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Atmospheric Measurement Techniques Discussions

Interactive comment on "A total sky cloud detection method using real clear sky background" *by* J. Yang et al.

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The authors thank the anonymous referee for her/his constructive and useful comments. We have worked on the comments carefully and made all requested changes to the manuscript.

Referee 2

This manuscript presents a technique for detecting clouds in total sky images. The technique uses the difference between the observed green channel brightness and a library of real clear sky images obtained from the same instrument at the closest date and same solar elevation angle. The current technique is shown to perform as well as or better than other traditional techniques for partly cloudy scenes and for optically

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Interactive Discussion

Discussion Paper

thinner clouds. The manuscript is well written, the authors demonstrate a clear grasp of the traditional techniques and literature, and the results are clearly presented. I recommend the manuscript for publication after a few mostly minor edits. General Comments My only major concern with the authors' technique is the impact of aerosols. The authors mention aerosols only once in the manuscript, stating that the brightness distribution of the clear sky (and thus the CSBL) is affected by aerosols and climate. Do the authors expect the impact of aerosols to be insignificant compared to other error sources such as solar elevation angle, etc.? What about in locations where the aerosol loading can have day-to-day fluctuations, thus the observed background brightness and corresponding CSBL image may have different aerosol loading and thus different clear sky backgrounds? Using the CSB image from the nearest date may not completely account for these effects.

Response: We agree with the reviewer's comment. The impact of aerosols is a very important error source for cloud detection. It is difficult to distinguish between cloud and aerosols in the visible because of their similar radiation characteristics. In this manuscript, we update the CSBL on every clear sky just in order to reduce the impact of aerosols. Although the aerosol loading may fluctuate day to day, its impact on the sky background is relatively uniform. By setting a reasonable threshold when performing binaryzation processing, the impact of aerosols on cloud detection can be largely reduced. When the sky affected by the aerosols severely, accurate cloud detection requires a combination of more observation data.

Specific Comments Page 13076, Line 23: Change "difference with the original image obtained improving cloud identification results" to "difference with the original image to obtain improved cloud identification results"

Response: We have changed it in the revised manuscript.

Page 13080, Line 2: Change "CSBL included" to "CSBL to include"

Response: We have changed it in the revised manuscript.

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Figure 5: On what day was the CSB image obtained?

Response: The CSB image is captured on 26 May 2013. We have added this information in the revised manuscript.

Page 13081, Line 25: In the binaryzation process, is there a threshold applied to the brightness difference image to obtain the “yes/no” cloud detection results, and if so what is it?

Response: Good question. There should be a threshold when performing binaryzation processing. After the difference process, the result image has a very homogeneous background, and the background value represents the scattering differences of the aerosols in the two images. So the threshold should be larger than this difference. In this case, we set the threshold equal to 10.

Figures 6-8: Just a minor comment that the authors are free to address or ignore: The differences between the cloud detection results in (d) are at first glance somewhat difficult to discern. Is it feasible to add a fifth column (e) for rows 2 and 3 that highlight the differences between the 2-degree and 5-degree offset results and the baseline result in row 1? I guess the fact that the differences are in fact difficult to discern speaks to the robustness of the approach.

Response: Thanks for the reviewer’s suggestion. We added a fifth column (e) for row 2 and 3 as suggestion in the revised manuscript.

Page 13085, Line 8: Change “suggested using the 1-D green channel of the RGB image to instead of the 2-D R/B and the 3-D RGB methods in the cloud detection methods” to “suggested using the 1-D green channel of the RGB image instead of the 2-D R/B and the 3-D RGB methods for cloud detection”

Response: We have changed it in the revised manuscript.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 13073, 2015.