Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2018-452-RC2, 2019

Atmospheric Measurement Techniques Discussions

Interactive comment on "ELIFAN, an algorithm for the estimation of cloud cover from sky imagers" *by* Marie Lothon et al.

Anonymous Referee #1

Received and published: 12 May 2019

The manuscript deals with the development of an algorithm for the estimation of cloud coverage from a network of different all-sky imagers. Although the estimation of cloud coverage is the basic metric derived from an all-sky imagers (in literature there are a lot of methods for estimating several optical and geometrical properties of atmospheric constituents), the need to investigate it is valid for 2 reasons: first, it may provide much better estimations than visual observations; second, a common algorithm is needed in order to build a homogenized network of instruments with comparable results.

However, the physical base to characterize an image pixel as cloudy or not, is the radiometric calibration of the all-sky imager. This is not the case here. Instead, the well-known solution of building a clear-sky library is proposed. So, we have to be precise here: we are not talking about clear sky images but for cloud-free ones. Aerosols

Printer-friendly version

Discussion paper

are not considered and the same stands for thin cirrus clouds. As a result, it is sure that thin cloudiness is not estimated correctly. However, due to the fact that there is a real scientific need to develop and test such algorithms, this original error could be neglected. Even under this consideration, the manuscript needs major changes before published, as follows:

Most of the questions arise from the description of the methodology steps (paragraph 3.2.1).

1. How the circumsolar area is selected? Is it always the same area around the Sun? Is it dependent on the solar zenith angle (the Sun disk area, depicted in the image is dependent for sure).

2. The cropped area does not refer only to obstacles (e.g. the building and the surroundings cover only a very small part of this area) but also to droplet area and clouds at high solar zenith angles. This may improve the results a lot because this is the "difficult area" for cloud cover decision. What is the percentage (relative to the total sky are) of the cropped area?

3. Please add more details in step 2 (page 9, lines 3-5). In order to put the solar mask on the image around the position of the Sun, you need some kind of geometric calibration.

4. Page 9, line 16-17: it is mentioned that "if there are several reference images, the sky with the least turbidity is chosen as reference, based on the RBR pdf". If the other references images are not used, they have to be moved from the clear sky library before the classification. The use of the image with the minimum turbidity cannot be considered as the most important one as it does not correspond to the "average" turbidity (or aerosol) conditions. It is exceptional for sure. So, another approach (e.g. an image selection for the "average" conditions) should be followed.

Some more comments for the rest of the manuscript:

5. Figure 5a: this is definitely not a clear sky image. It may classified as clear sky but it is not and this should be discussed. Moreover, it is concluded later that the differential method is judged better than the absolute and definitely gives better results in detecting thin cirrus clouds (page 17, lines 10-14). So, why you do not use the differential method instead of the absolute also here for the categorization of such a type of images?

6. Page 12, line 20: it is not clear if the method is dependent for solar zenith angle. The images in figure 3 correspond almost to the same solar zenith angle. What about a set of images at a lower solar zenith angle? Are the same thresholds valid? Moreover, it is very common that the RBR values change among different cameras. Apart from the distribution of RBR, which is the effect on RBR threshold values?

7. Page 12, lines 22-23: Why do you choose now the pixel by pixel process but not in the previous step? In this way, some cloudy areas (e.g. in figure 5a) could be removed from the “cloud-free” image. 8. Figure 6 and relevant text: The sky image in figure 6b has been detected as partly cloudy.

However, it is almost identical with the image 5a. Which is the pdf versus RBR for the 6b image? This example questions strongly the robustness of the cloud-free image selection method.

9. Table 3and relevant text: the EKO camera at P2OA presents different Tclear and Tcloudy values when compared to those at SIRTA and CO-PDD. Please explain the differences taking into account that the cropped radii are different.

10. Page 17, line 20: the hours between 9 and 15UT corresponds to which solar zenith angles in summer and winter time? How this is related to the cropped sky area?

11. Section 4: It is good to know that an all-sky imager could provide useful information for cloudiness at any measuring site. It also explains much of the measured variability of surface irradiance. This seems to be a nice paragraph promoting all-sky imagers but it does not enhance the validity of the algorithm. Moreover, the fact that an all-sky

imager, compared to a ceilometer, could provide a holistic information for cloud cover (but not for cloud height) is totally expected. It is not clear what is the purpose of section 4, it may be removed.

12. Based on the above comments, the abstract and conclusion paragraphs should be revised.

Minor comments: Page 9, line 4: the solar mask (instead of maks)

Figure 3: please align horizontally the 2 images

Figure 5: please check again the y axis title in figures d,e,f.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-452, 2019.

Printer-friendly version

Discussion paper