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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global analysis of cloud field coverage and radiative properties, using morphological methods and MODIS observations" *by* R. Z. Bar-Or et al.

Anonymous Referee #1

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General comments

This paper uses a morphological method to analyze MODIS cloud mask data. Authors describe the algorithm in 6 steps. The algorithm is applied to MODIS-Terra atmosphere level 2 products on July 28th, 2008. They also present aerosol properties as a function distance from nearest cloud. The main results are (1) cloud field fraction over land differs dramatically from that over ocean; (2) mean aerosol optical depth decreases away from cloud with larger rate over land that over ocean; (3) aerosol fine mode increase away from cloud. I find the results of this study very interesting in studying cloud and aerosol near the transition zone between completely cloud areas and purely

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clear atmosphere. This transition zone is very important in studying aerosol-cloud interaction. Though there are some progresses in this research area in the past several years, how to characterize aerosol and cloud in the transition zone still remains fully understood. The morphological method in this paper could be potentially useful for the transition zone research. I recommend this paper to be published in Atmospheric Chemistry and Physics with reservations to the authors' response to my comments below. And I hope my comments could help authors to improve their paper.

Specific comments 1. I don't follow the definition of A(r) in step 3 in page 7. Here is what I guess what it means. Suppose there is a pixel at P(x1,y1). For P(x1,y1) the closest cloud pixel is Q(x2,y2). r=sqrt((x2^2-x1^2)+(y2^2-y1^2)). And A(r) = total(Pi*r^2). If this is what you mean, should the distribution be for the area (or Pi*r^2)? The integral of probability distribution should be unitless and equal to 1. The integral of A(r)/dr *dr has an unit for area. Also distributions of r^2 and r could be very different. Please clarify this.

2. Fig. 3 shows the sensitivity for a MODIS observed cloud field (line 17, page 8). This figure shows cloud fraction is insensitive to resolution, while the cloud field distance does. How is the cloud field distance determined? Is it at the minimum of the distribution? Authors also state "The cloud fraction is stable in the range . . .., as expected by a resolution reduction of a binary mask". How this was done? Please clarify.

3. Fig. 5 presents mean aerosol optical depth as a function of the distance from the nearest cloud. The increment of the distance is 1 km as plotted in Fig. 5. But MODIS product only provides aerosol with a resolution of 10 km x 10 km. In MODIS algorithm, if the standard deviation of reflectance of 3 x 3 pixels exceeds some critical value, the group of the nice pixels is classified as cloud (see Remer et al., 2005). Please clarify the 1 km increment in aerosol optical depth in this figure.

4. Fig. 5 shows systematic feature of aerosol away from cloud over land vs over ocean. It is very nice. However, it is known that clouds also act to en-

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hance clear sky reflectance and affect aerosol retrieval in the similar temporal scale (∼10 km). Author should at least to need to mention this effect. (See http://modis.gsfc.nasa.gov/sci_team/meetings/201001/presentations/posters/atmos/wen.pdf)

No Technical corrections:

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 19567, 2010.