

Interactive comment on “Weather model verification using Sodankylä mast measurements” by M. Kangas et al.

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Thank you for your valuable comments and suggestions. Please find our response below.

Q: Although it would be beyond the scope of this paper to investigate the impact of initialization on the verification, it would be useful to have some information on what data are assimilated in HIRLAM and HARMONIE-AROME

A: The following chapter about the data usage in NWP model assimilation has been added close to the end of the Introduction: "The Sodankylä measurements are likewise important in the initialization of NWP models in operational forecasting. Of the measurements performed in Sodankylä, balloon soundings (temperature, humidity, wind

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components) and some SYNOP measurements (surface pressure, screen-level temperature, snow depth) are assimilated in the upper air and surface analysis of HIRLAM and HARMONIE-AROME models."

Q: A certain amount of repetition could be removed from the text. There is redundant information in: Page 579, lines 11-13 and page 581, lines 14-16 ; 581, 12-13 and 25-26 ; 584, 16-17 and 24-27.

A: Redundancy removed on the indicated pages

Q: The text information in Figure 1 would be better presented in a table. The CNR4 at 48 m mentioned in the text is not shown in the figure and, indeed, is not used for the verification of radiation fluxes.

A: CNR4 added to the figure (although not used in the verification). The height of the radiation instruments corrected to 45 m as shown in Figure 1. The "Description" part of the text removed from Figure 1 and added as Table 1. We would like to keep the description of all mast instruments although they are not all used in the mast verification, because they can be used for other purposes or in later developments of the mast verification.

Q: Are the instruments on the radiation tower heated or ventilated? Is any quality control applied to identify periods when they may have been covered with snow?

A: With one exception the instruments are ventilated, but none of them is heated as it would interfere with the measurements. Snow is removed when found to exist on the instruments. Text added to the tower description (chapter 2.3)

Q: The web page sample in Figure 3 will be of limited interest to most readers if the verification is not publically accessible.

A: Figure 3 with references to it removed with appropriate text modifications.

Q: The stated agreement between simulations and observations of upwelling long-

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wave radiation could be shown. As the observations will include contributions from both the snow surface and trees, are they strictly comparable? It is also stated that comparison of the lowest model level temperature with mast measurements could shed light on the temperature bias problem; these measurements are available, so why not make the comparison?

A: We have added LWU as Fig.4e and modified the related text: "The simulated LWU (Figure 44e) followed observations generally much more closely than the screen-level temperature. This indicates that the surface (skin) temperature seen by the radiation parametrizations was predicted well in most cases (with the exception of the first two days and 7–8 February). In the model, the properties of the snow cover on ground and, to some extent, the soil and vegetation properties under the snow, influence the surface temperature and the grid-average LWU." We also added a reference to the SURFEX surface parametrizations to the end of 4. The suggested comparison between mast observations and the model's lowest level temperature falls out of the scope of the present study, which focuses on radiation fluxes. In fact this comparison would require significant additional data processing, both from the observations and from HARMONIE experiments.

Q: It would help to state in the abstract, as later in the text, that the seven measurement masts are distributed across Europe

A: Added in the Abstract and in the Introduction as suggested.

Q: The English writing is always clear enough to understand the authors' intentions but will benefit from some editing. Some minor corrections are given below. 578, 9 : "Starting in 2000 with the NWP model HIRLAM" 578, 14 : "produced somewhat different downwelling long-wave radiation fluxes during cloudy days" 578, 23 : "ideal locations" 582, 27 : "in more detail by Thum et al." 588, 8 : "Typically, the forecast" 588, 14 : "will focus on the LWD comparison" 589, 25 : "shed light on the problem" 590, 6 : "the operational runs"

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A: Suggested corrections in the text made.

Q: "from HIRLAM forecasts". The date would be better printed in the caption than on the figure.

A: Figure caption corrected and date added in it: "Figure 2. Example mast verification plot from September 22, 2015: Screen level temperature from HIRLAM forecasts compared to Sodankylä measurements... "

Please also note the supplement to this comment:

<http://www.geosci-instrum-method-data-syst-discuss.net/5/C262/2016/gid-5-C262-2016-supplement.pdf>

Interactive comment on Geosci. Instrum. Method. Data Syst. Discuss., 5, 577, 2015.

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Sodankylä meteorological mast

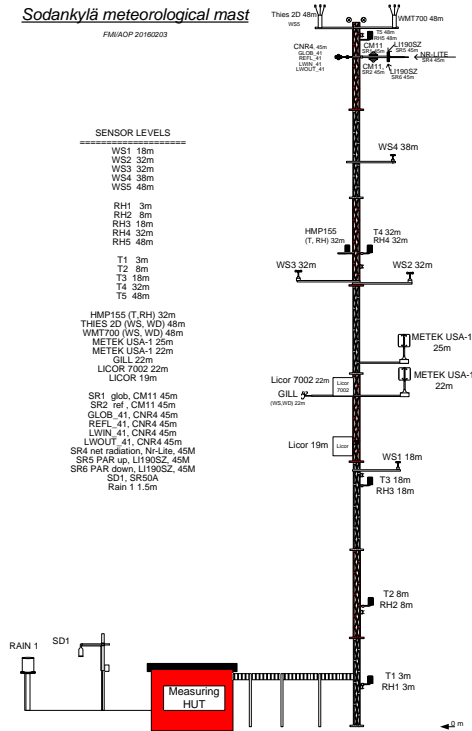


Fig. 1.

