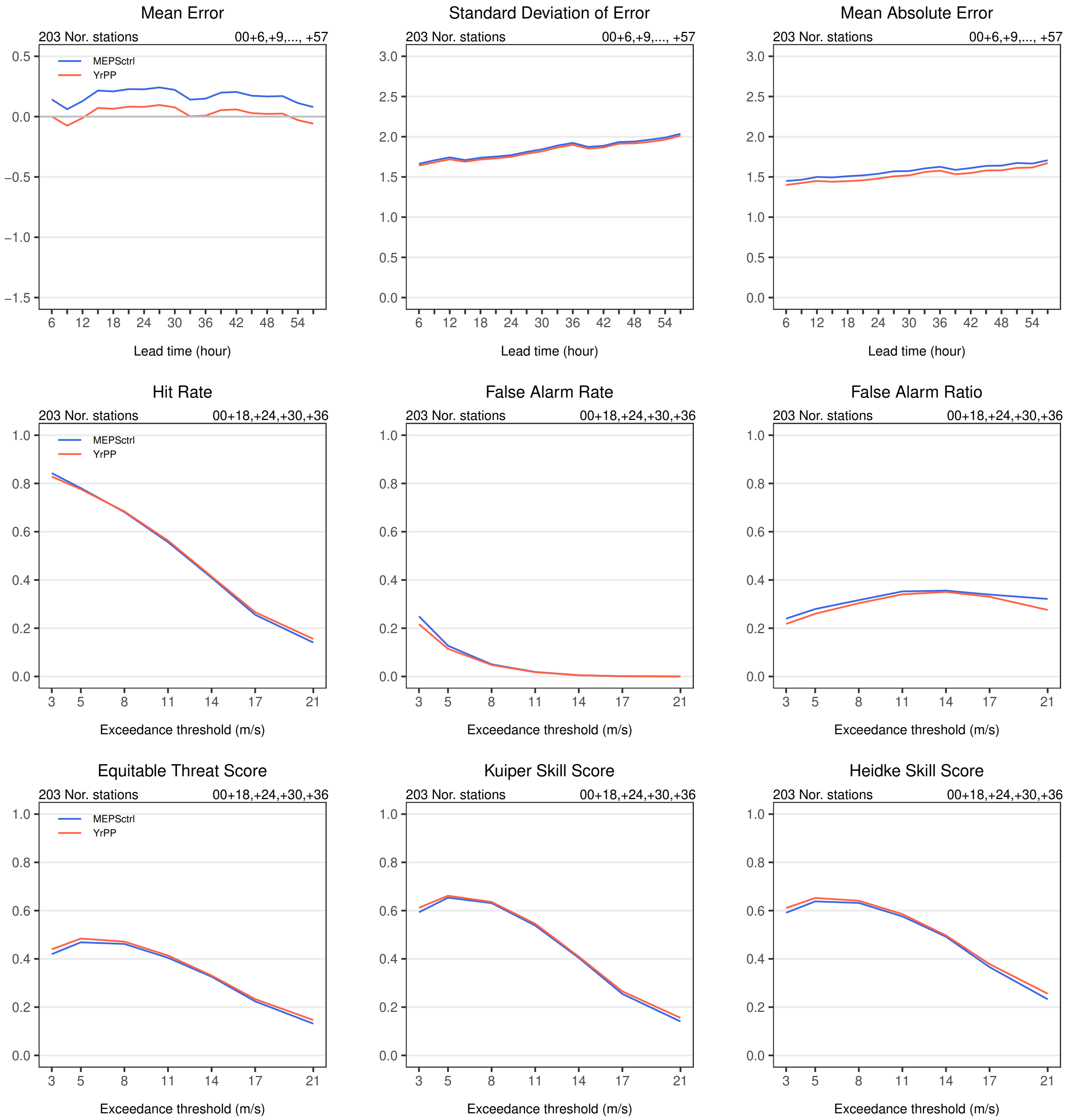


	Min	Mean	Max	Std	N
synop: 00,06,12,18	0.8	7.4	24.6	3.8	363
MEPSctrl: 12+18,+24,+30,+36	0.4	6.9	20.8	3.6	364
IFS: 12+18,+24,+30,+36	0.3	6.6	23.0	3.5	360

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	–0.5	1.8	1.9	1.4	6.3	359
IFS – synop	–0.7	1.6	1.7	1.3	5.6	359

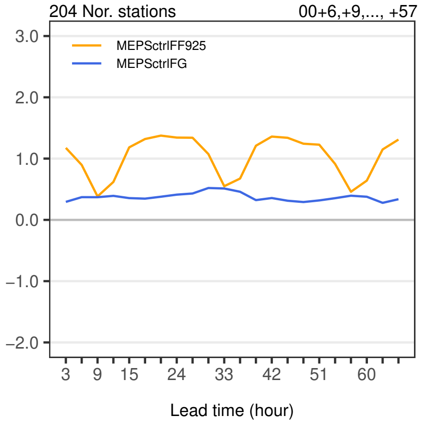

FÆRDER FYR
300
200
100
0
Sep 01
Sep 08
Sep 15
Sep 22
Sep 29
Oct 06
Oct 13
Oct 20
Oct 27
Nov 03
Nov 10
Nov 17
Nov 24


synop: 00,06,12,18
MEPSctrl: 12+18,+24,+30,+36
IFS: 12+18,+24,+30,+36
PDF
0.005
0.004
0.003
0.002
0.001
0
100
200
300
Wind direction

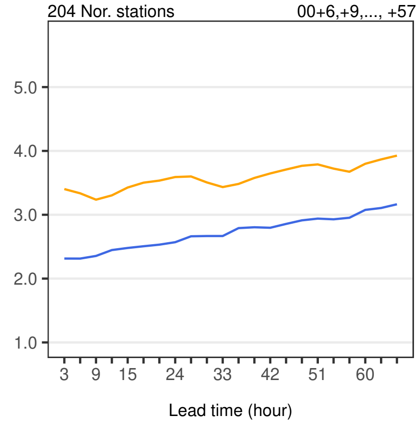

Mean Error
203 Nor. stations
00+6,+9,..., +57
MEPSctrl
YrPP
Lead time (hour)
Standard Deviation of Error
203 Nor. stations
00+6,+9,..., +57
Lead time (hour)
Mean Absolute Error
203 Nor. stations
00+6,+9,..., +57
Lead time (hour)
Hit Rate
203 Nor. stations
00+18,+24,+30,+36
MEPSctrl
YrPP
Exceedance threshold (m/s)
False Alarm Rate
203 Nor. stations
00+18,+24,+30,+36
Exceedance threshold (m/s)
False Alarm Ratio
203 Nor. stations
00+18,+24,+30,+36
Exceedance threshold (m/s)
Equitable Threat Score
203 Nor. stations
00+18,+24,+30,+36
MEPSctrl
YrPP
Exceedance threshold (m/s)
Kuiper Skill Score
203 Nor. stations
00+18,+24,+30,+36
Exceedance threshold (m/s)
Heidke Skill Score
203 Nor. stations
00+18,+24,+30,+36
Exceedance threshold (m/s)

Wind gust (FG) and wind speed in 925 hpa (FF.925)

