**Atmospheric
Measurement
Techniques
Discussions**

Interactive comment on "Improved cloud screening in MAIAC aerosol retrievals using spectral and spatial analysis" *by* A. Lyapustin et al.

M. J. Garay (Referee)

michael.j.garay@jpl.nasa.gov

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General Comments:

This paper describes an improved cloud and snow screening algorithm based on the analysis of spectral residuals and spatial variance implemented within the Multi-Angle Implementation of Atmospheric Correction (MAIAC) algorithm for MODIS-Terra. The authors discuss the motivation for these new corrections and present examples of the theoretical basis for such approaches.

This is an informative, well written paper, and I believe it is appropriate for publication in the journal. I agree with the suggestion of Referee #2 that "Snow" should appear in

the title. My other comments are relatively minor and of a technical nature.

Specific Comments

The comments below are presented in terms of page and line number in the manuscript as much as possible.

Page 1576, Line 19-20: It's a minor point, but a single MODIS instrument only provides daily "near global" coverage.

Page 1578, Lines 1-2: This is probably asking for more detail than is necessary, but the edges of the MODIS swath have a well-known "bow tie" effect, which reduces the effective spatial resolution of the data. I wonder how this effect is handled in the gridding process. Also, there's no mention here of what specific bands are gridded. In the paper only bands 1, 3, 7, and 8 are mentioned. The native spatial resolution of band 1 is 250 m and the resolution of the other bands is 500 m. Do you simply use the 1 km aggregated information from the 1B2 product, or do you bin the data at the native resolution of the bands?

Page 1580, Lines 5-7: As the other reviewer noted, there is a difference here in the radius used for the cloud. Also, the size distribution for your cloud seems rather narrow. You might want to mention what you used as the source of the parameters selected for this modeled cloud.

Page 1580, Lines 9-24: First, the authors should consistently use either "COT" or "τcl" for cloud optical thickness, but not both in the same paragraph. Second, I believe the authors imply, but do not directly state, that the thinner cloud (COT = 0.234) over the brighter surface is not detectable by their technique, while the thicker cloud (COT = 0.7) is. Also, the stated purpose of this section was to "assess [the] sensitivity limit to. . . detectable thin clouds over different surfaces" (page 1579). Unless I'm missing something, the authors do not appear to be attempting to find the limits of the sensitivity, but just tested two different surfaces with two different COTs and found somewhat

different sensitivities. As actually assessing the sensitivity to COT over different surfaces is a major undertaking, I would suggest that the authors restate the focus of this section to something like "testing the sensitivity of detectable thin clouds over different surfaces."

Page 1585, Line 11: The authors mention "a standard validation approach which filters the high 70% of MAIAC AOD data." Do the authors really mean that the highest 30% of the outliers are filtered out, or is something else being done here? If this is "standard," a reference would be helpful.

Page 1585, Line 14: The authors mention the spatial window, but fail to discuss the time window used for the matching to the AERONET data.

Page 1585, Line 15 (and Figure 3): It appears that the comparisons are done for a wavelength of 470 nm (Band 3). AERONET typically measures optical depth at 440 nm, so how was the AOT determined at 470 nm?

Figure 5: There should be a description of what the colors represent on the cloud mask panels. Also, it would be helpful to indicate (with an arrow or a circle) the locations of the fire plumes. I can see them in Fig. 5b, but I know what I'm looking for. I don't find Fig. 5a particularly convincing.

Minor Corrections

The minor corrections are presented in terms of page and line number in the manuscript as much as possible.

Page 1577, Line 7: Should maybe just read "...revealed residual cloud and snow contamination."

Page 1577, Line 27: "level of detail which is..."

Page 1578, Line 9: "Common to all CM algorithms, the MAIAC CM has..."

Page 1579, Line 8: "...implemented in the MOD04..."

Page 1579, Lines 10-11: "...there is additional information..."

Page 1579, Line 19: "...assess the sensitivity limit to thin clouds..."

Page 1580, Lines 6-7: "...refractive indices from Hale and Querry (1973)"

Page 1581, Line 5: Might be more clear as: "...last BRDF retrieval. For example, rain can darken..."

Page 1581, Line 21: "For example, the MOD04 Collection 5 algorithm uses a 3 x 3 ..."

Page 1581, Line 23: "...box, helping to screen cloud shadows and..."

Page 1581, Line 27: "... data over a 10-20 km window..."

Page 1582, Line 25: "...results in the final stage..."

Page 1582, Line 1: "...according to the MAIC cloud mask..."

Page 1584, Line 4: "...avoid unnecessary processing..."

Page 1585, Line 14: "...from the AERONET sunphotometer..."

Page 1585, Line 21: "...switching to a 3 km window..."

Page 1586, Line 4: "...for Beijing where..."

Page 1586, Line 9: "...two days (235 and 274) of 2003..." It would be helpful to include the actual dates, too.

Page 1586, Line 21: "...problem of remote sensing..."

Page 1586, Line 23: "...there is not an ultimate solution..."

Page 1586, Line 24: "...overall high quality aerosol product."

Page 1587, Line 10: "...centers of active fires..."

Page 1587, Line 12: "...remain a problem which needs..."

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