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Atmospheric Measurement Techniques Discussions

Interactive comment on "Implications of MODIS bowtie distortion on aerosol optical depth retrievals, and techniques for mitigation" *by* A. M. Sayer et al.

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This article focuses on describing the impacts of the spatial distortion of MODIS sensor pixels on aerosol retrieval, and proposes two methodologies to mitigate the growth in pixel size. Although there are a handful of papers that discuss the MODIS "bowtie effect" and potential mitigation, most come from the engineering perspective and not from an algorithm/product perspective. The information the authors provide will be useful for users who have no reason to look into the instrumental literature. Additionally, this old topic has new relevance due to active work on development of multi-sensor algorithms for both MODIS and VIIRS, which handles the bowtie effect differently than

MODIS (and the authors provide and excellent description of the VIIRS instrument as well). The paper is well written, gives clear evidence, and is straightforward. I only have a few comments.

Comments :

Page 8728, Line 1 : The bowtie effect occurs both from the scan geometry (mentioned) and the Earth's curvature (not mentioned).

Page 8731, Line 17: Since the algorithms are performed in reflectance space rather than radiance space, probably should change 'radiance' to 'reflectance' (even though radiance is technically correct).

Page 8731, Line 21,22 and Page 8732 Line 2: Did you mean "pixels", not "positions"?

Page 8733 : The authors contend that aerosol variability is decreased at large viewing zenith angles is mainly due to the increase in pixel size, and they also assert that the decrease in AOD variability is undesirable. Certainly, there is smoothing of the retrieved aerosol field at the edge of scan due to pixel size. However, the authors gloss over the well-supported argument that AOD retrievals tend to be more accurate at the edge of scan due to increased atmospheric path length. Part of the decrease in standard deviation for the VZA population of >55° is a decrease in noise/error; Figure 6c shows that negative dark target retrievals are more common (by a factor of 2 or 3) at the more nadir viewing angles. This would narrow the distribution, but in a desirable way.

I am very curious how the histograms change if both mitigation techniques are applied. This would help ascertain whether the narrowing of the distribution at larger VZA is actually due to pixel spreading, or a something else. It would be worthwhile to run a year of aerosol retrievals with the mitigation techniques, and analyze the global impact.

Page 8738, Lines 9-12 : The authors recommend implementing their techniques for mitigating the bowtie distortion in future reprocessings. In my opinion, one of the strengths of the MODIS sensor is that there is collocated aerosol, cloud, water va-

por, snow and ice data. If aerosols, on their own, choose to leave the common swath grid, it will be much more difficult to do cross-disciple science with the MODIS sensor. The authors should present their work without recommendations, and allow this to paper to lend support in further discussions of what to do in the future.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 8727, 2015.