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Atmospheric Measurement Techniques Discussions

Interactive comment on "Sky camera geometric calibration using solar observations" *by* B. Urquhart et al.

Anonymous Referee #2

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This manuscript describes a procedure for automated geometric calibration of sky imaging cameras. The purpose is to advance localized solar forecasting for solar power generation stations. The manuscript is very well-written and is suitable for publication, but I have a few minor comments that should be addressed first.

General Comments:

1) Days with scattered cloud cover (SCC) appear to be the most important days for the forecasts that motivate this study because high-frequency variability in the downwelling shortwave is comparatively small for both clear-sky and overcast conditions. Thus, it is a bit disappointing that uncertainties in the calibration associated with the sun position measurement during SCC are not more central to the focus of Section 5. What are the errors when there is SCC (as opposed to days with SCC where clear-sky times reduce

the daily mean errors)? One way to communicate this might be to add labels to Figure 4 showing where along the x-axis SCC (or whatever conditions are the most important for the forecasts) likely falls based on the analysis from SGP.

Additionally, it might be worth noting that the uncertainty associated with SCC will increase with solar zenith angle because even if the actual SCC is constant in time and space, there will be an apparent increase in SCC near the horizon from the perspective of the camera (e.g., Warren et al. 1986, p18).

Warren, S.G., C.J. Hahn, J. London, R.M Chervin and R.L. Jenne, (1986),ÂăGlobal Distribution of Total Cloud Cover and Cloud Type Amounts over Land.Âă NCAR Technical Note TN-273+STR, Boulder, CO, 29 pp. + 200 maps

2) None of the errors are translated to Wm-2, which I presume is the metric used for the forecasts and the way that forecast requirements are communicated. The final statement of the text (P27L22-24) suggests you have thought about this some. Can you add some detail to that final statement and also in the introduction that contextualizes the needs of stakeholders? Additionally, the final statement implies that future needs may require more accuracy. I'm surprised by this because the text is discussing errors of tenths of a degree in sun position, yet clouds modulate the downwelling shortwave by 100s of Wm-2 (a substantial fraction of the diurnal cycle).

Specific Comments:

P9L20: Why is N set to 9? Is the result very sensitive to the degree of polynomial used? From a cursory glance, it looks as though Gennery provides little guidance to this choice, but also appears to use a much smaller order polynomial than is used here.

P15L1: Following from the previous comment, more generally N for the back-projection is equal to N from Eq. 9, yes?

P16L10: Is leveling not important?

P16L24: If the Temp/Pres correction is deemed necessary, are the annual averages

sufficient for the correction? Synoptic variability in surface pressure at SGP is about as large as the annual cycle, but both the seasonal and synoptic variability in near-surface air temperature at SGP are quite large. (Obviously, these statements also differ by location.) Also, the uncertainty from refraction should be particularly large for low sun angles.

Section 3.3.: I was at first surprised by the lack of discussion surrounding potential errors in the sun position detection in the images, even in the absence of clouds, such as from variability in aerosols of sub-visible ice clouds. However, I see that some context is provided in Appendix A, in particular in the last paragraph. It might be helpful to work this context also/instead into the text in Section 3.3.

P18L21: Check spelling of Marquardt through the text.

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