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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evaluating the spatio-temporal performance of sky imager based solar irradiance analysis and forecasts" *by* T. Schmidt et al.

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We would like to thank the reviewer for the valuable comments on our article.

First, the authors would like to respond to the reviewer's first comment regarding the orientation of the paper:

One important reason for the publication in ACP is the framework of the special issue "HD(CP)2 Observational Prototype Experiment". As the application and evaluation of the introduced methodology is mainly based on the datasets generated during that measurement campaign, we would like to emphasize the high value of the data mea-

sured by several research groups. To our knowledge, there is no comparable dataset existing that provides both the high spatial density of solar radiation measurements (with high temporal resolution as well), sky imager and ceilometer. Moreover, this paper highlights the value of the dataset not only for basic atmospheric sciences, but also for solar energy related research.

To highlight this aspect already in the introduction of the paper, we added the following sentences on p.27000 l.10:

"The sky images, the ceilometer based cloud base height measurements as well as the pyranometer data used in this study, are collected during the HD(CP)ˆ2 Observational Prototype Experiment (HOPE) in spring 2013. The dataset provides both a high spatial density of solar radiation measurements as well as the necessary temporal resolution of pyranometer and ceilometer data as well as sky images."

In the following, we will respond on the suggestions for minor revisions:

1.

Reviewer Comment (RC): Remove the last paragraph in section 1...

Author Response (AR): The last paragraph of section 1 has been removed.

2. p. 27004, lines 4-5:

RC: explain what is the "grade of saturation".

AR: We added 2 sentences with a more detailed definition of the "grade of saturation".

"We defined the grade of saturation (S in [0, 1]) as the average pixel intensity in the disc up to an angular distance of 5° to the center of the sunspot. A value of S=1 would correspond to a completely saturated sun area (each pixel's intensity I = 255)."

3. Section 3.4.1:

RC: I think you should explain a little better the transformation you are talking about

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and the meaning of Fig. 5.

AR: We modified the last sentences of first paragraph in Section 3.4.1:

"Similar to the cloud shadow projection, each single CMV is transformed to the underlying metric grid by projecting the image coordinates of the vectors initial and terminal point. (Sect. 3.1.6). Figure 5 shows an example of the transformation from the circular fisheye image to the grid. This scene illustrates the rectification of the CMVs which is important for quality control and averaging to a global CMV."

4.

RC: Why do you use measurement minus estimate (analysis or forecast)? I would say that usually the definition of MBE is the other way around (y_i minus x_i) so in case of overestimation, MBE is positive, while MBE is negative in case of underestimation.

AR: We could switch measurements and forecasts but we would say as it is about definition the results are not affected by it.

5.

RC: Conclusions. You mention that installing several pyranometers is very expensive, this is relative. [...] installing dozens of non-first class pyranometers may be easily affordable.

AR: We agree, compared to the costs for the solar plant the prize would be small. I guess the message becomes clearer if we compare several pyranometers to a single camera. Therefore the sentence is modified to

"As installing a sufficient number of pyranometers which cover the field of view of a sky imager with a comparable resolution is more expensive than a camera, a camera based areal irradiance monitoring can be beneficial."

6.

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RC: Too many significant numbers for CBH and CC in table 1:

AR: We agree, a reduction of the significant number makes sense. The table has been adapted with two significant numbers for each parameter. We had no deeper investigation in cloud base height distribution yet to give a detailed explanation why the average height is lower than expected from meteorology. One explanation could be that cloud type classification always decides for one of the seven classes. In times, where a mix of cloud classes is present, the algorithm decides for the class with the highest probability. This can lead to low cloud base heights in a cirrus dominated cloud scene. The same is valid for altocumulus/cirrocumulus which can be mixed with stratocumulus/cumulus.

Response on typo and technical corrections:

- We applied all proposed corrections

- p.27015, line 25 changed to "...contributing to RMSE and a positive MBE"

- colors in Fig.12 and 14 (RMSE vs Lead Time and Accuracy vs Lead Time) have been changed aiming at a better discrimination of single overlapping lines.

attachments:

Figure 12 and 14 as described in the response on the reviewer's comment.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 26997, 2015.

