Atmos. Meas. Tech. Discuss., 6, C546–C549, 2013
www.atmos-meas-tech-discuss.net/6/C546/2013/

Atmospheric Measurement Techniques Discussions

Interactive comment on "MISR Dark Water aerosol retrievals: operational algorithm sensitivity to particle non-sphericity" *by* O. V. Kalashnikova et al.

J. Reid (Referee)

reidj@nrlmry.navy.mil

Received and published: 10 April 2013

This is a very dense paper on MISR's ability to characterize aspherical particles. MISR is unique in the remote sensing world in that it can cover multiple degrees of freedom of aerosol particle characteristics: Small-medium-large; absorbing-less absorbing; and spherical-non spherical. But, MISR data is much more complicated to work with than other data sets and this intimidates potential users. The density of this paper probably does nothing to alleviate that, but it does do the community a significant service in going through the whole particle spherical/ non-spherical algorithm. As is typically the case from the MISR team, the paper goes into great detail into the pros and cons of the

product. Eventually scientists will make more use of this data (It is MISR's fate to be ahead of their time with an undersized budget). This paper is a good step in enabling usage and certainly be published after major revisions. There is some framing bias in this, and the authors should put the key issues up front in the abstract: There are significant non-spherical particle fractions in the high mid-latitudes. You want to know why. Their bottom line from their conclusion is cirrus. . ..maybe.

I do take some issue though on their conclusion. I think cirrus is certainly part of the problem. It might even be all of the problem. But in all the exhaustive theoretical analysis, they fail to provide the one thing I was wishing I could see throughout: A hand analysis! They have AOTs>0.4 in the southern oceans when they likely should not. How about showing some side by sides of RGBs and cases where you have erroneous retrievals?

So a conclusion of this is that MISR's cloud screening can't completely detect cirrus, even for high COTs. Instead they say that one should be cautious when cirrus are present. Well, how do we know???? Or, later it looks like they have no sensitivity to non-spherical particles just where it is used the most-the Sahara plume. I think the authors will do the target audience a favor by just getting right to the point, instead of dragging the problem to the end. Problem: Global maps of particle non-sphericity are not physical. Why? We think cirrus! Here is why we think that. Here is why we may be wrong. And as noted below there are other things that may be wrong like water cloud edges or the lower wave fields.

Bottom line is that this is important work that just needs to be framed better. I expect they can make revisions in 4-6 weeks.

Specific comments. Page 1596, line 25. You may want to point out Yingxi Shi's 2011 paper, where they are all mapped out.

Page 1596 line 27: I always wondered about the medium dust being the best fit, as this is clearly too small. But then, the MISR large is too big!

AMTD

6, C546–C549, 2013

Page 1597: This is an interesting point that we were unaware of-perhaps because we only looked at the non-spherical maps in places where we see dust. Your possibilities for the mid latitude bands sort of slightly brush aside some key points. When you say that (2) there is reduced sensitivity in the high mid-latitudes, really what the initial presentation of the data is that MISR has no sensitivity to spherical particles. These look like maps of coarse mode AOT. Not to add to a long paper, but maybe you should do that in the supplemental materials. Or, you don't have to show all 12 months. We like to do the winter/summer monsoon thing and break it up into Dec-May, June-November. You could have one plot that shows total AOT, fine, medium and coarse AOT and aspherical fraction. This would get us more information and less space.

Page 1597-part 2. Another possibility here is lower boundary condition. There are pretty big waves in the mind-latitudes too.

Page 1601 line 13-27: The thing is that we don't expect AOTs of 0.4 in the sea salt bands. In fact to my knowledge it has never been observed. This does not mean that it does not happen-sampling bias is likely part of this. This discussion is a bit inconsistent with that of Figure 5, where you say that the aspherical fraction is independent of AOT. Really what you want to say is that there are times when MISR has a strong positive AOT artifact (no surprise there). When that happens, it also shows up in the aspherical fraction. Just say it outright. The statement that "this is only for certain viewing geometries" is not really proven either. It could be that for the African Sahara belt there is an absence of artifact (certain type of clouds, lower boundary condition etc) or that you have a big coarse AOT, and that would then be flagged as aspherical too. Just say that too in the early discussion.

Page 1604. Line 5. So are you saying that where you use dust non-spherical fraction the most (i.e., the Sahara) MISR really does not have sensitivity? I think one way to improve the presentation to make things more clear is that for figure 11 and 12, cut the angles down to where MISR sees. Next, you should normalize them to one key scattering angle. Perhaps 140 degrees. It is the wavelength dependency, not the

AMTD

6, C546–C549, 2013

actual phase function that you care about in the retrieval.

Page 1606 Section 5.1&5.2 cant this be supplemental material? I think the authors can make their point in much more straightforward fashion.

Page 1615 line 10. You can see from your earlier figures that this is not a noise floor issue, nor is this a multiple scattering thing.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 1589, 2013.