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TITLE: Application of satellite observations for timely updates to global anthropogenic NO_x emission inventories

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ABSTRACT:

[1] Anthropogenic emissions of nitrogen oxides (NO_x) can change rapidly due to economic growth or control measures. Bottom-up emissions estimated using source-specific emission factors and activity statistics require years to compile and can become quickly outdated. We present a method to use satellite observations of tropospheric NO₂ columns to estimate changes in NO_x emissions. We use tropospheric NO₂ columns retrieved from the SCIAMACHY satellite instrument for 2003–2009, the response of tropospheric NO₂ columns to changes in NO_x emissions determined from a global chemical transport model (GEOS-Chem), and the bottom-up anthropogenic NO_x emissions for 2006 to hindcast and forecast the inventories. We evaluate our approach by comparing bottom-up and hindcast emissions for 2003. The two inventories agree within 6.0% globally and within 8.9% at the regional scale with consistent trends in western Europe, North America, and East Asia. We go on to forecast emissions for 2009. During 2006–2009, anthropogenic NO_x emissions over land increase by 9.2% globally and by 18.8% from East Asia. North American emissions decrease by 5.7%.

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