2014-10-03. Atmospheric Measurement Techniques, MACC Special Issue

Answer to comments by Anonymous Referee #1

regarding the revised version of “Technical Note - Improving HelioClim-3 estimates of surface solar irradiance using the McClear clear-sky model and recent advances on atmosphere composition” for submission to Discussion.

Comment 1. Page 4, line 25: this should be Eq. 3 (not Eq. 5)

Answer. Thank you. Done

Question 2. Page 8, lines 14 and 15. Could the authors propose a physical explanation for the fact that at Tamanrasset the bias is increased with the new method?

Answer. We have rewritten this part, which is as follows, where changes are underlined:

A closer examination of the data sets of irradiation and clearness index for Tamanrasset reveals that I_{HC3v3} exhibits negative bias for clear sky conditions and positive bias for cloudy situations. The balance between <u>these negative and positive biases</u> yields an overall bias of 1.3 J cm^{-2}. The combination of I_{HC3v3} with McClear <u>yields more accurate results for clear sky conditions as expected. The bias in these conditions is now strongly reduced and close to 0. On the contrary, there is almost no change in results for cloudy situations which exhibit positive bias. Contrary to I_{HC3v3} this positive bias is not counterbalanced in $I_{HC3McClear}$ by an equivalent but negative bias for clear sky. It results that the bias in $I_{HC3McClear}$ is slightly greater than that of I_{HC3v3}.</u>

Question 3. In lines 7 to 9 of the conclusion, it is said that the it is not necessary to correct HC3v3 at the resolution of 15 min and then sum up to obtain the hourly and daily products, but that the hourly and daily irradiation can be corrected directly. I find it hard to believe that the two types of calculations would yield the same results. Could the authors provide a numerical example supporting their proposition?

Answer. We believe that there has been a misunderstanding by Reviewer 1 on what we did exactly that originates from not enough accurate description in Section 2 “Data sets and method”. Accordingly, we have made changes in Section 2.

We have rewritten the last part of Section 2, which is as follows, where changes are highlighted in yellow:

The irradiation $I_{HC3McClear}$, and hence the clearness index $KT_{McClear}$, are computed for each summarization: 15 min, 1 h, and 1 day:

$$(I_{HC3McClear})_{hour} = [(I_{HC3v3})_{hour} (I_{HC3McClear})_{hour}] / (I_{ESRA})_{hour} \quad (7)$$

$$(I_{HC3McClear})_{day} = [(I_{HC3v3})_{day} (I_{HC3McClear})_{day}] / (I_{ESRA})_{day} \quad (8)$$

where the quantities $(I_{HC3McClear})_{hour}$, $(I_{HC3v3})_{hour}$, $(I_{HC3McClear})_{hour}$, $(I_{ESRA})_{hour}$, $(I_{HC3McClear})_{day}$, $(I_{HC3v3})_{day}$, $(I_{HC3McClear})_{day}$, and $(I_{ESRA})_{day}$ are directly retrieved from the SoDa Web site. Another approach could be to compute $I_{HC3McClear}$ every 15 min, and then perform the summarization for 1 h or 1 day, though less practical for the many users of the SoDa Web site.

For each summarization, the deviations $(I_{HC3v3} - I_{ground})$, $(I_{HC3McClear} – I_{ground})$, $(KT_{HC3v3} - KT_{ground})$ and $(KT_{HC3McClear} - KT_{ground})$ are computed and synthesised by the bias, the standard-deviation, the root mean square difference (RMSD), and the correlation coefficient.

We have never tested the other approach. In this approach, $I_{HC3McClear}$ is computed every 15 min and then summed up to yield hourly and daily irradiation. We believe that the Reviewer was led to believe that this was the method discussed here. A quick appraisal was made of this alternated approach without developing software as the PhD student (Z. Qu) has left to Toronto and so has the knowledge of the soft used in this study. By chance, the company Transvalor the SoDa Web site has a piece of code doing this alternate approach though limited to 1 h and to Carpentras, one of our sites. The period is 2009-2011 while ours is 2005-2009. The test has therefore severe limitations. It shows that this alternate approach exhibits similar gain in RMSE and correlation coefficient that the method discussed in the paper.

It should be noted that we have not claimed in Conclusion that both methods should yield similar results. We have only tested one and changes in Section 2 aim at making it clearer.