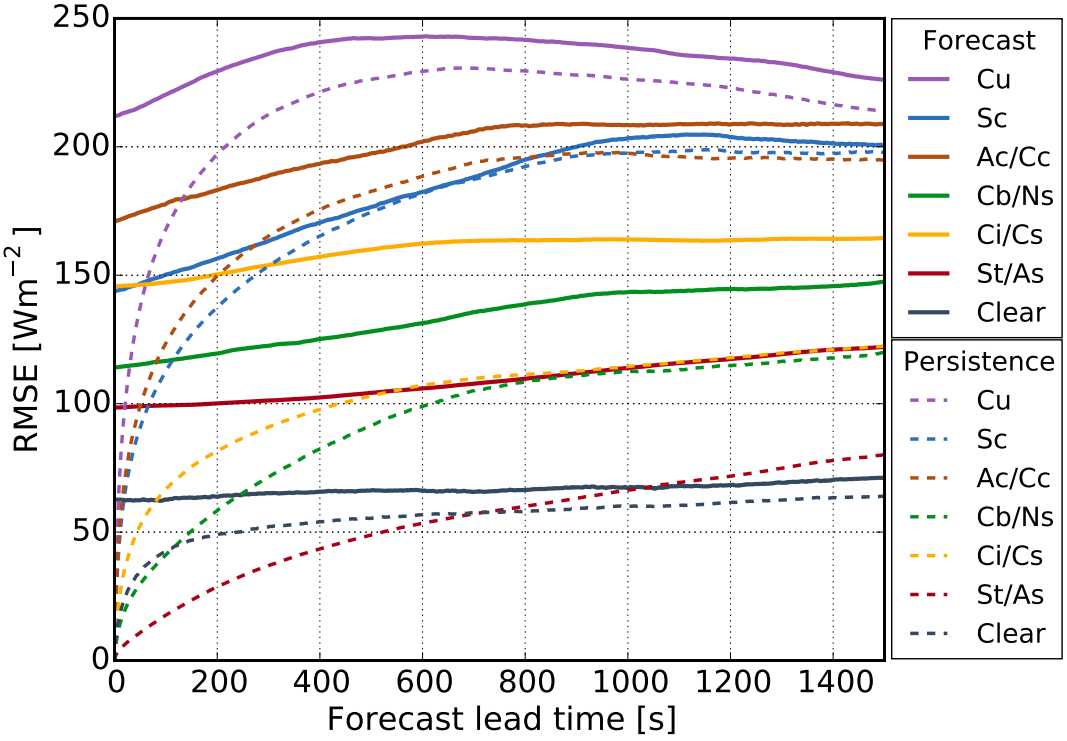

Fig. 1.

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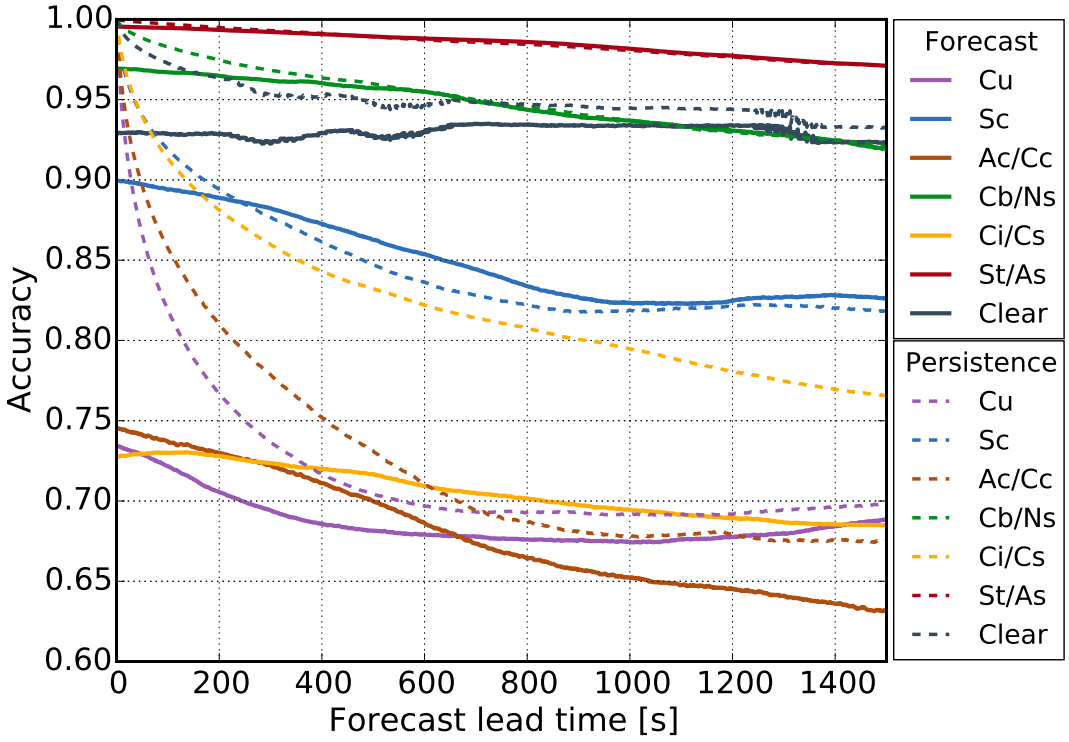

Fig. 2.

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