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## Constraint of anthropogenic NO<sub>x</sub> emissions in China from different sectors: a new methodology using multiple satellite retrievals

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**Abstract.** A new methodology is developed to constrain Chinese anthropogenic emissions of nitrogen oxides (NO<sub>x</sub>) from four major sectors (industry, power plants, mobile and residential) in July 2008. It combines tropospheric NO<sub>2</sub> column retrievals from GOME-2 and OMI, taking advantage of their different passing time over China (~10:00 a.m. LT (local time) versus ~02:00 p.m.) and consistent retrieval algorithms. The approach is based on the difference of NO<sub>x</sub> columns at the overpass times of the two instruments; it thus is less susceptible to the likely systematic errors embedded in individual retrievals that are consistent with each other. Also, it explicitly accounts for diurnal variations and uncertainties of NO<sub>x</sub> emissions for individual sources. Our best top-down estimate suggests a national budget of 6.8 TgN/yr (5.5 TgN/yr for East China), close to the a priori bottom-up emission estimate from the INTEX-B mission for the year of 2006. The top-down emissions are lower than the a priori near Beijing, in the northeastern provinces and along the east coast; yet they exceed the a priori over many inland regions. Systematic errors in satellite retrievals are estimated to lead to underestimation of top-down emissions by at most 17% (most likely 10%). Effects of other factors on the top-down estimate are typically less than 15% each, including lightning, soil emissions, mixing in planetary boundary layer, anthropogenic emissions of carbon monoxide and volatile organic compounds, magnitude of a priori emissions, assumptions on emission diurnal variations, and uncertainties in the four sectors. The a posteriori emission budget is 5.7 TgN/yr for East China.

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