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Satellite observations of SO2, NO2, CO, and aerosol over China

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Satellite observations of SO2, NO2, CO, and aerosol over China are related to demographic population density, emissions inventories, industrial production, and thermal power plant geospatial distributions. Similarities and differences in the geospatial distributions of SO2, NO2, CO, and aerosol are identified. Ozone Monitoring Instrument (OMI) SO2 and NO2 atmospheric columns, Measurements of Pollution in the Troposphere (MOPITT) CO columns, and Moderate Resolution Imaging Spectroradiometer (MODIS) aerosol optical depths over China are analyzed during 2005-2007. A comparison of OMI NO2 and University of Columbia gridded population maps indicates a close correspondence between centers of enhanced NO2 and population, with enhanced NO2 and SO2 co-located along the geospatial arc from Shijiazhuang to Luoyang in Hebei, Shanxi, and Henan provinces of China. The region near 35 N and 112 E in northern Henan and southern Shanxi provinces has maxima in NO2, SO2, and CO, which is co-located with power plant number density and population centers. Trends in Global Ozone Monitoring Experiment (GOME) and Scanning Imaging Absorption Spectrometer for Atmospheric Chartography (SCIAMACHY) NO2 over China from 1996 – 2007, and OMI NO2 from 2004-2008, are compared, and placed in context, to other regions of the world. In accord with previous studies, trends in GOME and SCIAMACHY NO2 over China during 1996-2007 are positive, while trends over Europe and the United States are negative. OMI NO2 columns increase by 8.7 % per year over eastern China (20-30 N, 110-123 E) in the winters of 2004-2008.