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Greenhouse gas emitted from vehicles in Seoul megacity, South Korea: Molar ratios (N_2O:CO_2, CH_4:CO_2) and stable isotopic compositions of N_2O

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Quantifying greenhouse gas (GHG) emissions in the megacities is important to mitigating climate change. To characterize the vehicle emissions which is one of the largest contributors to anthropogenic greenhouse gas emissions, we collected air samples from the entry and exit points of the Sang-do Tunnel in Seoul, South Korea in 2021, and measured dry molar mixing ratios of major greenhouse gases spices emitted from vehicles (CO_2, CH_4, and N_2O). The N_2O:CO_2 emission molar ratio from vehicles is $3.82 \pm 0.39 \times 10^{-5}$, being within a range of $1.8 – 18.7 \times 10^{-5}$ previously reported in Germany, Switzerland, Sweden, and the USA. The CH_4:CO_2 emission molar ratio from the vehicles is $33.52 \pm 0.43 \times 10^{-5}$, which is significantly greater than those observed in Switzerland and the USA of $4.6 \pm 0.2 \times 10^{-5}$ and $15 \pm 4 \times 10^{-5}$, respectively. Compared with the calculated Further, we also analyzed $\delta^{15}N$ and $\delta^{18}O$ values of N_2O from the tunnel air. The $\delta^{15}N$ and $\delta^{18}O$ values of N_2O emitted from the vehicles are estimated as The newly measured data from Seoul may help us better understand greenhouse gas emissions from vehicles in megacities.