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Trend Analysis of global AOT based on various Polar Orbiting Satellite Observations: MODIS (Terra), MISR (Terra), SeaWiFS (OrbView-2), and MODIS (Aqua)

J. Yoon (1), M. Vountas (1), W. von Hoyningen-Huene (1), D. Y. Chang (2), and J. P. Burrows (1)

(1) University of Bremen, Environmental Physics, Bremen, Germany (yoon@iup.physik.uni-bremen.de, +49 (0)421 218 4555), (2) Max-Planck-Institute for Chemistry, Mainz, Germany

Many studies have investigated temporal trends of cloud-free AOTs derived from polar orbiting satellite observations since aerosol retrieval accuracy has been improved substantially. However, only few studies have discussed the fundamental limitation of incomplete sampling originated from frequent cloud disturbance and restricted temporal coverage. Furthermore, the AOT trends derived from various polar orbiting satellite observations are hardly comparable due to different sensor calibration, retrieval accuracy, and cloud screening. Therefore, the present paper integrates various analyses of AOT trends derived from multiple observations (i.e. MODIS-Terra (MOD) from 2000/03 to 2009/12, MISR-Terra (MIS) from 2000/03 to 2010/12, SeaWiFS-OrbView-2 (SEA) from 1998/01 to 2007/12, and MODIS-Aqua (MYD) from 2003/01 to 2008/12) using a weighted least squares regression in order to minimize the above mentioned issues. With high statistical confidence, the weighted trends of MOD AOT (550 nm), MIS AOT (558 nm), SEA AOT (510 nm), and MYD AOT (550 nm) over OECD Europe showed a significant decrease (-0.00274$\pm$0.00126, -0.00303$\pm$0.00169, -0.00077$\pm$0.00044, and -0.00530$\pm$0.00304 per year respectively) while increasing over East Asia (+0.00727$\pm$0.00385, +0.00673$\pm$0.00401, +0.00342$\pm$0.00171, and +0.01939$\pm$0.00986 per year respectively).