

Interactive comment on “Cloud Detection in All-Sky Images via Multi-scale Neighborhood Features and Multiple Supervised Learning Techniques” by H.-Y. Cheng and C.-L. Lin

Anonymous Referee #2

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General comment.

This paper addresses a relevant question as it is the automatic processing of All-sky images to get information about the sky conditions. Specifically, and unlike other paper by the same authors, this paper focuses on distinguishing between cloudy and clear-sky pixels in an image. The title and the abstract are explicative enough.

The paper does not present very novel concepts, but it introduces a combination of classifying methods that may be useful for the community of researchers (and company engineers) that are dealing with the issue of cloud detection in ground based sky images. In this sense, the paper concludes that the suggested method overcomes other earlier methods from the literature, in particular the broadly used red-to-blue

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(RBR) method.

In general, the scientific methods and assumptions are valid and clearly outlined, and the results are sufficient to support the conclusions. The traceability of results is somewhat complicated, as some parts of the paper are not fully understandable, from my point of view (see my specific comments below). Overall, however, the language is good enough, and the content is correctly structured. Mathematical symbols and abbreviations could be simplified sometimes (see comments below).

The authors give credit to related work and indicate their original contribution, although some previous works could be cited in a different way (see my specific comments below).

The paper can be published at AMT, provided that the authors consider the comments below in a revised version of the paper.

Specific comments.

Abstract. When the authors say “The classic method for cloud detection is based on thresholding of the red blue ratio of an image pixel”, they could add that other methods have been suggested.

Introduction, first paragraph. At the end, the authors talk about “recent developments” while in fact, all devices mentioned are more than 10 years old (as the references are). Right now there are several sky imagers (either commercially available or not) that are more recent. Authors must keep these references as pioneering works, but should add that new, more recent developments exist. In addition, some of these references could be placed below, when the authors refer to works devoted to classifying clouds, as this was the goal of most of those papers.

Introduction, second paragraph. It is pretty obvious that cloud cover is critical for solar irradiance assessment. You don’t need to add the reference Cazorla et al (2008) here, since that work is focused on sky imaging. A more general reference (from a text book

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or similar) or no reference at all would be ok.

Introduction, third paragraph. Please write “red to blue ratio (RBR)” instead of “red blue”. In addition, you should mention that Long et al (2006) already suggested using several thresholds depending on the relative cloud/sun/horizon position.

Introduction, last paragraph. Although they are defined later, I think that RGB, HSV, and YCbCr should be defined here, which is the first time these acronyms appear. Contrarily, the authors don't need to define again RBR in the first paragraph of section 2.

Section 2.1. How w_1 and w_2 are determined? Are the values “a priori” fixed or are they a result also from the Hough line transform?

Section 2.2. It is not clear to me which color model use the “original” or “raw” images. Are they codified in the three color models? Or do your transform from one model to the others? Are these color model independent, or can they be derived from each other? The authors must think that readers of the geophysical community are not necessarily familiar with color models, so more explanation is needed here.

Section 2.6. The authors should make an effort to improve the explanations in this section, as well as to simplify mathematical symbols. From my point of view, this section is difficult to follow, and Figure 3, that should help, is not explanatory.

Section 3, first paragraph. So the same 250 images are used for training and for assessing the classifier? Please state this clearly. What do the authors mean by “10-fold cross validation”? Definition of symbols TP, TN, . . . could go after Equations 5, 6, 7.

Section 3, second paragraph. From my point of view, this paragraph should not start with “According to Long (Long et al., 2006), the recommended RBR threshold is 0.6.” In my opinion, the authors should start this paragraph by explaining that the RBR method will be used as baseline (as they say later). In addition, the sentence referring to Long

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et al (2006) could be rewritten, since the value of 0.6 was recommended for one system (the WSC) in that paper, while for the TSI several thresholds are used depending on the relative position between pixel/sun/horizon.

Section 3, paragraph regarding Thr_PCA. I don't understand why the accuracy gets worse for higher Thr_PCA. I understand the use of PCA, as this means that feature vector reduce its dimension and the whole process is accelerated. But it seems to me that a higher Thr_PCA means including more information in the classifier, so why results deteriorate?

Figure 8. For these or for other examples, the authors could also show the result of the RBR method, to illustrate the differences.

Conclusions. I wouldn't say that the RBR is not "feasible". This method produces somewhat poorer results, but is easily applied, so I would recommend a different wording here. Finally, the authors should explain further how the new method can be implemented to other cameras. Do other researchers need to select a number of images, set "ground truth" and train the method? Are the values that are set her for thresholds and voting (Thr_PCA, Nv, etc.) adequate for all cases, or must be "tuned" for each site?

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