Referee #2

We deeply thank the reviewer for his/her comments and questions, which helped to improve the clarity of the manuscript.
Below are the responses to each of his/her comments.

But first, note that the values of the evaluation in Table 4 have changed. We have found that at submission, we had not taken into account the most updated and optimized evaluation that had been previously done. This does not change any of the concluding messages in the article.

General comments:

However, besides the thin cirrus clouds, aerosols and fogs are two big problems challenging the accuracy of cloud identification for visible images. Discussions about impacts of aerosols and fogs on ELIFAN are not presented in this paper.
→ Yes, this is true. We do not consider the influence of aerosol at all in this algorithm.
It turns out that the algorithm performs quite well without doing so.
But it could be different in region with much more aerosol loading.
Fog is not addressed here either. But ELIFAN is detecting 100 % cloud cover during the fog events, which remains a correct cloud fraction estimate in this case.
This was tested with images of fog events, and also quantified at SIRTA with a visibilimeter : All fog cases studied (visibility < 1000 m) were found with 100 % cloud cover with ELIFAN.

Since there are some obvious weaknesses in the innovation, methodology, and validation of ELIFAN, major revisions are suggested.

Specific comments:

1) This study focuses on the algorithm. Since there have been some algorithms of estimating cloud cover from all sky images, progress or advances of ELIFAN relative to previous researches or other algorithms should be addressed clearly in the introduction or section 3.1
→ This was actually partly done in the introduction of section 3.2, but only after the description of different methodologies found in the litterature. We added on page 8, lines 10-12 some more comments on what ELIFAN brings to those previous works, even if there is no fundamental innovation relatively to the principle of the method used here :

One originality of ELIFAN, is that it applies both an absolute and a differential thresholding processes independently. Each of them has advantages and drawbacks, but both are complementary.

2) The ELIFAN contains an absolute and a differential threshold process to estimate the cloud cover.
Is ELIFAN automatic?
→ Yes.

When the two cloud covers are different, which one will be used in "real-time" operation?

More words should be added.
→ Both are estimated and available. The user is free to use one or the other estimate, depending on the goal of his/her study, and taking account of the strength and weaknesses of each process.
See page 12, lines 13-14 of the manucript « Depending on the aim of an analysis, one may use one or the other result, ».

3) For the differential threshold method, how does the reference image be selected for an all sky image?
How do you deal with the differences caused by solar position and background atmosphere which change with the time and location?
→ The reference images are selected as cloud free images with the same solar zenith and azimuth angles than the processed image. This was indicated in the initial manuscript.
See page 8, lines 20-21 of the revised manucript : « the algorithm searches for a reference blue sky image within a library, with the sun at same azimut and same elevation, ±1° , as the considered image » [i.e. as the image to be processed].

If there are several reference images with the same zenith and azimuth angles, the image with the least turbidity is used (that is the one with the PDF having the smallest RBR). This was also indicated in the initial manuscript.
See page 8, lines 24-25 of the revised manucript : « If there are several reference images available, the sky with the least turbidity is chosen as a reference, based on the RBR pdf. »
But, following Rev#1 suggestion, we have changed the algorithm to rather use the image with the median turbidity (median RBR distribution), which is indeed more appropriate. This will be part of the next version of ELIFAN.
We added a discussion about this in the conclusion.

In addition, settings of white-balance mode also exert influences on colors of images.
Please add more statements of these problems.
→ We did not consider this aspect at all. As far as we know, we did not need to adjust the white-balance of the images before adapting ELIFAN to the various cameras. But this is a relevant suggestion, especially for cameras which take images with strong differences in this setting.

4) There exist some thin clouds (near the solar circle, area around (400,700)) in Figure 5(a). Why do the authors think it is a clear sky?
→ We agree. Image 5a is not absolutely cloud-free. As an example of a cloud free image, with the corresponding pdf, we do need to give a better illustrating example.
We have now considered another time with a fully cloud-free image, as a better example.
We also corrected an error on the year of the images, which was 2014 (not 2018).

