

Answer to comments by Anonymous Referee #2

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. L 7795, 25: It might be worth to discuss also briefly the disadvantages of the Linke turbidity factor at this place and in the conclusions.

Answer. We have limited the brief discussion to Section 1. We have added the following sentences:

...clear skies (Lefevre et al., 2013). In addition, the Linke turbidity factor has a drawback inherent to its definition. It is a single value that summarizes the effects of many variables. Simultaneous changes in these variables induce changes in irradiation in clear sky conditions that may not be reflected in the Linke turbidity factor and therefore not in the irradiation estimated by the ESRA model.

Comment 2. L 7801, 5: I think that not only the RMSD is affected but also the bias. Far away from nadir the cloud index / cloud albedo is "artificially increased" due to the slant geometry (broken clouds). This may be discussed as well.

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

Schutgens and Roebeling (2009) or Marie-Joseph et al. (2013) argue that such angles induce shift in actual location of clouds. The sensor aboard the Meteosat satellite does not see exactly what is happening in the atmospheric column right above a measuring station. This contributes to the deviation between HC3 and ground measurements. The effects of the parallax are enhanced in case of fragmented cloud cover, especially when the pixel size is large which happens for large viewing angles. Marie-Joseph et al. (2013) mention that cloud fragmentation may contribute to a larger bias for intermediate skies because of the limited spatial resolution of the Meteosat sensor that prevents from detecting small broken clouds such as cumulus. This patchwork of small clouds may be interpreted by the sensor and further by the Heliosat-2 method as a large thin cloud. This mistake contributes to the deviation. As a rule of thumb, the farther from the nadir of the Meteosat satellite located at latitude 0° and longitude 0°, and the greater the occurrence of fragmented cloud cover, the greater the bias, relative standard-deviation and RMSD.

Schutgens, N.A.J., and Roebeling, R.A.: Validating the validation: The influence of liquid water distribution in clouds on the intercomparison of satellite and surface observations, *Journal of Atmospheric and Oceanic Technology*, 26, 1457-1474, doi: 10.1175/2009JTECHA1226.1, 2009.