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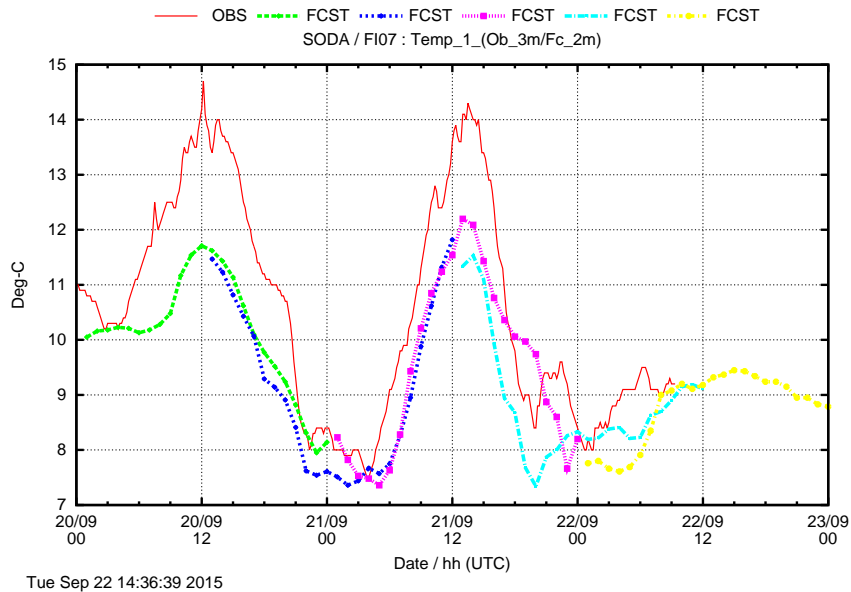


Fig. 2.

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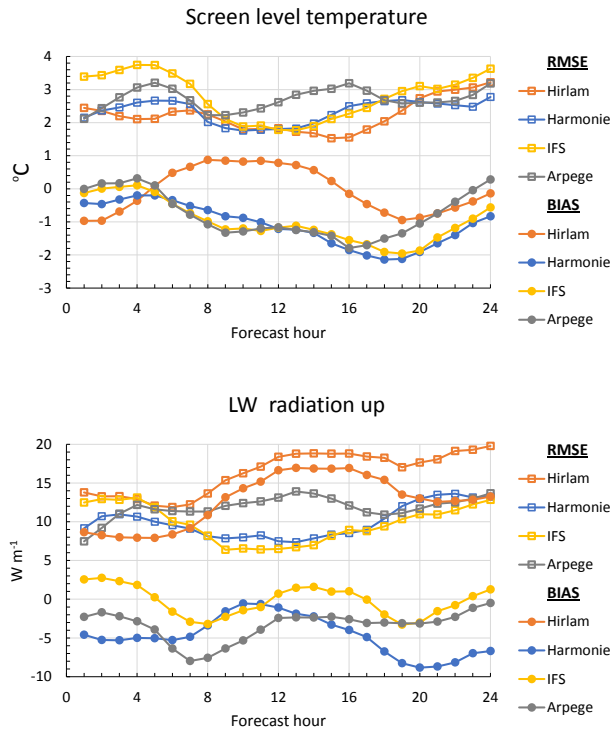


Fig. 3.

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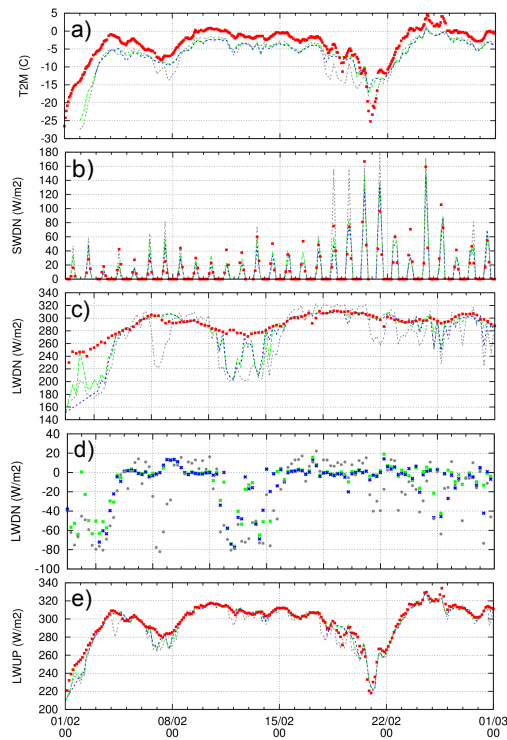


Fig. 4.

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