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Testing and Improving OMI Tropospheric NO2 Using Observations from the DANDELIONS and INTEX-B Validation Campaigns

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We present a validation of tropospheric NO2 columns from the Ozone Monitoring Instrument (OMI) using measurements from the Dutch Aerosol and Nitrogen Dioxide Experiments for vaLIdation of OMI and SCIAMACHY (DANDELIONS) and Intercontinental Transport Experiment (INTEX-B) campaigns held in 2006. These unique campaigns covered a wide range of pollution scenarios and provided detailed information on the vertical distribution of NO2. We examine how changes in the a priori profiles and albedo assumptions affect the OMI NO2 retrieval. The absolute average change in tropospheric columns retrieved with measured profiles and improved albedos is 23% with a standard deviation of 31%. We present two case studies related to pollution in the Southeastern US and Anchorage, Alaska to exemplify these changes. For most cases, using improved a priori information improves the OMI retrievals. This validation study lays the groundwork for examining trends in tropospheric NO2. We analyze changes in tropospheric NO2 observed from OMI between 2004 and 2008 in the United States and China. Our results suggest that the EPA Clean Air Act is taking effect in a number of states in the eastern United States with an average decrease of 19% (from 2004-2008), whereas previously reported increasing levels of air pollution in China, determined from GOME and SCIAMACHY, appear to continue at a high pace of 28% from 2004 to 2008.