

Interactive comment on “Global and regional trends in aerosol optical depth based on remote sensing products and pollutant emission estimates between 2000 and 2009” by A. de Meij et al.

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Reviewer 2 This is a useful trend analysis of MODIS, MISR, and AERONET aerosol datasets which deserves to be published. However, the paper should be revised in order to place it in the appropriate context with respect to previously published results.

1. Regional and global AOT trends based on AVHRR data and preceding these new trends were published in the following papers: Mishchenko, M. I., and I. V. Geogdzhayev, 2007: Satellite remote sensing reveals regional tropospheric aerosol

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trends. *Opt. Express* 15, 7423–7438.

Zhao, T. X.-P., et al., 2008: Study of long-term trend in aerosol optical thickness observed from operational AVHRR satellite instrument. *J. Geophys. Res.* 113, D07201. I believe it would be very instructive to compare the old and the new trends as most of them seem to be similar. If so, this would add credibility to both.

We thank the reviewer for the references. We included the findings of these studies in the Introduction and we made a comparison with our results in section 3.1. “Mishchenko and Geogdzhayev (2007) analyzed long-term AOD trends between 1988 - 1991 and 2002 - 2005 using the AVHRR instrument. They found a decrease of 0.033 (~ 0.0024/year) of the global tropospheric AOD and a significant decrease over a large part of Europe, Atlantic Ocean, the Great Lakes in northeastern North America. A significant increase was observed along the western coast of Africa, over southern Asia and over the 45°S - 60°S latitudinal belt. Zhao et al. (2008) studied the long-term (nearly 25 years) AOD trends over the global oceans using the AVHRR Pathfinder Atmosphere extended (PATMOS-x) data set. Their study indicated a global negative trend of -0.01/decade up to -0.03/decade and positive trends of 0.04/decade over several developing regions, such as India, South-East Asia and China. A qualitative comparison reveals that our findings are consistent with those of Mishchenko and Geogdzhayev (2007) and Zhao et al. (2008).”

2. AOD and AE trends based on level-2 MODIS and MISR data were published and discussed in: Mishchenko, M. I., I. V. Geogdzhayev, L. Liu, A. A. Lacis, B. Cairns, and L. D. Travis, 2009: Toward unified satellite climatology of aerosol properties: what do fully compatible MODIS and MISR aerosol pixels tell us? *J. Quant. Spectrosc. Radiat. Transfer* 110, 402–408 [erratum: *JQSRT* 110, 1962-1963 (2009)] Again, it would be appropriate to compare/discuss the current level-3 results with the previous level-2 results.

We thank the reviewer for the reference. We inserted in section 3.3 the following: “The

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general AOD increase found over East Asia and the general decrease over Europe and North America are consistent with the study of Wild et al. (2009). They used global solar surface observations from different observational networks between 2000 and 2005 to estimate the tendencies in the surface solar radiation for the different regions in the world, and confirm that these tendencies are typical for these regions. Statistical comparisons have also been carried out between MODIS and MISR Level 3 and Level 2 and AERONET by Mishchenko et al. (2009). They analyzed ~8 years of the MODIS-Terra and MISR aerosol data. They found disagreements in the AODs at the pixel level as well as between spatially averaged ($1^\circ \times 1^\circ$) and long-term aerosol properties, which is consistent with our findings, i.e. that for a few locations in North America and Asia the trends between MODIS and MISR disagree. We emphasize, however, that the overall trends between MODIS and MISR Level 3 and MODIS Level 3 and L2 as derived in our study are of similar magnitude. Further Mishchenko et al. (2009) showed that MODIS over land tends to overestimate AOD near 120° and slightly underestimates it between 140° and 160° . Therefore the AOD differences between MODIS and MISR tend to increase with increasing scattering angle and these differences might be substantial in some areas.”

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