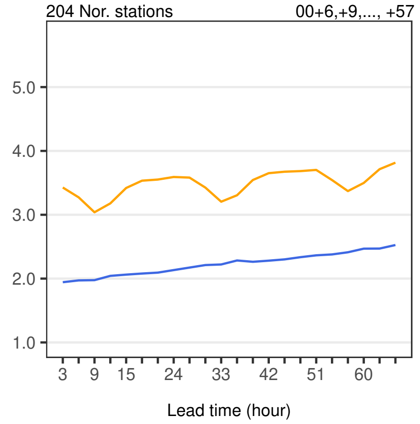
Mean Error



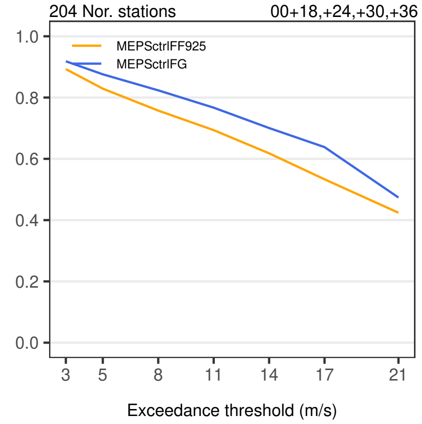
Standard Deviation of Error



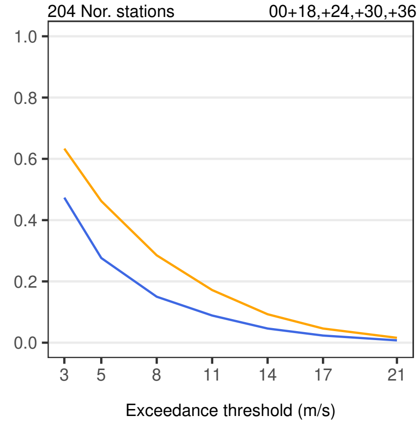
Mean Absolute Error



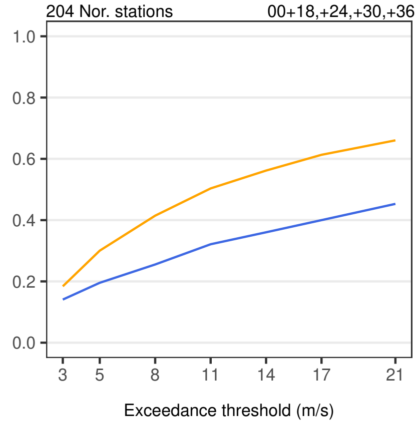
Hit Rate



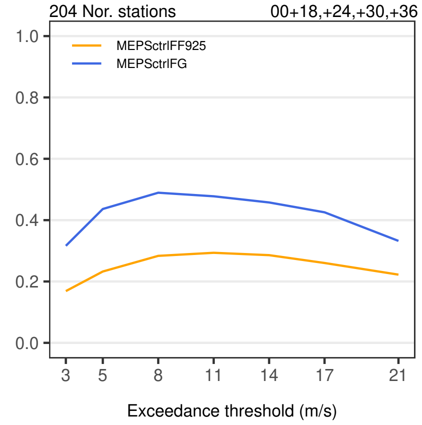
False Alarm Rate



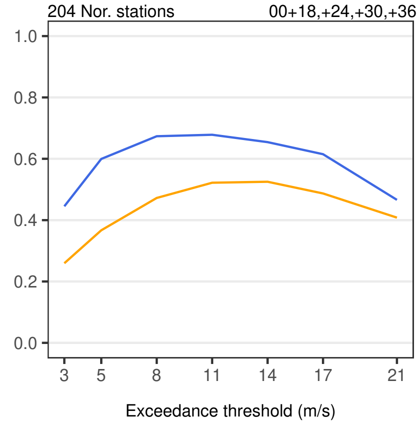
False Alarm Ratio



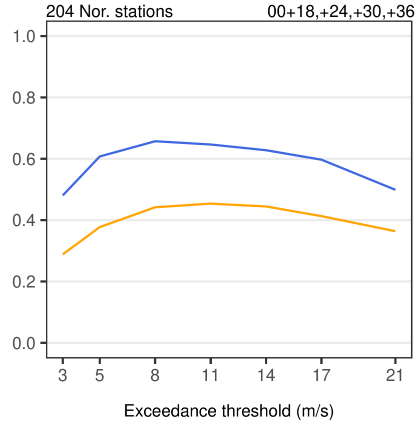
Equitable Threat Score



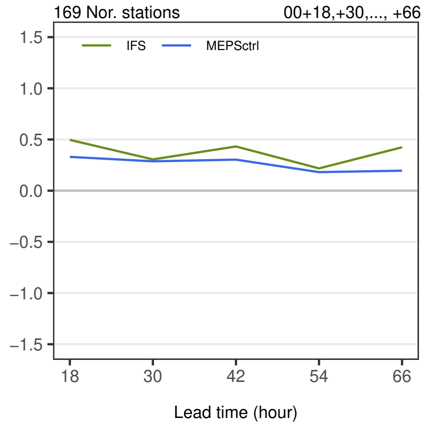
Kuiper Skill Score



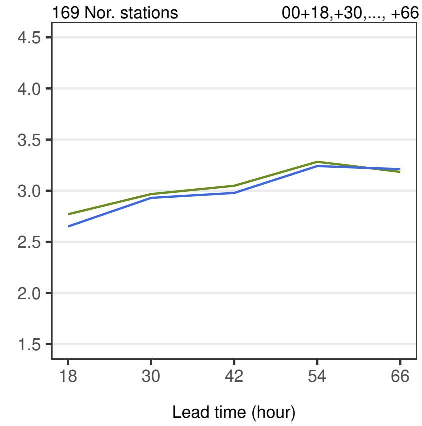
Heidke Skill Score



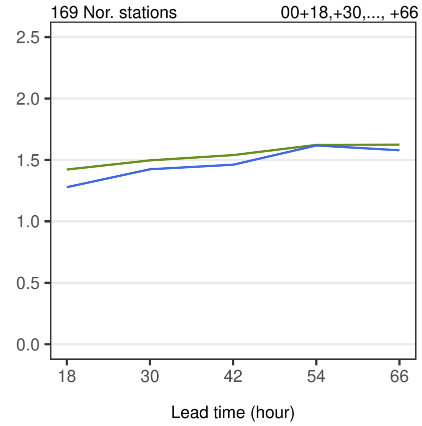
Mean Error



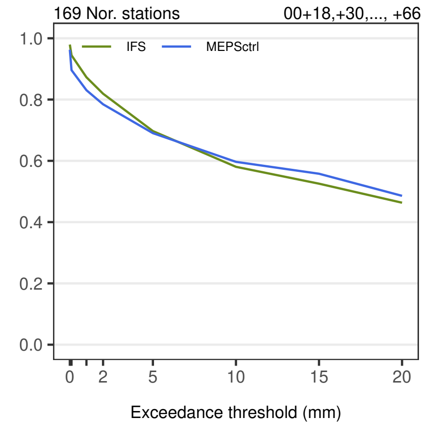
Standard Deviation of Error



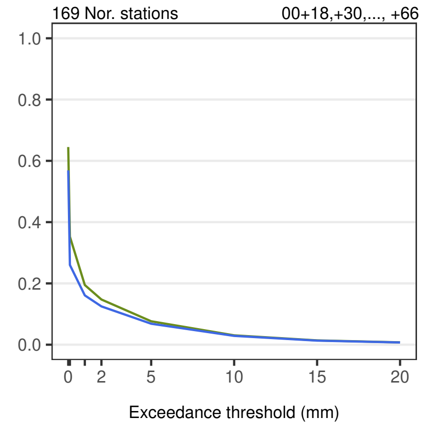
Mean Absolute Error



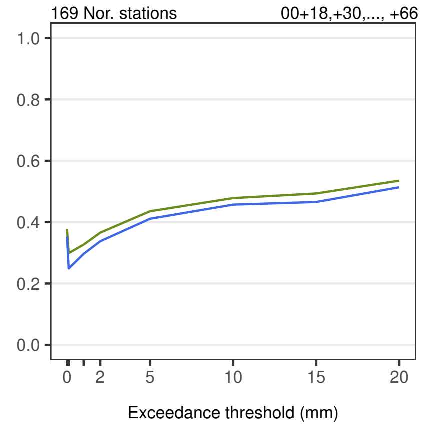
Hit Rate



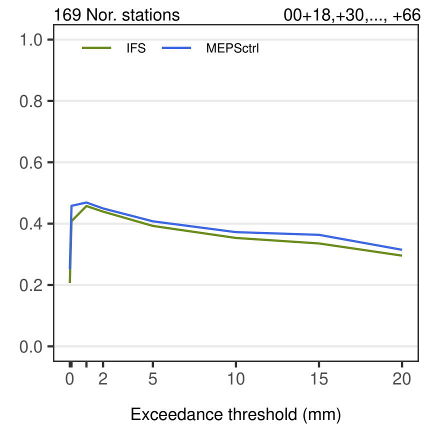
False Alarm Rate



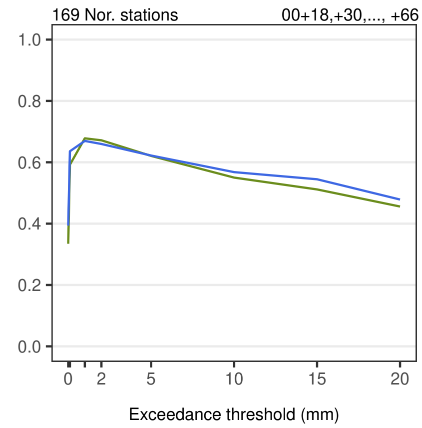
