

***Interactive comment on “An automated method for the evaluation of the pointing accuracy of sun-tracking devices” by Dietmar J. Baumgartner et al.***

**Anonymous Referee #1**

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This paper introduces a method for the assessment of pointing accuracy in solar radiation measurements as carried out e.g. in the Baseline Surface Radiation Network (BSRN). The method relies on a camera system mounted similar to a pyrheliometer that allows continuous monitoring of the position of the solar disc and thereby evaluates the sun tracking accuracy. After a description of the instrumental setup and the data analysis scheme, the paper provides an evaluation of the system performance based on several months of field measurements.

**General Comments**

While somewhat similar approaches to the evaluation of pointing accuracy have already been proposed and implemented for other sun-tracking instruments (see specific

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comments), the setup presented in this paper provides a simple and widely applicable solution to detect measurements with non-optimum pointing accuracy in solar radiation monitoring instruments which need to be identified to avoid inaccurate measurements. The proposed scheme is therefore suitable for implementation in many other measurement sites. The paper contains a clear and concise description of this method and should therefore be considered for publication in AMT after a number of minor comments have been addressed.

**Specific Comments**

Page 2, line 25: Since this is the key motivator for the paper, a more detailed outline of why pointing accuracy is an important requirement for accurate solar radiation measurements would be useful for the reader (see e.g. McArthur, 2005, Annex D).

Page 2, line 30: While pointing accuracy is not commonly monitored automatically for the instruments used by the authors, this is a common challenge for most types of sun-pointing instruments. Therefore, several previous efforts have been made to implement systems that monitor this parameter for other instruments. Since these methods are partly similar to the concept proposed here, a short discussion of relevant previous work would be appropriate. As an example, in the field of solar FTIR spectrometry, a camera-based system partly similar to the approach shown in this study has been described by Gisi et al. (2011). An alternative approach for the evaluation of sun pointing accuracy which does not require a camera setup has been presented by Reichert et al. (2015). Other equally relevant studies possibly exist for different types of sun-tracking instruments.

Page 5, Sect. 2.3: If I understand correctly, this initial zero point determination method does not allow to distinguish between systematic mispointing of the sun tracker used in the solar radiation measurements and a misalignment of the KSO-STREAMS system relative to the sun tracker's line of sight. Can you elaborate if a significant systematic mispointing of the sun tracker is possible and, if yes, how such an effect will influence

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the accuracy of the solar radiation measurements?

Page 5, line 21: "mainly affected by different atmospheric conditions" - can you specify more explicitly which atmospheric parameters influence the zero point position?

Page 8, lines 15-22: You conclude that, as expected, the quadrant sensor-based tracking is less accurate for measurement days with cloud influence. Can you discuss in more detail why you are confident that this finding is solely due to the accuracy of the tracking device and an influence by a possible dependence of the KSO-STREAMS analysis algorithm's performance on the presence of clouds (e.g. for the solar limb detection) can be excluded?

#### References

Gisi, M., Hase, F., Dohe, S., and Blumenstock, T.: Camtracker: a new camera controlled high precision solar tracker system for FTIR-spectrometers, *Atmos. Meas. Tech.*, 4, 47–54, doi:10.5194/amt-4-47-2011, 2011.

McArthur, L. J. B.: Baseline Surface Radiation Network (BSRN) Operations Manual Version 2.1WCRP-121, WMO/TD-No. 1274, 2005.

Reichert, A., Hausmann, P., and Sussmann, R.: Pointing errors in solar absorption spectrometry – correction scheme and its validation, *Atmos. Meas. Tech.*, 8, 3715–3728, doi:10.5194/amt-8-3715-2015, 2015.

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