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Aerosol optical thickness trends and population growth in the Indian subcontinent

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The anthropogenic aerosol concentrations have peaks in the densely-populated regions, many of which are concentrated in Asia. The current study was aimed at finding evidence that links urbanization to aerosol optical thickness and its trends over the Indian subcontinent, based on the eight-year NASA databases of Multiangle Imaging SpectroRadiometer (MISR) and Moderate Resolution Imaging Spectroradiometer (MODIS) satellite retrievals, from March 2000 to February 2008. The subcontinent is characterized by high levels of air pollution due to intensively developing industries and mass fuel consumption for domestic purposes. Furthermore, it has a wide range of population density (persons/km2), from zero in remote sites to thousands in the Ganges basin. The aforementioned factors give us the opportunity to quantify the effects of urbanization on aerosol optical thickness, averaged separately over regions with differing population densities. Currently available satellite measurements with global coverage provide us with evenly distributed aerosol optical thickness (AOT) data. This makes it possible to estimate aerosol effects on AOT trends over highly-populated areas. Our analysis has led us to the conclusion that, over the specified regions in the Indian subcontinent with differing population densities, (1) the higher the averaged population density – the bigger the averaged AOT, (2) the larger the population growth – the stronger the increasing trends in AOT. Over the regions with P > 100 persons/km2 (more than 70% of the territory), a population growth of $\sim$1.5 %/year was accompanied by increasing AOT trends of over 2 %/year. The presence of the aforementioned significant AOT trends is evidence of the current worsening of air quality. The population of the Indian subcontinent is already witnessing air quality deterioration and relating health problems due to anthropogenic aerosol emissions. This situation could become even worse with the projected population growth in India.