False Alarm Ratio



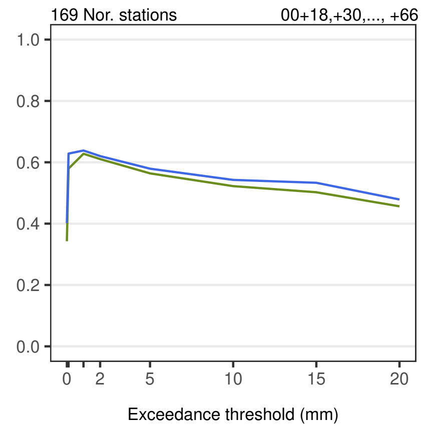
Equitable Threat Score

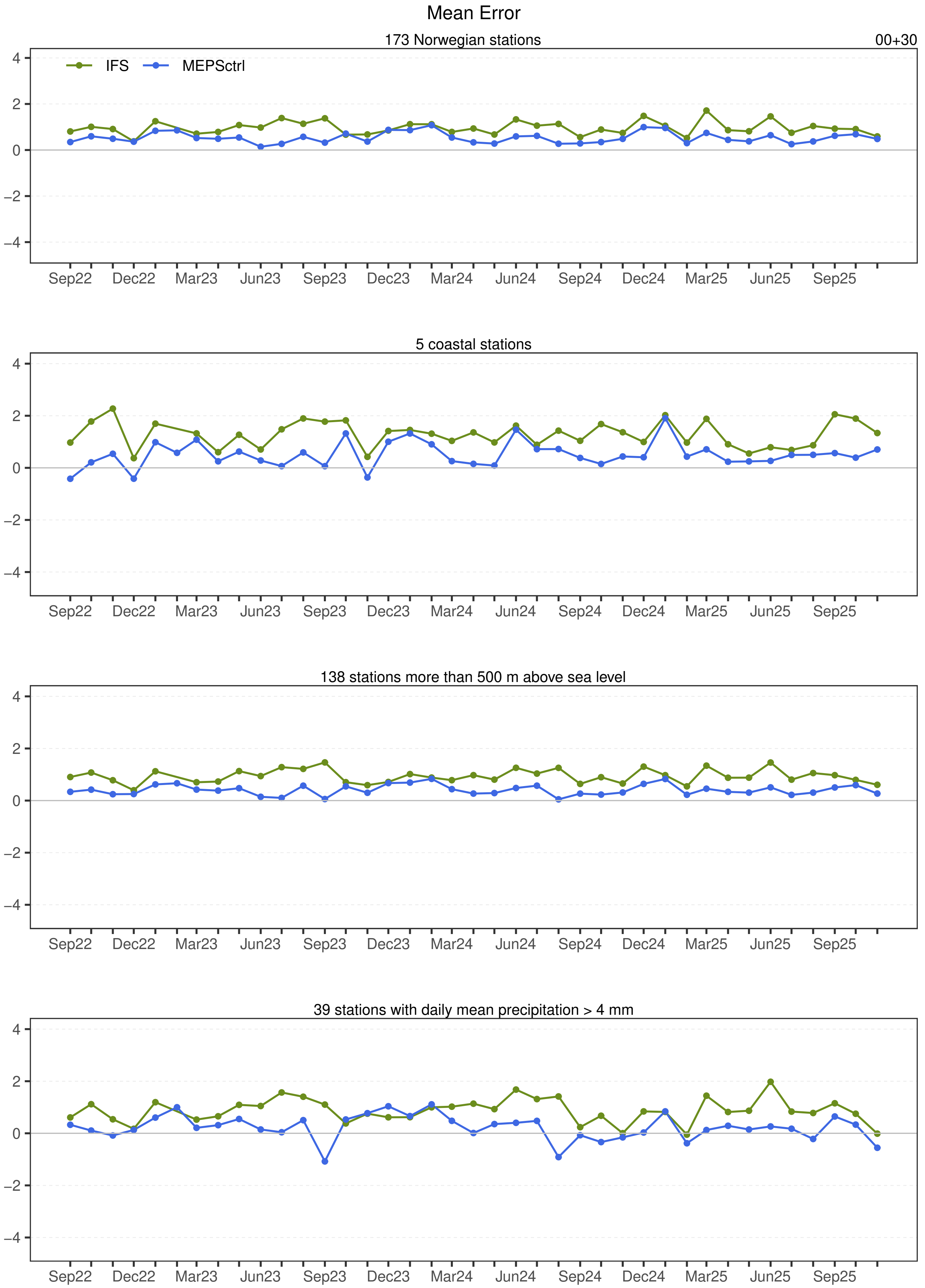


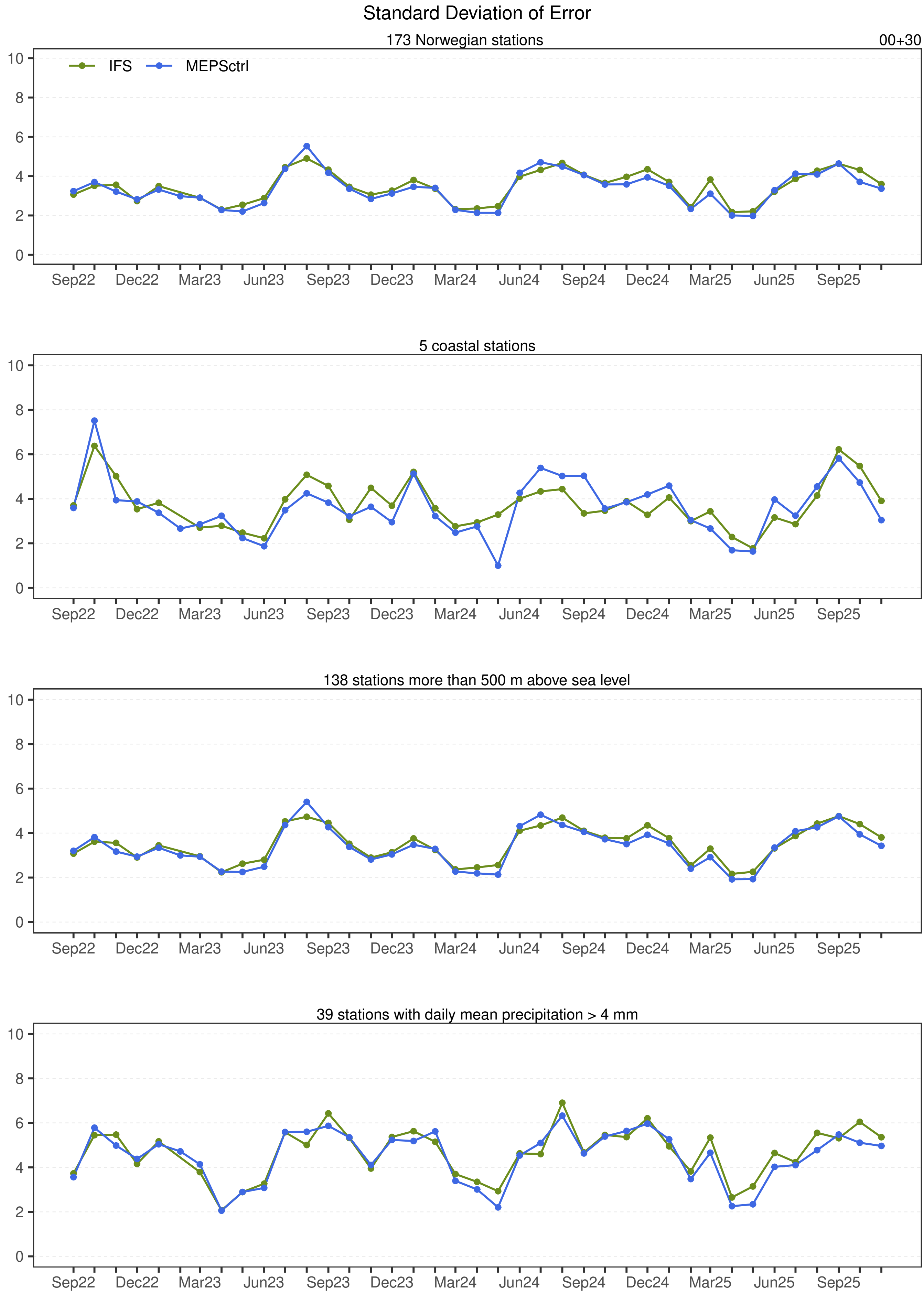
Kuiper Skill Score



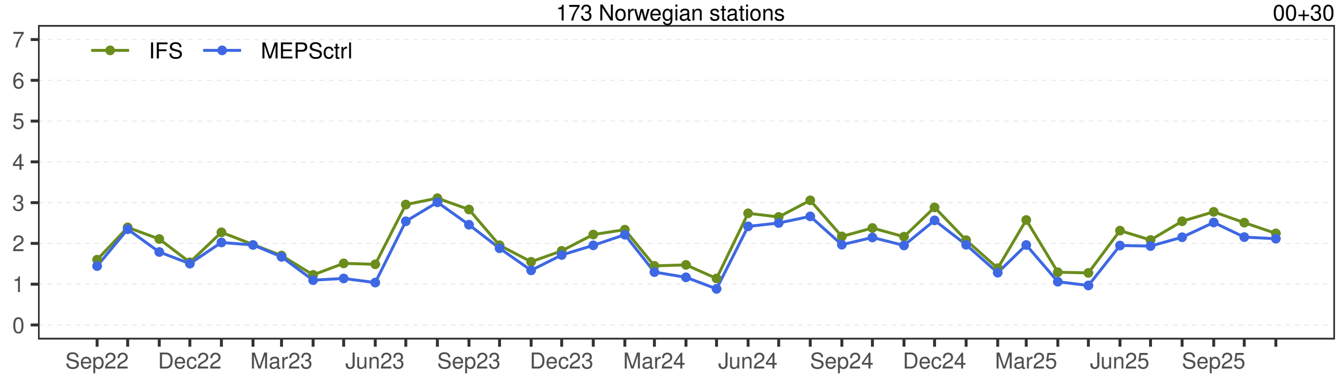
Heidke Skill Score

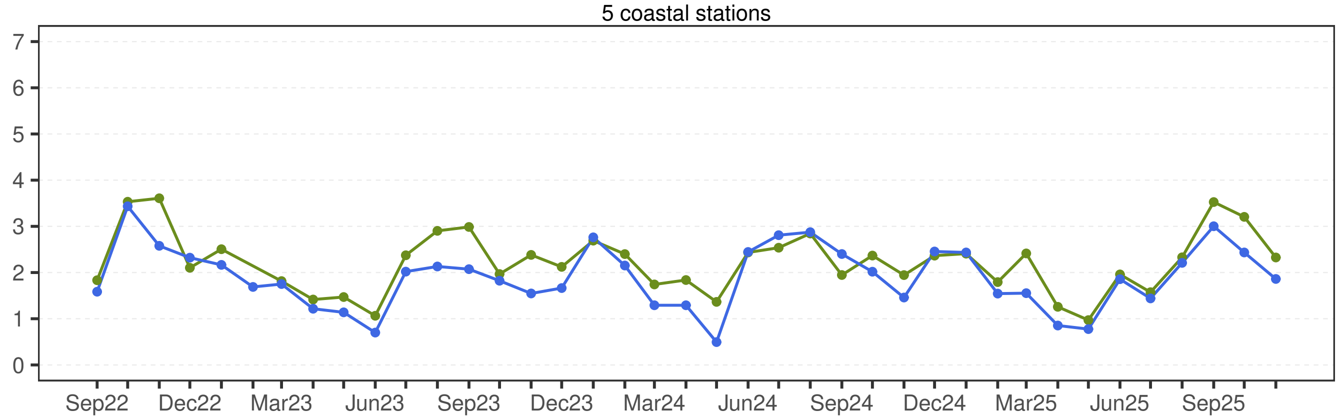


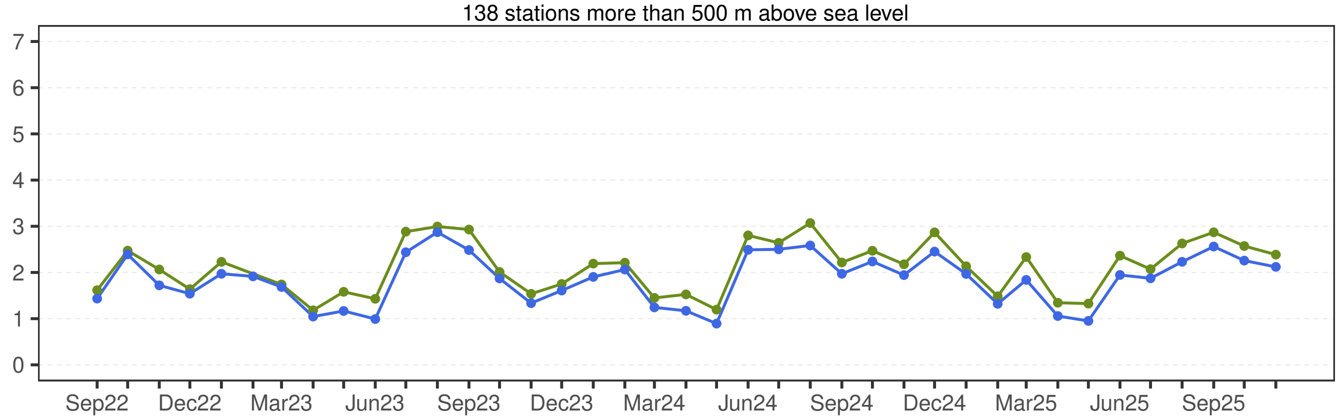

Mean Error
173 Norwegian stations
00+30
IFS
MEPSctrl
4
2
0
−2
−4
Sep22 Dec22 Mar23 Jun23 Sep23 Dec23 Mar24 Jun24 Sep24 Dec24 Mar25 Jun25 Sep25
5 coastal stations
138 stations more than 500 m above sea level
39 stations with daily mean precipitation > 4 mm

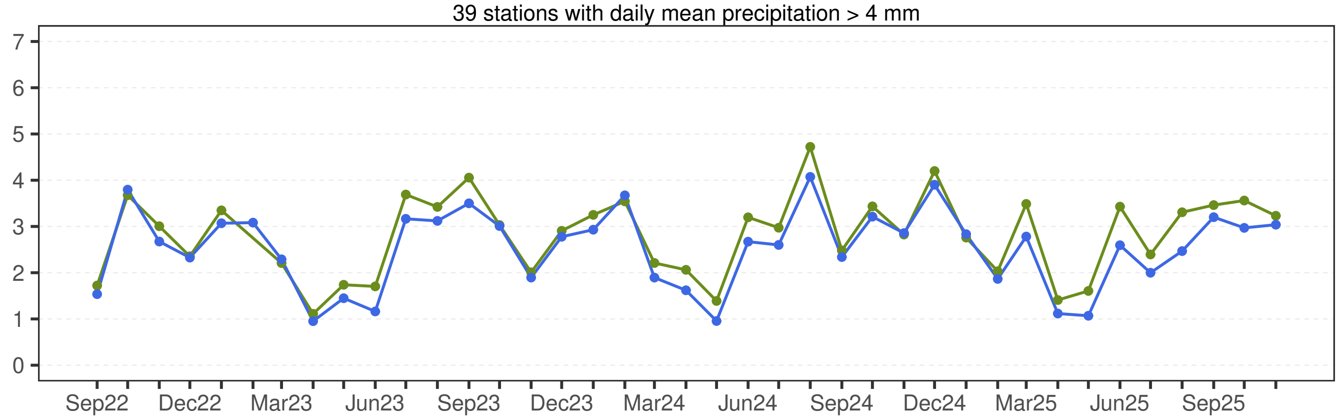

Standard Deviation of Error
173 Norwegian stations
00+30
IFS
MEPSctrl
5 coastal stations
138 stations more than 500 m above sea level
39 stations with daily mean precipitation > 4 mm
0
2
4
6
8
10
Sep22
Dec22
Mar23
Jun23
Sep23
Dec23
Mar24
Jun24
Sep24
Dec24
Mar25
Jun25
Sep25

