Evaluation of NO$_x$ emission fluxes over East Asia using model-predicted and OMI-retrieved tropospheric NO$_2$ columns

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To evaluate bottom-up NO$_x$ emission fluxes of INTEX-B, CAPSS, and REAS v1.11 inventories, CMAQ-simulated tropospheric NO$_2$ columns were compared with OMI-retrieved tropospheric NO$_2$ columns. For the direct comparison between the two columns, the averaging kernels retrieved from the KNMI algorithm were applied to the CMAQ model results. In the study, the two tropospheric NO$_2$ columns showed good spatial and seasonal correlation with correlation coefficients ranging from 0.71 to 0.96. In terms of the normalized mean error, the CMAQ-simulated NO$_2$ columns were, on annual average, $\sim$28% smaller than the OMI-retrieved NO$_2$ columns, indicating the NO$_x$ emission fluxes were possibly underestimated in East Asia. In addition, large absolute differences between the two tropospheric NO$_2$ columns found over Central East China during winter were investigated and analyzed with several sensitivity runs (monthly variations in NO$_x$ emissions; different NO$_x$ emission fluxes; and reaction probability of N$_2$O$_5$ onto aerosols).