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First assessment on NO_x sources for a regional background site of North China using isotopic analysis linked with modelling

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Nitrogen oxides (NO_x, including NO and NO_2) play an important role in the formation of new particles. Thus NO_x emission reduction is one of the most critical steps to improve the air quality, especially in severe air-polluted areas (e.g. the North China). In this study, the sources and conversion mechanisms of NO_x were explored at Beihuangcheng Island (BH), a regional background site in North China. Results showed humidity and oxidants were important promoters for the conversion of NO_x to nitrate (NO_3-) in the atmosphere. Based on nitrogen isotope and an improved Bayesian mixing model, 61.85 $\pm$ 2.50%, 24.46 $\pm$ 4.02% and 13.69 $\pm$ 3.18% of NO_x could be attributed to mobile source, coal combustion and biomass burning, respectively, which indicated that mobile source was the primary source for NO_x on BH. Seasonally, mobile source was dominant contributor in summer (75.24 $\pm$ 5.29%), spring (61.53 $\pm$ 4.66%) and autumn (58.72 $\pm$ 4.17%). While residential coal combustion confirmed by Mann-Kendall test and moving simulation contributed a main portion of 71.75 $\pm$ 11.35% in winter. This work indicated that isotope-modelling is a promising tool for partitioning NO_x sources, and provided policy maker with the valuable insight into the NO_x reduction in North China.