Mean Absolute Error



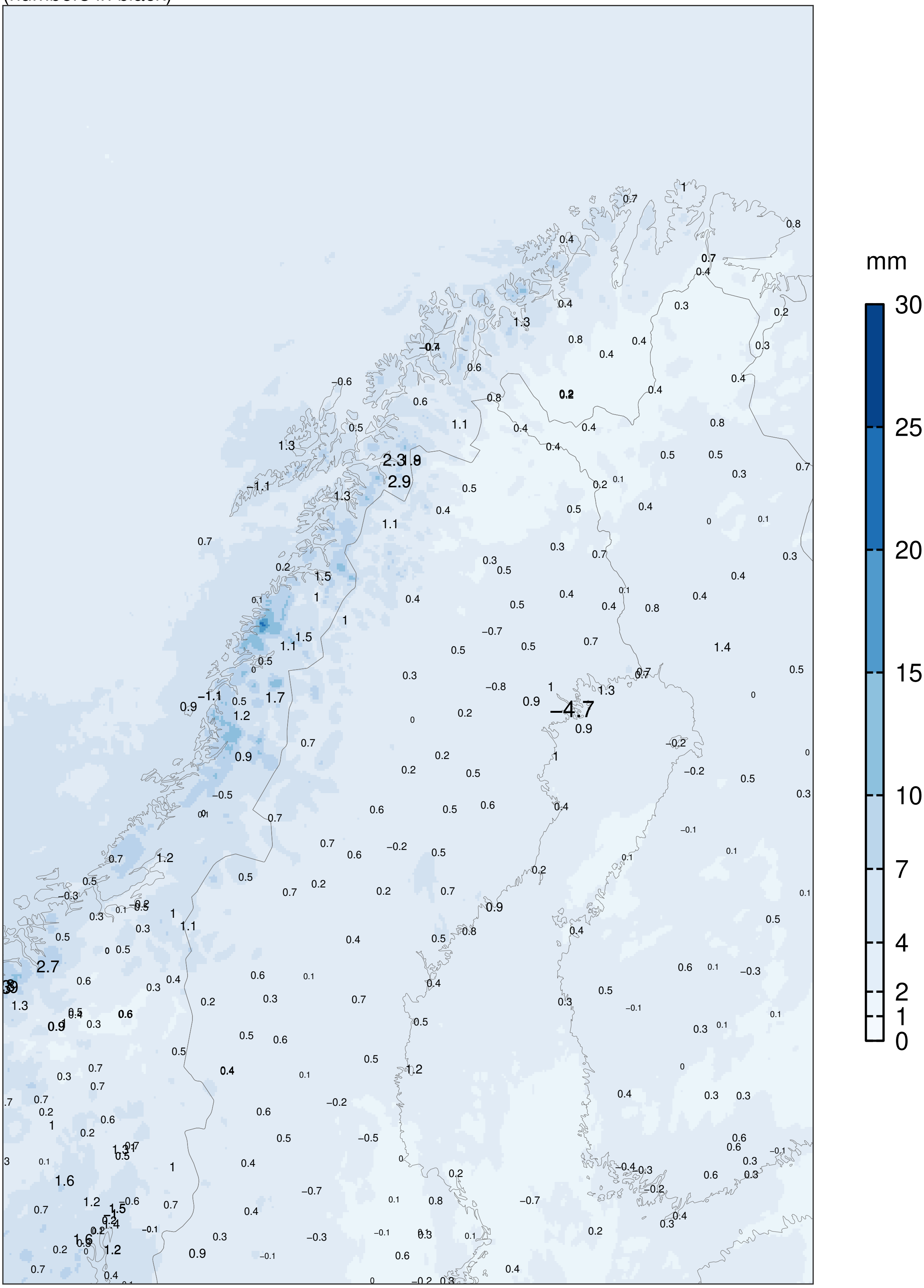






MEPSctrl 00+30

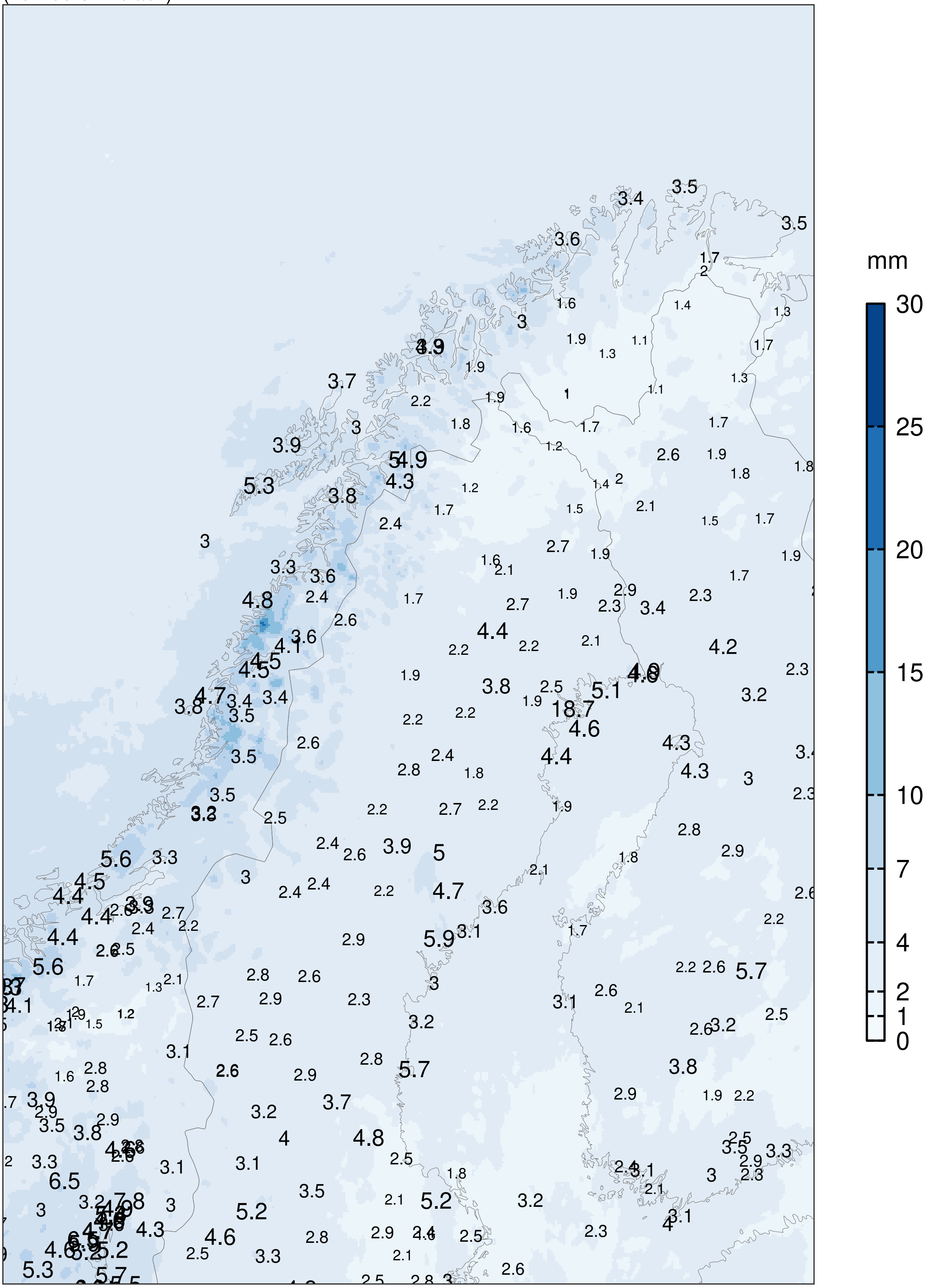
ME at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+30

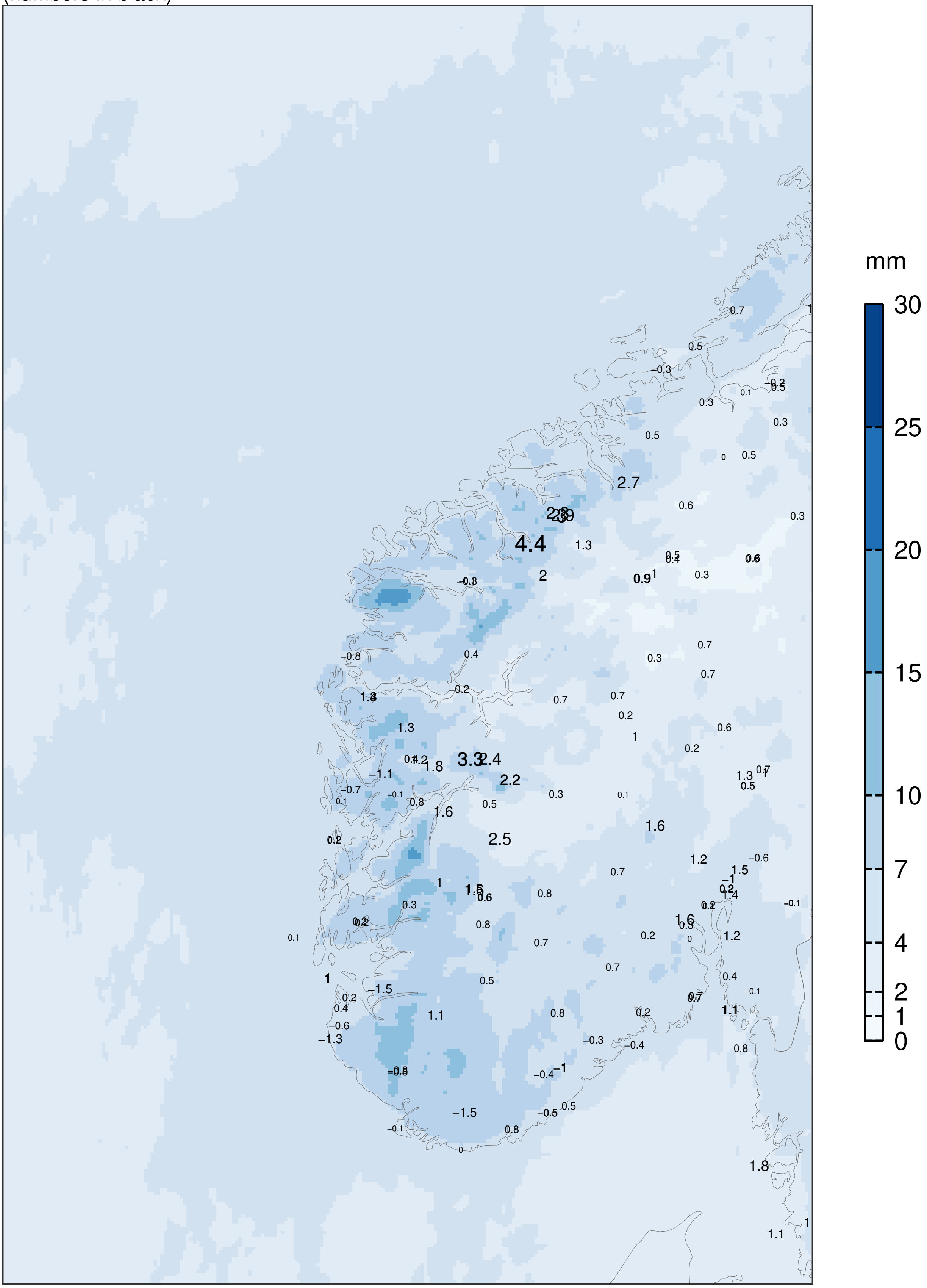
SDE at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+30