5) Aerosols and fogs always show similar R/B features with clouds in visible images.
They challenge the accuracy of cloud identification, especially for skies of low visibility.
How about the visibility (or aerosol optical depth) of those days for the validation in section 3.4?
→ We did not consider fog or aerosol neither in the algorithm, nor in our evaluation.
Note that fog and aerosol profiles are not measured on all sites. It is on sites like SIRTA, and could be an aspect to address in the future with this site.
For now, fog cases, and low visibility of very lowcloud decks are estimated as 100 % cloudy images by ELIFAN.

But we do not depart low clouds from fog, and to not estimate any index of visibility with ELIFAN.
More over, ELIFAN does not aim at identifying the type of clouds.

How about the occurrence frequency of thin cirrus clouds?
Thin Ci clouds occurrence has not been estimated during the human eye evaluation.
But Table 4 shows that we have 1356 images with some cirrus clouds, among the 4925 considered images. The success rate in identifying those Ci is 78%. This means that potentially 22% of those 1356 images are thin Ci clouds, that is 6 % of the 4925 images.
Assuming that some of the thin cirrus are well caught, 6 % is a minimum estimate of thin Ci occurrence.

The performances of ELIFAN are dependent on the sky conditions of images. Please present some rough expressions of the sky conditions of days for validation.
→ It is not easy to answer this question, because the 4925 images were picked up all along the year with a systematic and fixed time interval.
That means that most of the conditions which can be encountered in the (middle-latitude) site are considered.

6) What is the purpose of section 4?
→ This question was also raised by Rev #1.
The main goal was to illustrate the algorithm process presented before, and discuss it with other points of view brought by complementary instruments.
Which eventually gives 2 objectives :
(1) illustrating the ELIFAN process and weakness/strength points presented before
(2) showing the complementarity of the instruments.
We thought that this section would be useful, especially for readers who are interested in the application of the sky cameras for process studies.

But, based on the fact that :
- both Reviewer #1 and Reviwer #2 have put this section into question,
- we have inserted more illustrations of the strength and weakness of ELIFAN in section 3,
- it is appropriate to keep the manuscript to a reasonable length,
we propose to remove this section.
With this change, the previous evaluation section 3.4 has now been renamed section 4 itself, in order to better balance the size of the various parts of the revised article.

However, we are still willing to keep the original section 4 if ever the Reviewers and Editor finally find it more appropriate.

If it is aimed to show the performance of ELIFAN via comparisons with the pyranometer and ceilometer, the results are destined to be weak since the two instruments work in a different way.
→ We fully agree with this.

The pyranometer cannot estimate cloud cover. The ceilometer can estimate the occurrence frequency of clouds during a period. Supposing that the formation of clouds is random, the occurrence frequency during a certain period might be regarded as cloud cover. However, the formations, evolutions and movements of clouds interact with the atmospheric and topographical conditions and show regional character. The differences between occurrence frequency and cloud cover change due to different atmospheric conditions and locations. Thus, it’s deficient to deduce the strength or weakness of ELIFAN through

the comparison.
We agree with this too. That was not our purpose.

If it is aimed to show the complementarity of all sky camera and the ceilometer, the work somewhat departs from what the title indicates. Maybe, add "and its application" in the title to keep this section.
→ Yes. If we were to keep this section, we would adapt the title, and more clearly explain the aim of the section in the start.

7) How about the transferability of ELIFAN? Is it applicable for other areas, for example areas of high aerosol optical depth?
ELIFAN is transferable to other areas, but should be difficult to use in regions with heavy aerosol loading, since it does not deal with this aspect.
Also it is potentially more challenging to use it in Tropical regions, because the sun is for a large part of the time in the center of the image, which is the most « useful »/ »easy » part of the image for the process.
We added some comments in the conclusion about this.

Do you have some special approaches to discriminate the aerosols or fogs from clouds? More discussions should be added.
→ Using dynamical thresholds may do a better job in sunrise/sunset transitions, and also for aerosol impact on the variability of the cloud-free sky.
We do not plan to attempt to depart fog or aerosol from clouds with ELIFAN. We believe that ceilometer, lidar, and visibilimeters should do better, and are really complementary of all-sky imagers.
The perspective of using dynamical thresholds is mentioned in the conclusion.