Atmos. Chem. Phys. Discuss., 11, C5483–C5484, 2011
www.atmos-chem-phys-discuss.net/11/C5483/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Horizontal variability of aerosol optical depth observed during the ARCTAS airborne experiment" *by* Y. Shinozuka and J. Redemann

Anonymous Referee #1

Received and published: 27 June 2011

This paper describes the results airborne aerosol optical depth measurements and analyzes its spatial variability. Not surprisingly, it finds a variability that is significantly larger close to the aerosol (biomass burning) source that far away from it. The paper is very clear, well focused, and the conclusion derives logically from the analysis. It could be published with no change. I do have two suggestions to the authors however:

It should be made clear that the instrument measures the optical depth above the aircraft. As the aircraft is not at ground level (hopefully), the measurement is less than the total AOD. I wonder whether this has any significant influence on the result. The aerosol concentration at different atmospheric layers may be uncorrelated, so that the

relative variability of the total AOD is less than that of a portion of the atmosphere. Obviously, whether this has a significant influence depends on the airborne measurement height.

The authors attempt to interpret their measured variability along a line to that in a square. For this objective, they analyze the distribution of the distance ratio of two random points within a square and two points along a line. This requires a mathematic analysis that is provided in an appendix, and is way past the competences of the writer of these lines. I did however verified through a simple Monte Carlo simulation than the result is correct. BUT, it is assumed that the parameter of importance to compare the variability along a square and along a line is the geometric (rather than arithmetic) mean of the distance ratio. It is not justified why this should be used rather than the arithmetic mean or the ratio of the distance means for a square or a line. The authors may certainly be right, but some more justification could be useful.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 16245, 2011.