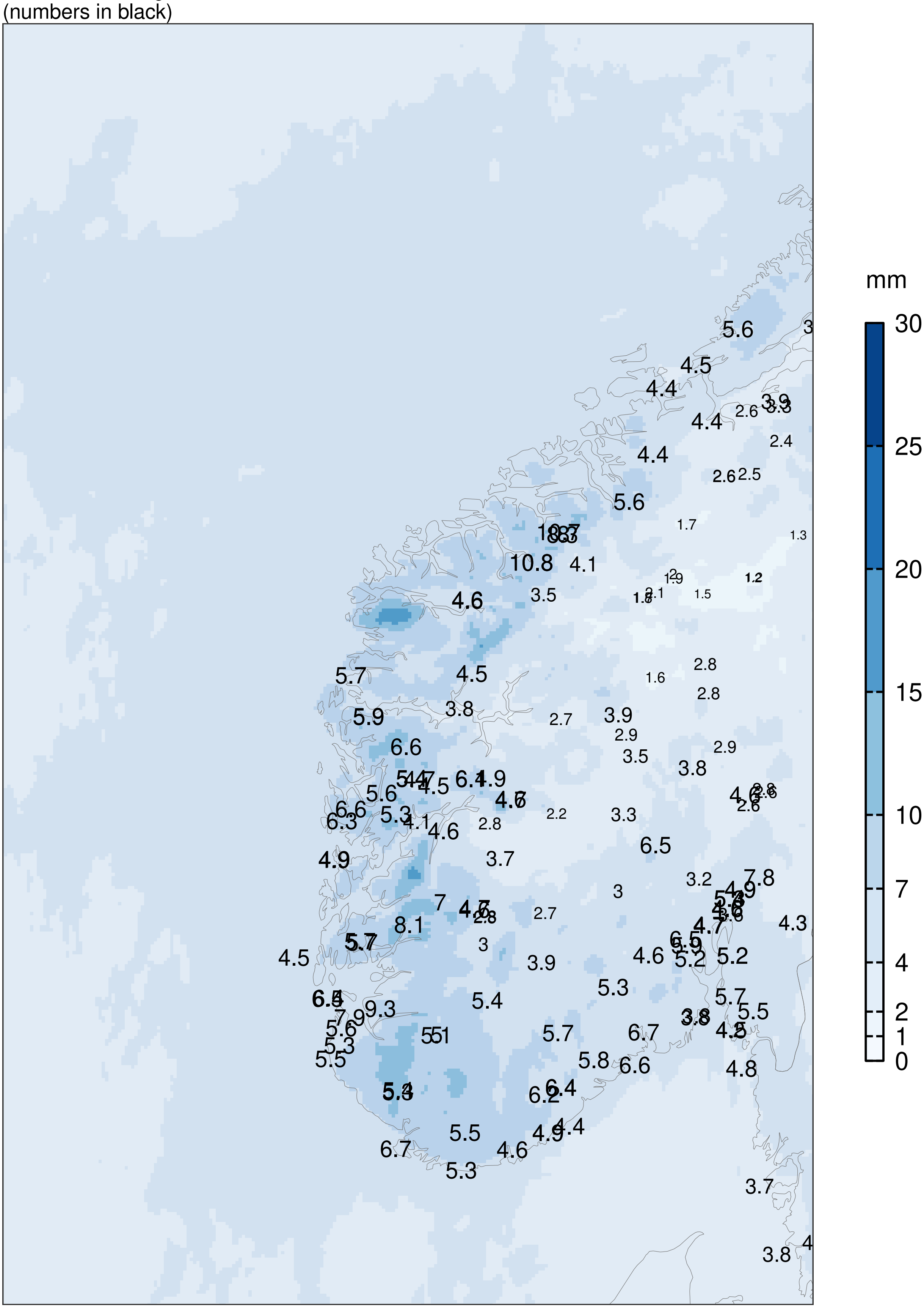
ME at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+30

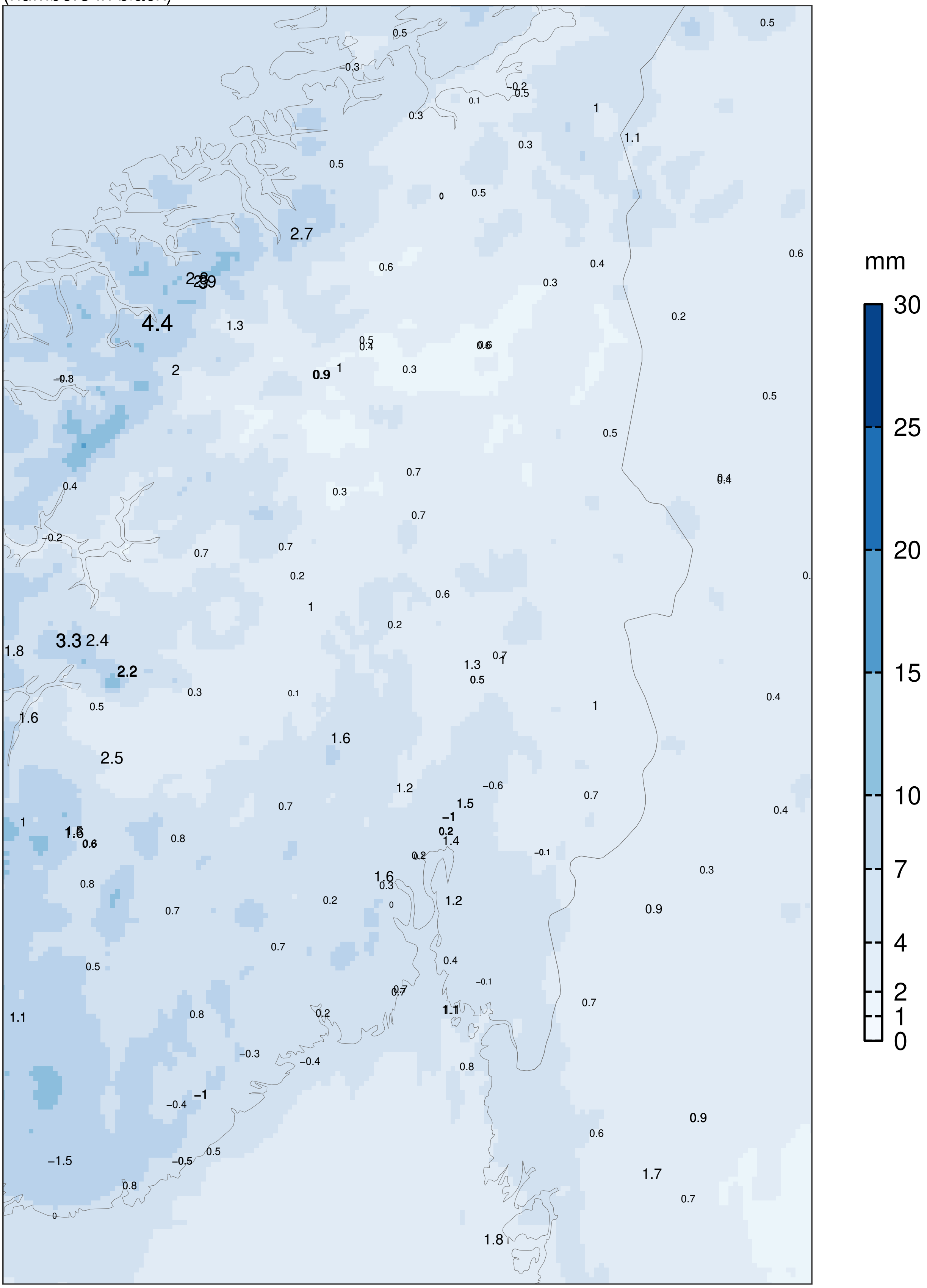
SDE at observing sites
(numbers in black)



Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+30

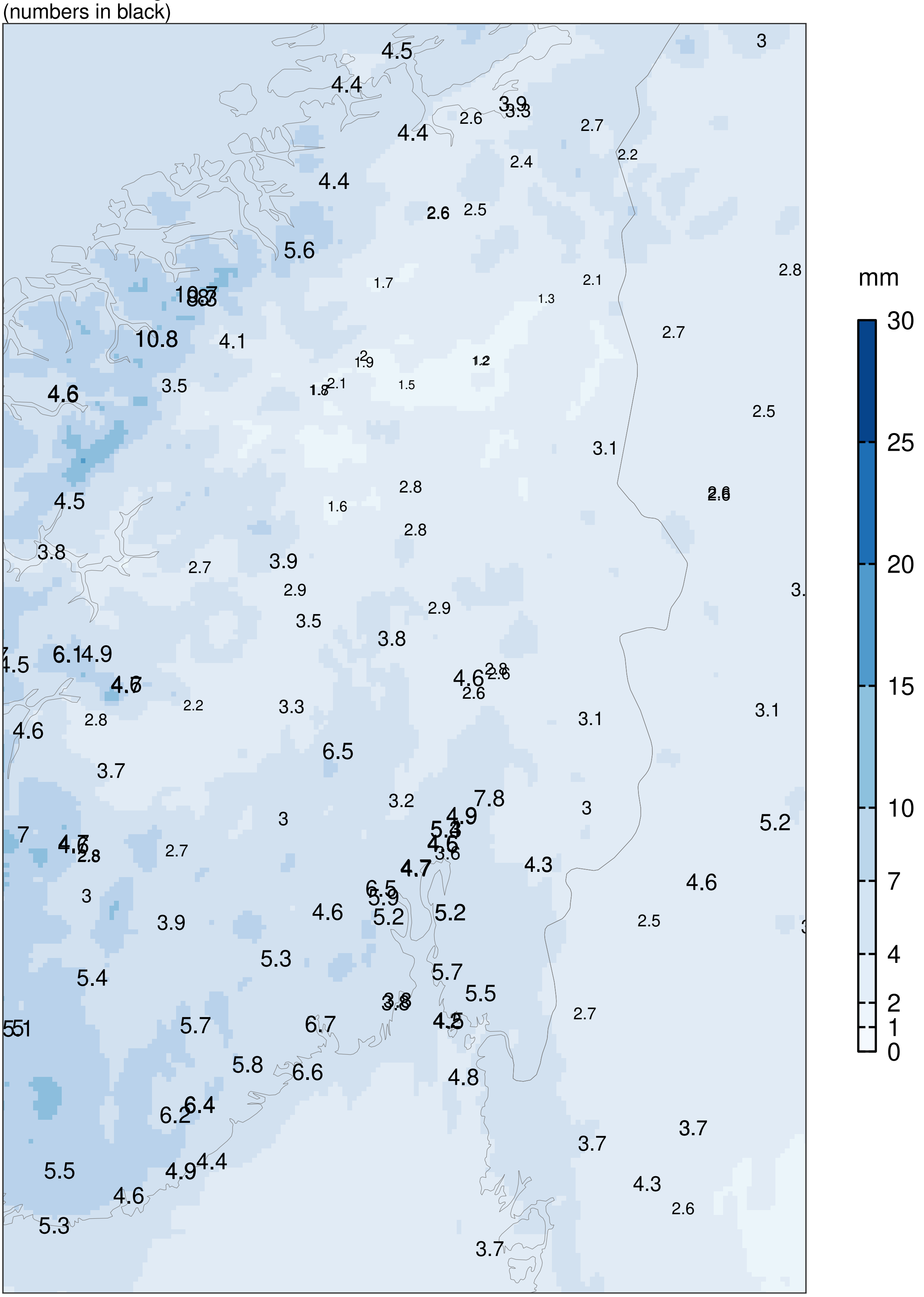
ME at observing sites
(numbers in black)



