Geophysical Research Abstracts
Vol. 16, EGU2014-12255, 2014
EGU General Assembly 2014

Multi annual evolution and trends of surface visibility in Athens and its relationship with aerosol optical depth

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Visibility concerns the visual air quality and constitutes an important feature of the climate and landscape of an area. Visibility impairment is the result of the absorption and scattering of light by gases and particles in the atmosphere. Low visibility could indicate fog or rain events but under cloudless sky conditions optical quality is mainly determined from the concentration of the aerosols in the atmosphere. For this reason, visibility data are broadly used as a surrogate for the investigation of long term trends of air quality.

One of the largest long term datasets of daily observations of visibility, conducted at the National Observatory of Athens at 14.00 LST (LST= GMT+2hrs) since 1931, was used to built time series of monthly, seasonal and annual averages of visibility in the city of Athens. Annual and seasonal courses of visibility over the studied period exhibit small scale fluctuations but with marked long term decreasing trends. An obvious drop of visibility is observed during early 1950's, a decade characterized by intensified urbanization of the city of Athens.

The long term linear trend over the entire studied period (1931-2012) is negative and exceeds - 300m/year. The trend is more pronounced in the warm and dry season of the year. This possibly indicates the major role of aerosol concentration rather than meteorological conditions (rain, fog etc) to visibility deterioration. A tendency for stabilization of the visibility in Athens is observed during the last decade. This is possibly related to a series of measures taken after 1990's, concerning the fuels quality and penetration of anti-pollution technology in industry and vehicles.

Daily values of visibility in Athens were analysed along with daily values of (MODIS/Terra) satellite derived aerosol optical depth retrievals over the city since 2000, in order to investigate a possible correlation between the two variables. This will enable the reconstruction of aerosol optical depth time series, from the 30's till the present time.