Response to Reviewers (2)

Revealing Halos Concealed by Cirrus Clouds

Yuji Ayatsuka

I would like to thank again the reviewers for their kind and useful comments and constructive suggestions on our manuscript. The modifications in our revised manuscript are listed below.

To Anonymous Referee #3

- *The manuscript "Revealing Halos Concealed by Cirrus Clouds" by Y. Ayatsuka presents a new algorithm to automatically detect halos in images that are often hard to see. Generally, the manuscript is well written and fits well within the scope of AMT. The author has addressed my comments satisfactorily and I suggest publication after editing of some typos found in the document.*

Thanks for your comment. I have fixed all the typos you found.

To Anonymous Referee #4

- *I understand that the Boyd and Foster algorithms are detection methods whereas the method in the paper currently under consideration is designed to improve the image processing. My initial criticism was that the proposed processing techniques are evaluated qualitatively using a small number of hand-picked example images and that even amongst those images, the advantages are inconsistent (e.g., Fig. 11). Boyd et al. reports that their detection method is 86% accurate relative to a curated training set. My suggestion was to run the Boyd et al. algorithm after first processing the images using the methodology presented here to test the hypothesis that the new processing approach will increase the accuracy of detection.*

Thanks for the comment. Running the Boyd et al. algorithm on images pre-processed by our algorithm is quite interesting, but I think it is beyond the scope of this manuscript for several reasons. First, Boyd's algorithm requires images in which each pixel represents an intensity, while our algorithm outputs images in which each pixel represents a kind of color difference signal. Then we have to modify and tune Boyd's algorithm to apply it to the

output images. Second, as I mentioned in the first response, our algorithm is currently tuned for images taken with standard cameras and lenses. I also need to adopt some parameters of our algorithm for total sky images to apply Boyd's algorithm.

As shown in Fig.12, the pixels of redder and bluer part of halos are clearly separated (color differences are large) by our algorithms, while the pixels of clouds are concentrated in narrow range of values (smaller color differences). It obviously helps the development and revision of halo detection algorithms, including Boyd's one, much easier. It is also quite helpful for human observers to find and distinguish many types of halos in the image, some of which are often difficult to notice.

To further demonstrate the effectiveness of our algorithm, I have added examples of atmospheric optical phenomena other than halos: third and fourth order rainbows and pollen corona.

Line 182:
6.2 Other Atmospheric Optical Phenomena
The sky-color regression algorithm can also be used efficiently to enhance other colored atmospheric optical phenomena. Fig.13(a) shows an example of quite faint third and fourth order rainbows. The algorithm extracts colored bows from the background sky without clouds. Fig.13(b) shows the diffraction pattern of Japanese cedar pollen corona. The algorithm also works on the sky color near sunset.

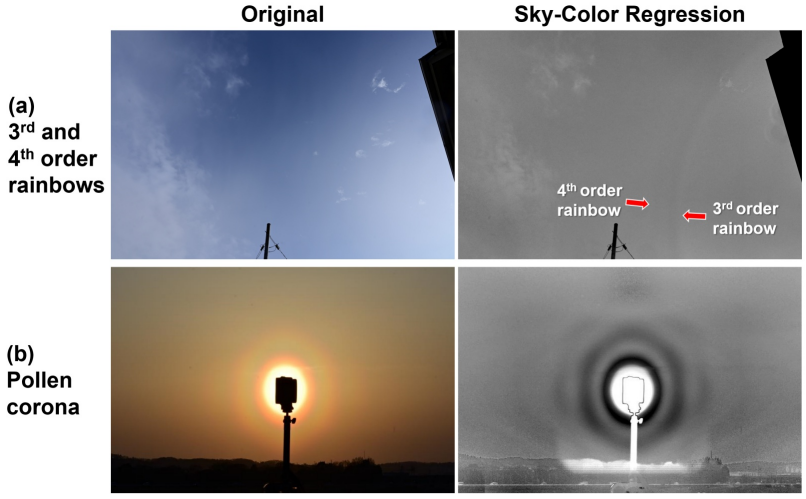

Figure 13: Applying sky-color regression for images of other atmospheric optical phenomena: (a) third and fourth order rainbows, (b) pollen corona (Japanese ceder).