



## Variability of trends observed in Atmospheric Aerosol optical properties over Pune, India

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Long term trends of various aerosol optical properties are observed over the city of Pune, the ninth most populated city in India using ground and satellite based instruments such as AERONET, MODIS (Aqua and Terra), MISR, CALIOP and reanalysis tool MERRA. Annually, the Aerosol Optical Depth is observed to be increasing over all the types of instruments (2004-17) with values of 0.01 to 0.006 yr<sup>-1</sup>, whereas the Angstrom exponent has a negative slope (AERONET) which suggests that the fine aerosols are decreasing. Single scattering albedo (SSA) is also increasing (0.00657 yr<sup>-1</sup>), which means the emission of smaller darker particles like soot has decreased over the years. MISR shows that the Absorbing AOD trend is decreasing in the overall study period (-0.0001237 yr<sup>-1</sup>). All these annual trends are related to anthropogenic activities and show differing trends before and after 2008, the year when various pollution counter measures were introduced mainly in Pune and also in various nearby areas. After 2008, the AOD increasing slope reduces, and the AAOD reverses the trend from positive to a negative slope. The average height till various kinds of aerosols reach and their vertical profile is studied using CALIOP data. Monthly variations of AOD and their vertical distribution also observed and discussed. Aerosol characterization is done using the MERRA tool into dust, sea salt, sulfates, elementary carbon, and organic carbon. Their monthly variations are explained by source characterizations using the HySplit model. In summer, air from the Arabian sea brings in dust and sea salt into the city and in winter, aerosols come from central India dominantly as carbon and sulfates changing the air quality over there. This study lays its stress on the fact that even though aerosols cover over a city is mostly non-local, anthropogenic activities of that area do play a significant role and here the city of Pune is a role model to show how measures can be taken to improve air quality over any urban area.