



AOD trends during 2001–2010 from observations and model simulations

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The trend of aerosol optical depth (AOD) between 2001 and 2010 is estimated globally and regionally from remote sensed observations by the MODIS (Moderate Resolution Imaging Spectroradiometer), MISR (Multi-angle Imaging SpectroRadiometer) and SeaWiFS (Sea-viewing Wide Field-of-view Sensor) satellite sensor.

The resulting trends have been compared to model results from the EMAC (ECHAM5/MESSy Atmospheric Chemistry [1]), model. Although interannual variability is applied only to anthropogenic and biomass-burning emissions, the model is able to quantitatively reproduce the AOD trends as observed by MODIS, while some discrepancies are found when compared to MISR and SeaWiFS.

An additional numerical simulation with the same model was performed, neglecting any temporal change in the emissions, i.e. with no interannual variability for any emission source. It is shown that decreasing AOD trends over the US and Europe are due to the decrease in the (anthropogenic) emissions. On contrary over the Sahara Desert and the Middle East region, the meteorological/dynamical changes in the last decade play a major role in driving the AOD trends. Further, over Southeast Asia, both meteorology and emissions changes are equally important in defining AOD trends [2].

Finally, decomposing the regional AOD trends into individual aerosol components reveals that the soluble components are the most dominant contributors to the total AOD, as their influence on the total AOD is enhanced by the aerosol water content.

[1]: Jöckel, P., Kerkweg, A., Pozzer, A., Sander, R., Tost, H., Riede, H., Baumgaertner, A., Gromov, S., and Kern, B.: Development cycle 2 of the Modular Earth Submodel System (MESSy2), *Geosci. Model Dev.*, 3, 717-752, doi:10.5194/gmd-3-717-2010, 2010.

[2]: Pozzer, A., de Meij, A., Yoon, J., Tost, H., Georgoulias, A. K., and Astitha, M.: AOD trends during 2001–2010 from observations and model simulations, *Atmos. Chem. Phys.*, 15, 5521-5535, doi:10.5194/acp-15-5521-2015, 2015.