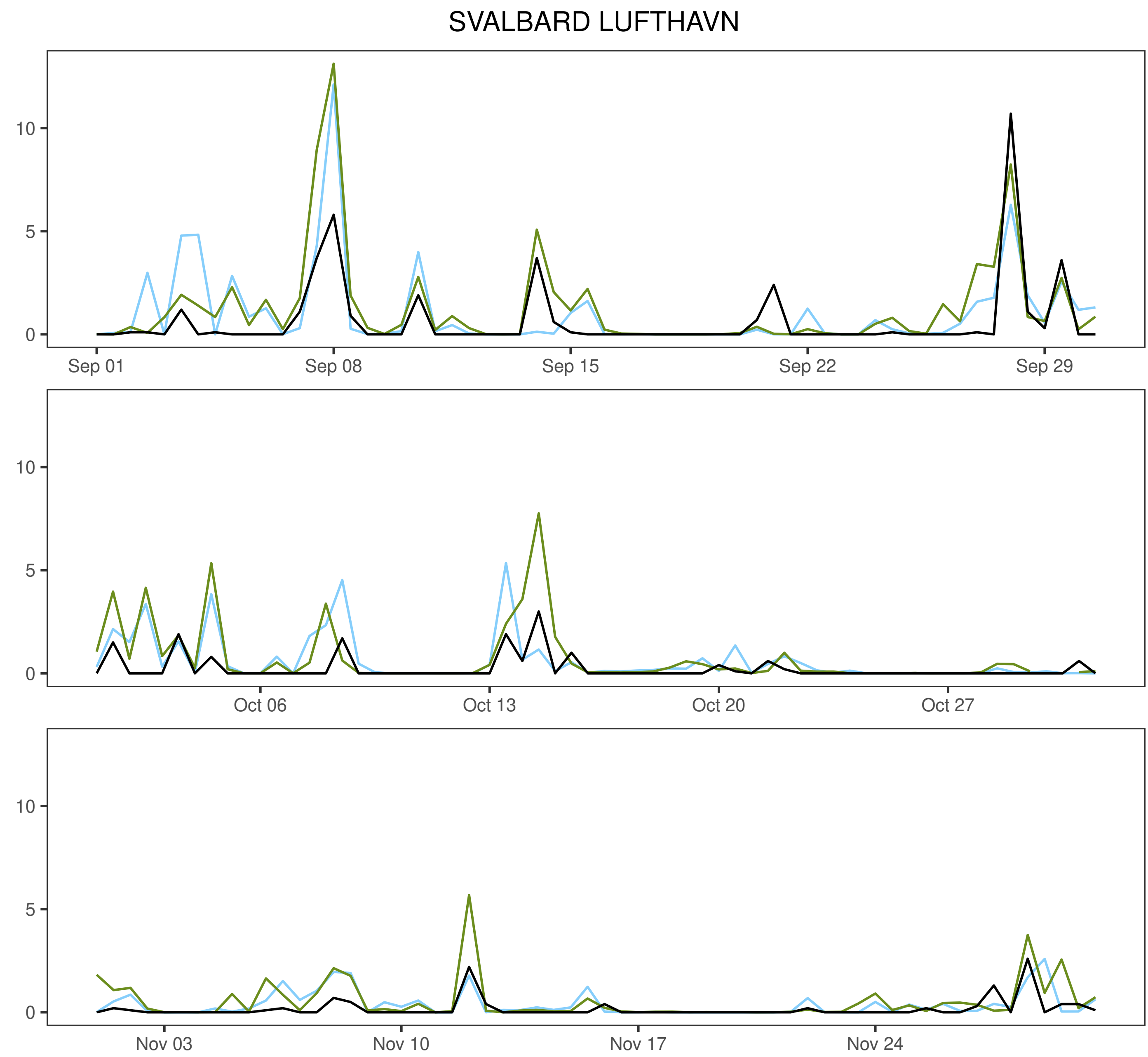
Model "climatology" 01.09.2025–30.11.2025

MEPSctrl 00+30

SDE at observing sites
(numbers in black)

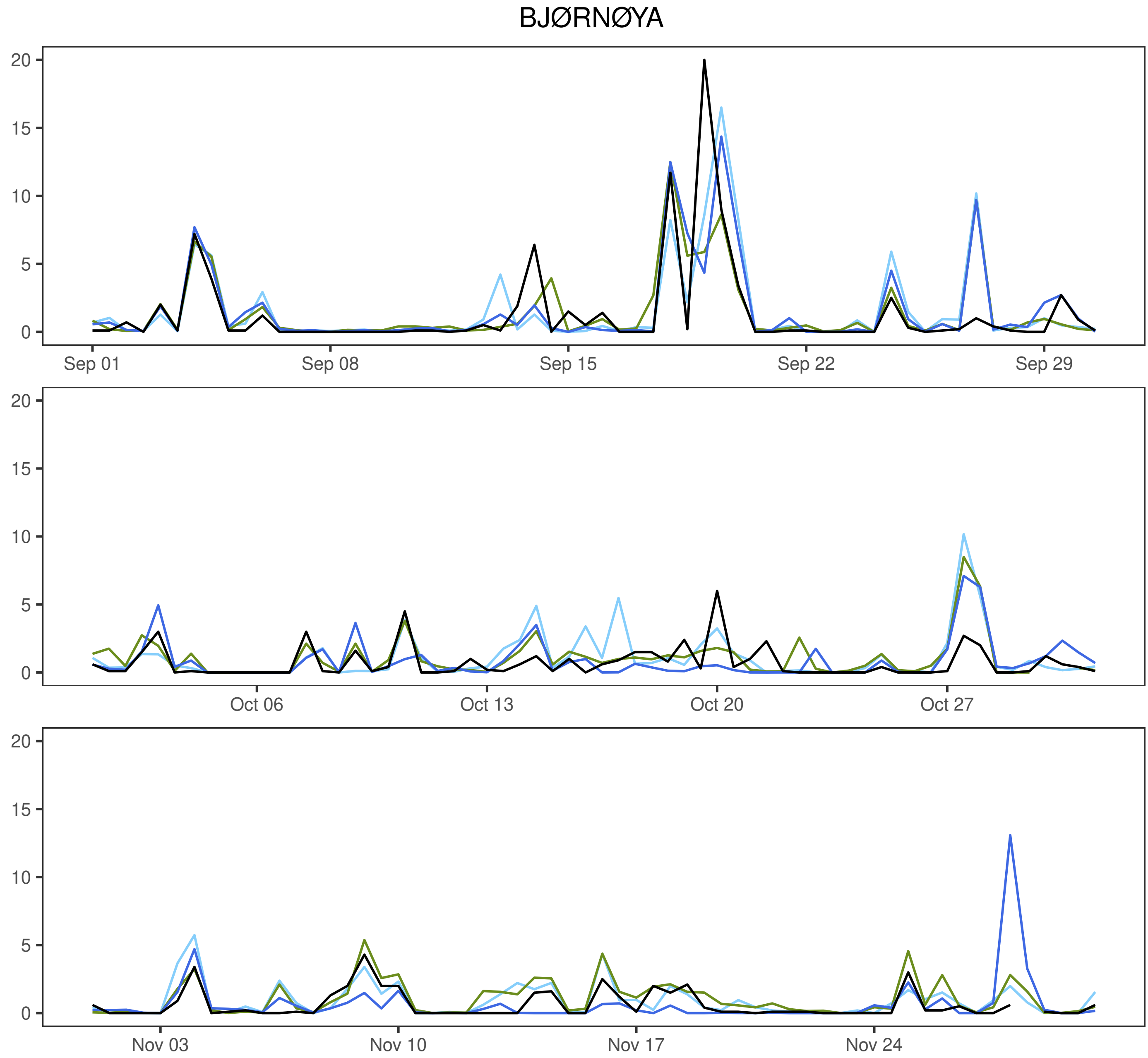


Model "climatology" 01.09.2025–30.11.2025



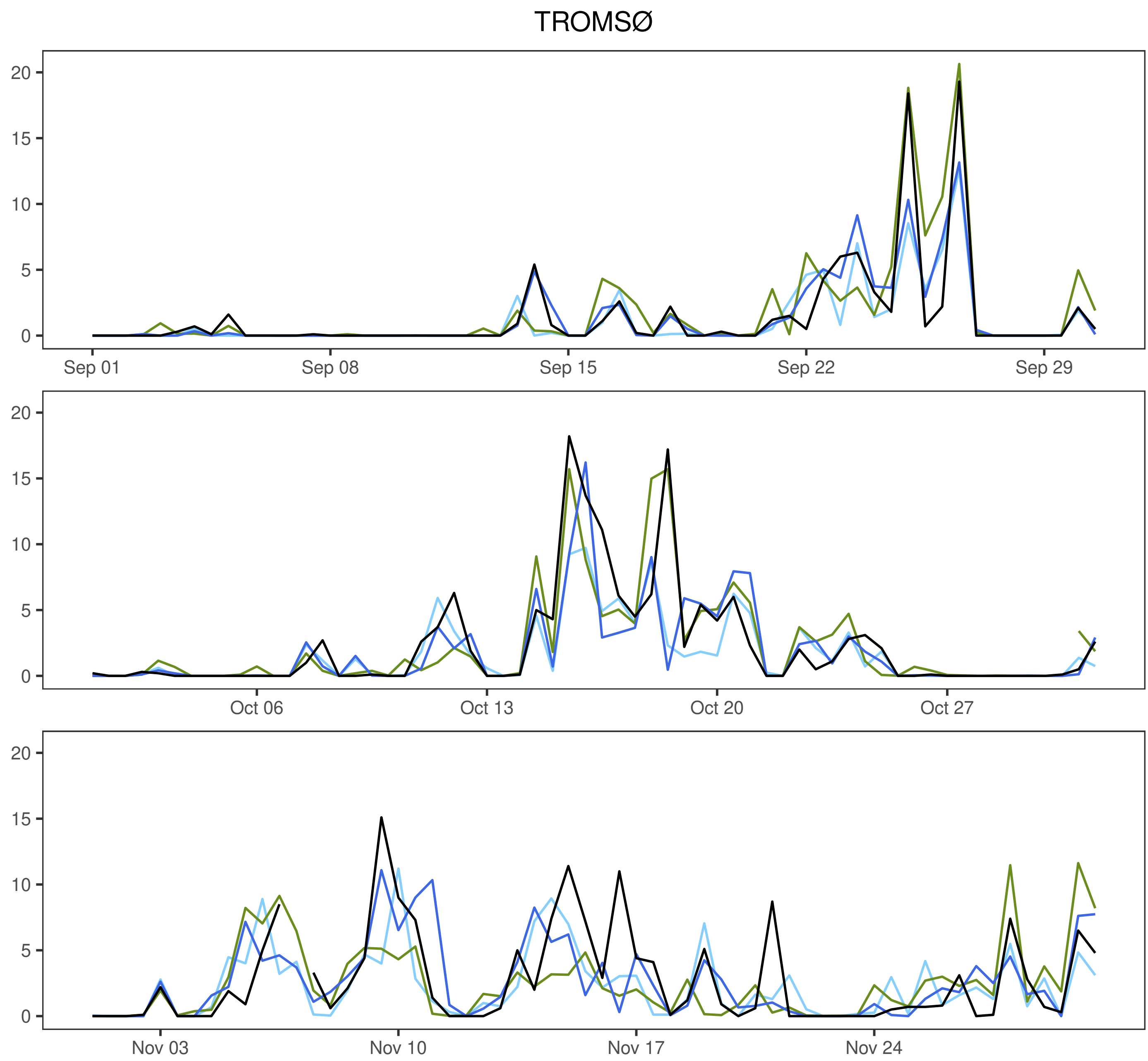
	Min	Mean	Max	Std	N
synop: 06,18	0.0	0.3	10.7	1.1	182
AA25: 12+18,+30	0.0	0.7	12.1	1.4	182
IFS: 12+18,+30	0.0	0.9	13.1	1.7	180

