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Trend analysis of satellite observed tropospheric NO2 vertical column density over East Asia

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Nitrogen dioxide plays a central role in the atmospheric environment as a toxic substance for respiratory system and precursors of ozone and aerosols. Furthermore, OH concentration is dependent on nitrogen dioxide concentration in the atmosphere. Although Hilboll et al.(2013) showed an increase in NO_2 concentration over Central Eastern China(CEC) until 2011 and a gradual decrease in NO_2 concentration over Japan until 2011, the latest trend until 2014 has not been reported yet. The time period is of interest, because it corresponds to the 12th 5-year-plan regulating NOx emissions in China and the period with the power substitution of thermal power generation for the nuclear power generation in Japan. In this study, we used two satellite datasets from OMI and GOME-2 that have been operationally observing tropospheric NO_2 VCD in recent years until 2014. Tropospheric NO_2 VCD trends in China and Japan were estimated based on the regression analysis for annual mean values. Although an increase in NO_2 VCD occurred at a rate of 7% per year from 2005 to 2011 over Central Eastern China, we found a decrease at a rate of 11% per year from 2011 to 2014. Over Japan, the NO_2 VCD increased at a rate of 4% per year from 2005 to 2011 and decreased from 2011 to 2014 at a rate of 4% per year. In this presentation, we also conduct detail trend analysis on a grid basis to discuss the potential causes for these variations in NO_2 VCD over China and Japan.

Keywords: Nitrogen dioxide, OMI, GOME-2, trend analysis