

## Response to the Reviewers' Comments

Concerning manuscript acp-2012-665, “*Effective aerosol optical depth from pyranometer measurements of surface solar radiation (global radiation) at Thessaloniki, Greece*”, by Anders V. Lindfors and co-authors.

We have received the comments on our manuscript by two reviewers. We thank the reviewers for their positive and constructive comments. We have considered these comments in regards of our revised manuscript. Below, we detail the comments by the reviewers together with our response to them.

### Reviewer #1

Reviewer #1 indicates in a general remark, that our method is highly valuable for examining the aerosol load in various environments. Furthermore, Reviewer #1 finds that the method and the results are presented clearly, and he recommends publication after considering some minor comments.

Comment 1: *page 33267, line 19: Wang et al. (2009) might be added to references.*

Reply: We added a reference to Wang et al. and did minor changes to the text accordingly.

Comment 2 (here combined into one, originally two separate general comments): *Section 3.1 and section 4.2 on creation of the look-up-table, the generality of the method and whether we have plans to make the method available online or somehow share it with the community?*

Reply: This is a very good idea, to make the method somehow available to the scientific community. However, we are not yet in a mature phase of developing the method: we cannot say exactly how general the method is, we do not have tools to make the method available as online or as a supplement to the paper. Instead, we very much hope that our paper will draw attention in the community, and initiate contact with researchers who are interested in applying the method at their station of choice. Meanwhile, we continue the development of the method and will test it also at other stations, which will help answer the question how general it is, and which kind of environments may not be ideal for our method.

Comment 3: *page 33274, lines 4–6: Similar ripples are present also on 18 Sep 2005, why is this day categorized as essentially cloud free?*

Reply: The time close to solar noon is somewhat of a challenge to the cloud screening method, because of the requirement (rule ii in section 3.2) on the change in SSR versus change in SZA: close to noon the change in SZA becomes very small, which leads to a situation where the change of radiation versus change in SZA becomes less informative. Therefore, the very small differences in the ripples of the two days have caused one day to be detected as cloudy close to noon, while the other one has stayed in the cloud free category. We will add some text noting the difference between the two days to the revised manuscript's discussion around Figure 1.

Comment 4: *page 33274, end of page: Have we performed tests with relaxed cloud screening criteria in order to help evaluate the performance of the method with historical radiation data, available as hourly values?*

Reply: We have unfortunately not performed such tests, but instead future work will aim for testing the method with real historical data. One of our ideas when we started this work was to use hourly pyranometer data together with sunshine duration and cloud observations to demonstrate the applicability of this kind of data ("historical"). But unfortunately, these data were eventually not

available for our study (as pointed out in section 4.1), and therefore we could not perform such an analysis. Because of the varying observational parameters of the two approaches (only radiation versus radiation, sunshine duration and clouds), we think doing this with relaxed cloud screening criteria on the minute by minute values would only partly answer the question.

### Reviewer #2

Reviewer #2 indicates in a general remark that our paper is well-presented. He recommends the paper for publication in ACP.