	ME	SDE	RMSE	MAE	Max.abs.err	N
AA25 – synop	0.3	1.1	1.1	0.6	6.3	180
IFS – synop	0.5	1.1	1.2	0.6	7.3	180



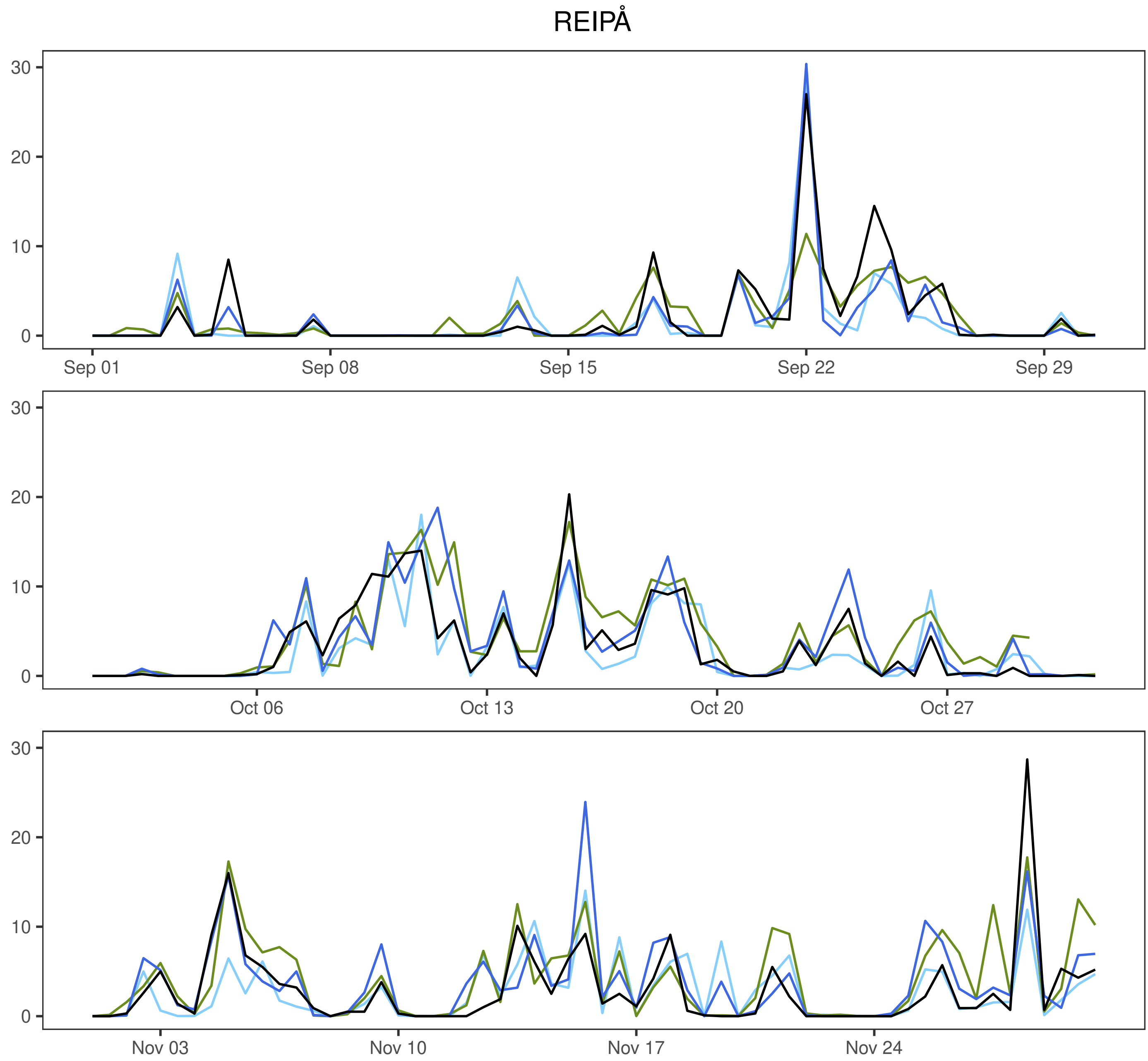
	Min	Mean	Max	Std	N
synop: 06,18	0.0	0.9	20.0	2.1	181
MEPSctrl: 12+18,+30	0.0	1.0	14.4	2.2	182
AA25: 12+18,+30	0.0	1.2	16.5	2.2	182
IFS: 12+18,+30	0.0	1.2	12.5	1.9	180

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.1	2.1	2.1	0.9	15.7	179
AA25 – synop	0.3	1.8	1.8	0.9	11.4	179
IFS – synop	0.3	1.7	1.7	0.8	14.1	179



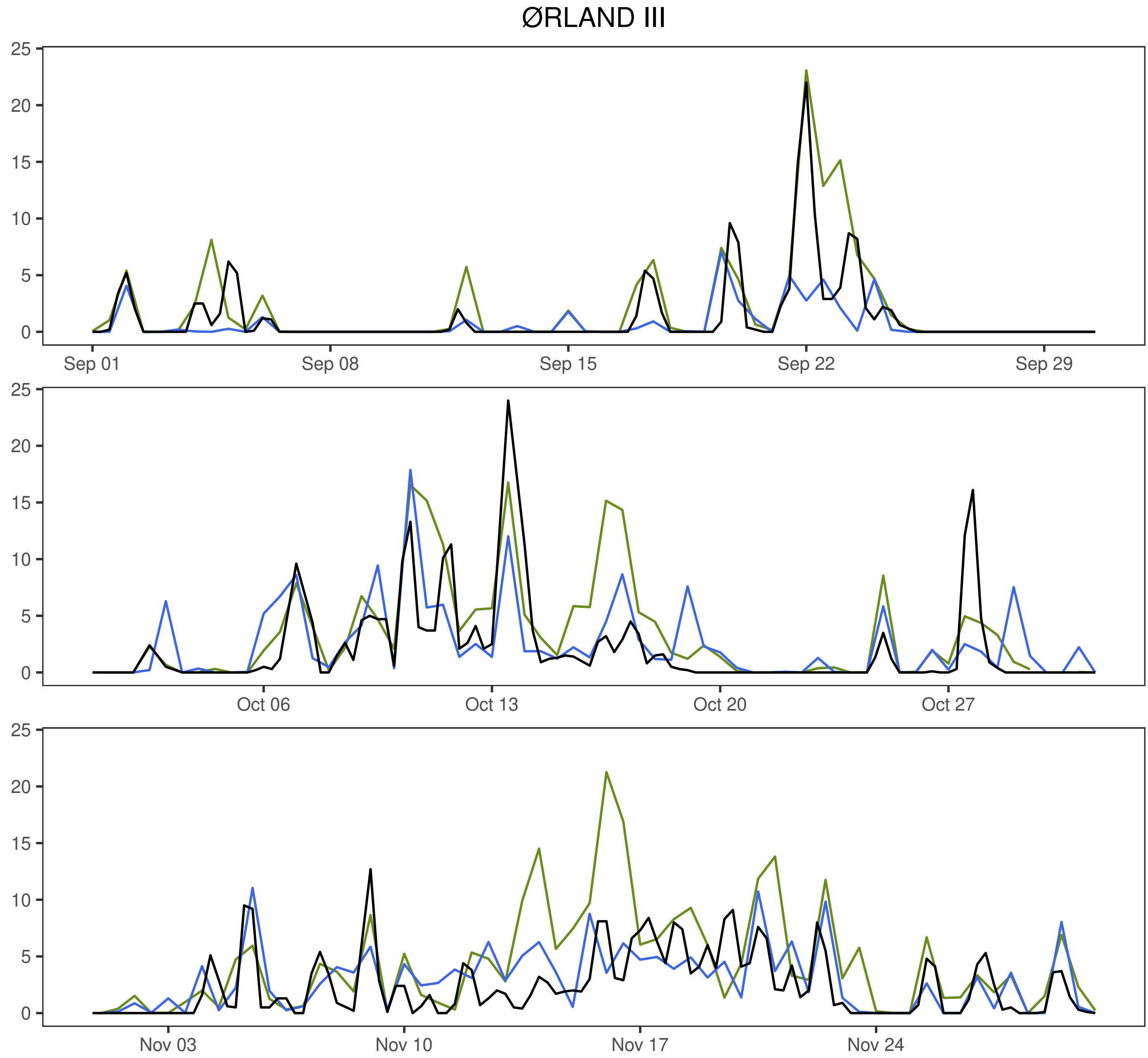
	Min	Mean	Max	Std	N
synop: 06,18	0.0	2.1	19.3	3.7	181
MEPSctrl: 12+18,+30	0.0	2.0	16.2	2.9	182
AA25: 12+18,+30	0.0	1.7	12.7	2.5	182
IFS: 12+18,+30	0.0	2.2	20.6	3.6	180

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	–0.2	2.6	2.6	1.3	16.7	179
AA25 – synop	–0.5	2.5	2.6	1.3	14.9	179
IFS – synop	0.0	2.5	2.5	1.4	10.0	179



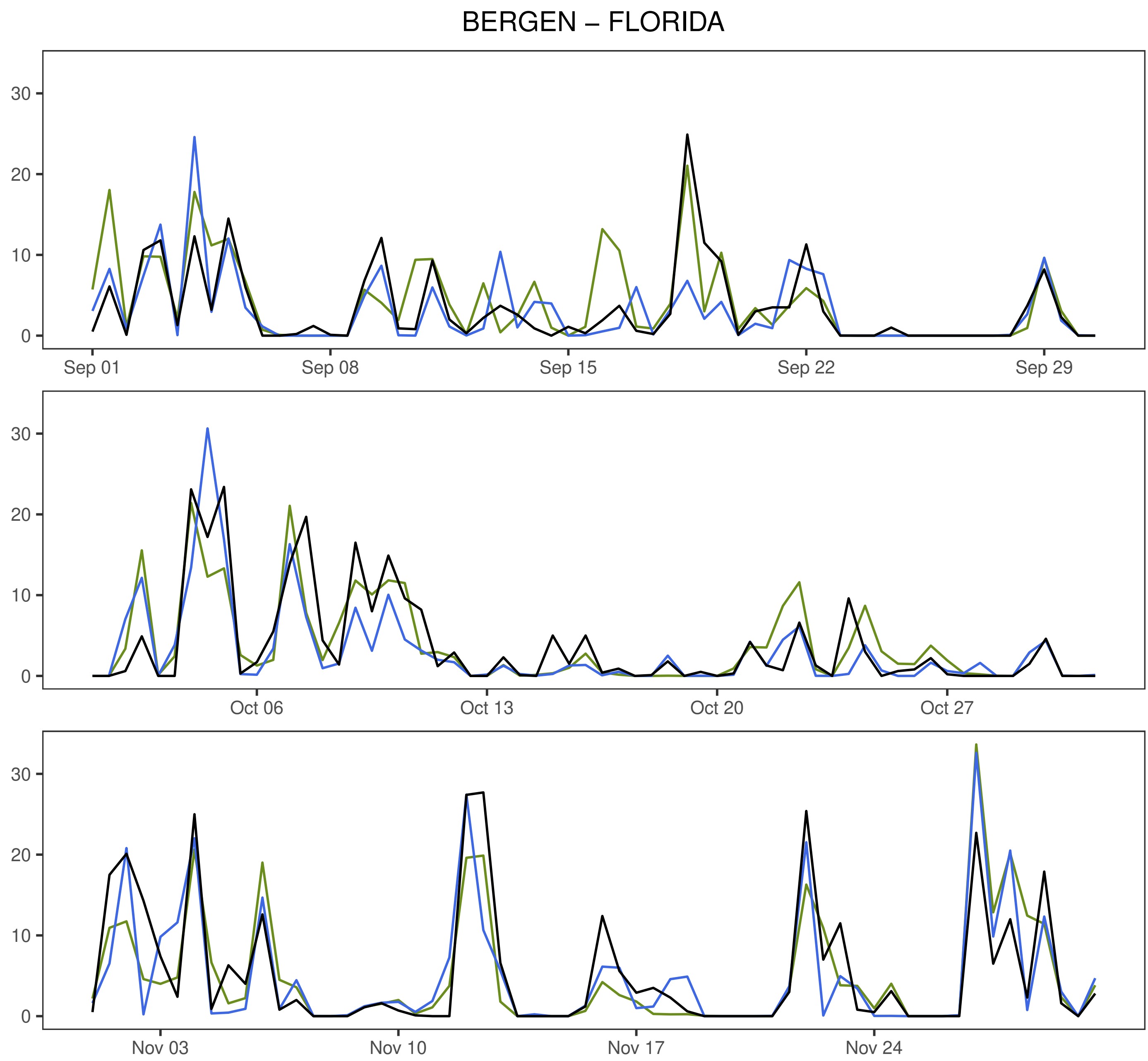
	Min	Mean	Max	Std	N
synop: 06,18	0.0	2.8	28.7	4.5	182
MEPSctrl: 12+18,+30	0.0	3.1	30.4	4.6	182
AA25: 12+18,+30	0.0	2.3	28.5	3.8	182
IFS: 12+18,+30	0.0	3.6	17.8	4.2	180

