



Multi-sensor studies of short-term interannual variations of aerosols

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In the present paper, we analyze in details the interannual variability of MODIS (Terra and Aqua) Aerosol Optical Depth (AOD) for years 2002 – 2008. The AOD anomaly maps of short-term trends exhibit interesting spatial variability with the AOD percent change per year reaching 10% or more in some contiguous areas (“hot” and “cold” spots). These numbers seem to be rather high to reflect the actual changes in aerosol emissions, thus prompting the following questions: Are these changes real, or some of these high trends are in fact artifacts of the analysis methods used? Can they be attributed to trends in aerosol sampling trends? Are they caused by changes in meteorological patterns affecting aerosol transport routes? Is there any relation of these changes to ENSO, NAO, and other known atmospheric cycles?

Our analysis (still in progress) provides numerical answers and physical explanation to some of these questions. We investigate alternative methods for trend calculation and provide recommendations for a more robust AOD trend calculation. We correlate AOD spatial and temporal distributions with those of humidity, winds, sea surface temperature, and other geophysical parameters using remote sensing data from various space-based sensors, e.g., MODIS, AIRS, along with reanalysis data. We provide the most likely relation of AOD changes observed in some equatorial areas with the recent phase of ENSO.

As a result, we identify regions where AOD short-term trends can be attributed to causes other than drastic changes in local aerosol emission and/or caused by the natural outbreaks (fires, volcano eruptions, etc.). We also identify regions with monotonic change in local pollution where the alternative explanations fail to provide different interpretation for the observed trends.