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.3	2.9	2.9	1.6	14.7	180
AA25 – synop	−0.5	3.0	3.0	1.7	16.8	180
IFS – synop	0.7	2.9	3.0	1.8	15.6	180



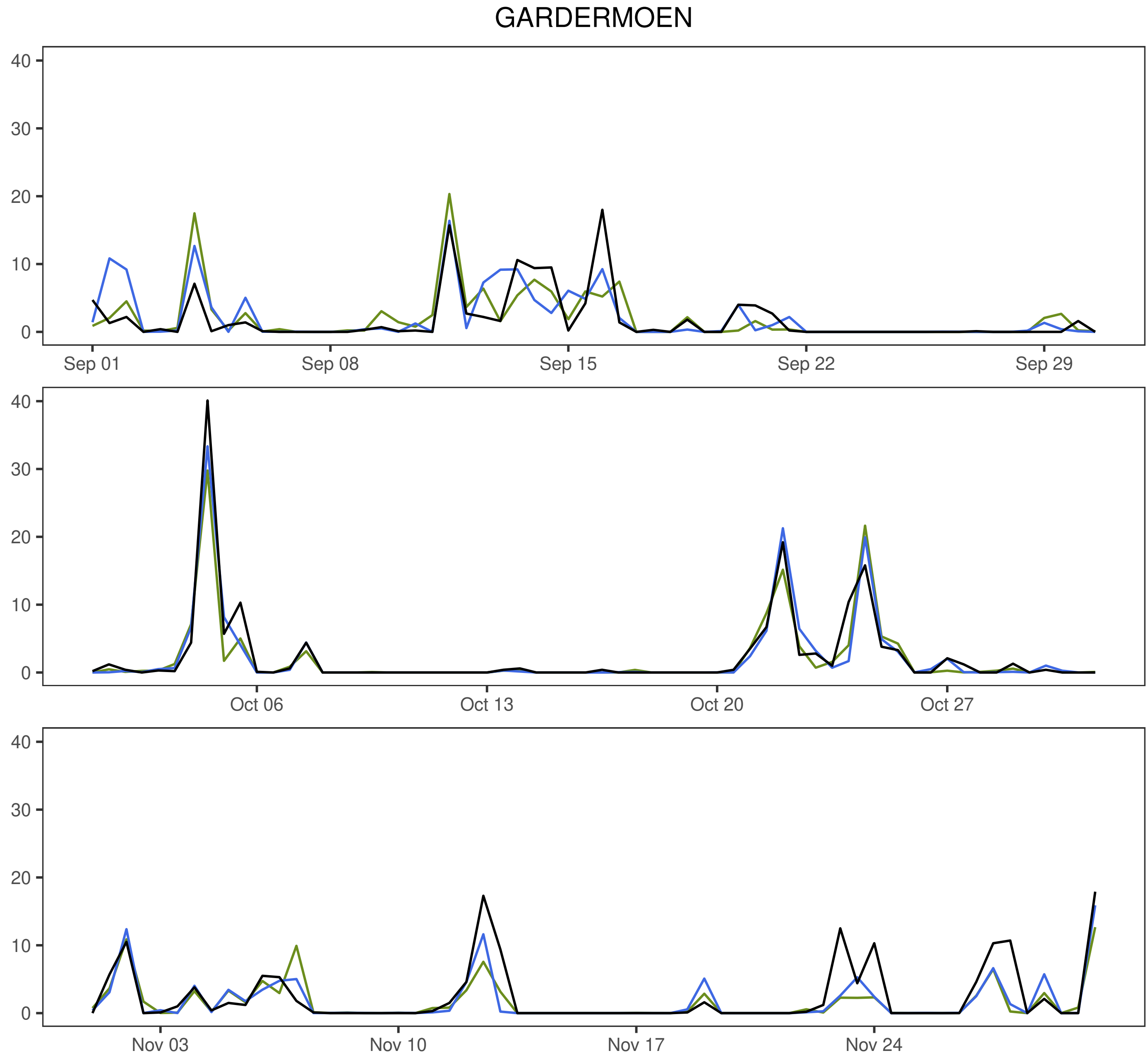
	Min	Mean	Max	Std	N
synop: 00,06,12,18	0.0	1.9	24.0	3.3	350
MEPSctrl: 12+18,+30	0.0	2.1	17.9	2.9	182
IFS: 12+18,+30	0.0	3.3	23.1	4.5	180

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	0.1	3.0	3.0	1.7	19.2	180
IFS – synop	1.3	3.3	3.5	1.9	14.0	180



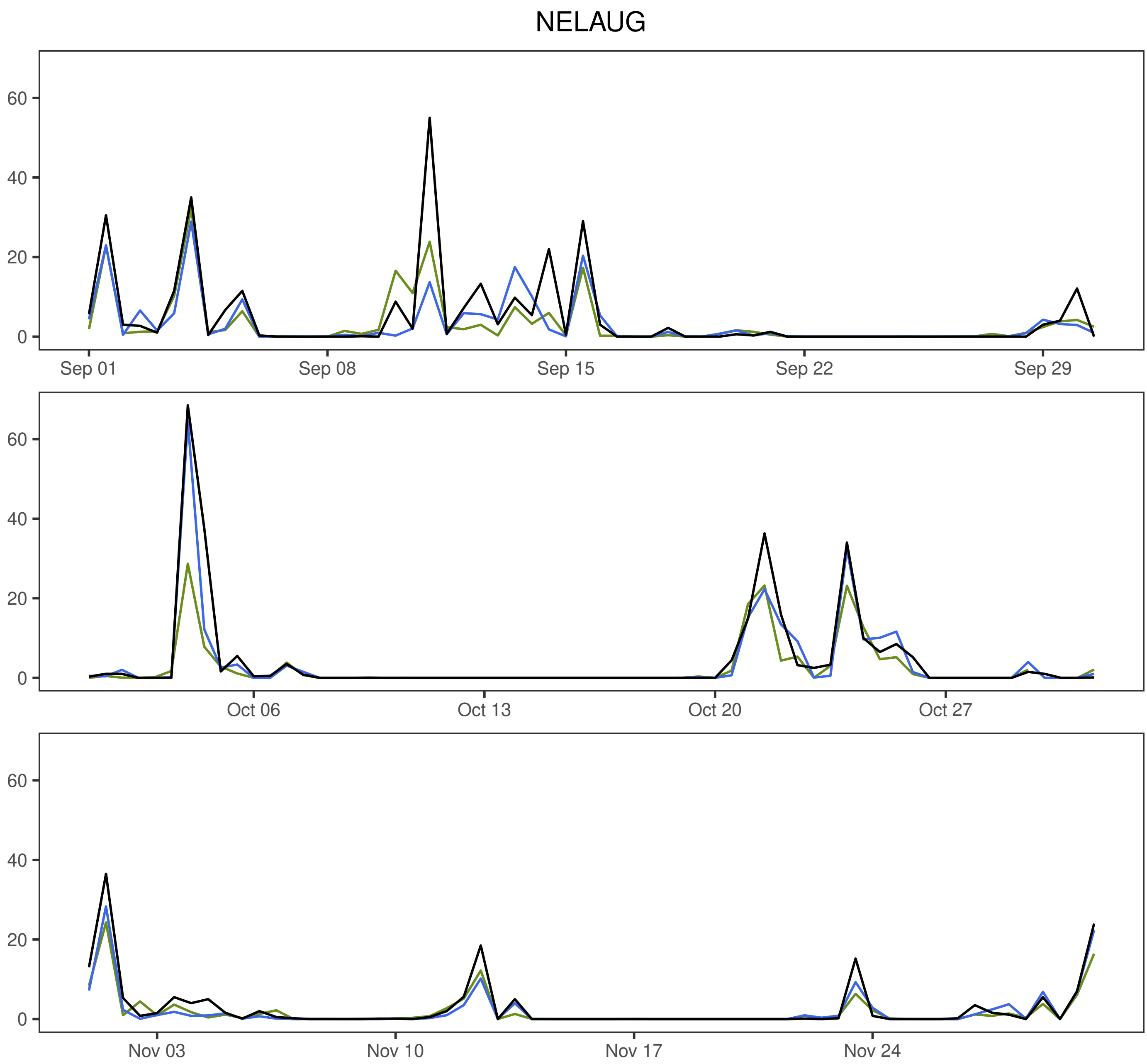
	Min	Mean	Max	Std	N
synop: 06,18	0.0	4.2	27.7	6.4	182
MEPSctrl: 12+18,+30	0.0	3.7	32.6	6.0	182
IFS: 12+18,+30	0.0	4.3	33.6	5.9	180

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	–0.5	4.1	4.1	2.3	18.1	180
IFS – synop	0.1	3.9	3.9	2.4	11.9	180



	Min	Mean	Max	Std	N
synop: 06,18	0.0	2.2	40.1	4.8	182
MEPSctrl: 12+18,+30	0.0	2.0	33.3	4.4	182
IFS: 12+18,+30	0.0	1.9	29.8	4.0	180

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	−0.2	2.5	2.5	1.2	9.9	180
IFS – synop	−0.3	2.7	2.7	1.3	12.8	180



	Min	Mean	Max	Std	N
synop: 00,06,18	0.0	4.0	68.5	9.6	183
MEPSctrl: 12+18,+30	0.0	2.9	64.6	7.3	182
IFS: 12+18,+30	0.0	2.6	32.3	5.7	180

	ME	SDE	RMSE	MAE	Max.abs.err	N
MEPSctrl – synop	–1.1	4.6	4.7	1.7	41.3	180
IFS – synop	–1.4	5.3	5.4	2.1	39.8	180