3.140 Studying Ammonia Sources Using Nitrogen Isotope in Beijing.

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Abstract:

Atmospheric ammonia (NH_3) plays an important role in secondary particle formation, which is the most important component of haze in Beijing. It is critical to understand various emission source characteristics of NH_3 and quantify each source contribution to NH_3 in ambient atmosphere. However, it is still a challenging question in Beijing. Stable nitrogen isotope composition ($\delta^{15}N$) provides an effective tool to investigate NH_3 sources. Since NH_3 from different sources has distinct $\delta^{15}N$ values, it is very important to develop the local source isotope profiles of NH_3. In this study, NH_3 samples were collected from March 2017 to February 2018 at six sites, which represent major and typical ammonia emission sources in Beijing. We find that there is a wide range in NH_3 mass concentration from different sources (ranging from 24 µg m^{-3} for traffic to over 5000 µg m^{-3} for livestock) with different $\delta^{15}N$ values (ranging from -68.2 to -7.7 ‰). The $\delta^{15}N$ value of traffic source (-15.1 ± 5.9) is significantly higher, which shows a clear distinction from other sources (-32.2 ± 7.5 ‰, -35.5 ± 9.6 ‰, -30.3 ± 9.5 ‰, -37.8 ± 14.2 ‰ and -35.9 ± 4.6‰, for waste water treatment, solid waste disposal, human excreta, livestock, and fertilizer respectively). Moreover, the NH_3 source apportionment is conducted using the IsoSource, an isotope mixing model, along with N isotope signatures of NH_3 for each source developed in this study. In March 2017, the average contribution of traffic, waste (including waste water treatment, solid waste disposal and human excreta), livestock, and fertilizer is 29.2 ± 9.6%, 30.7 ± 22.2%, 20.6 ± 15.1% and 19.4 ± 14.2%, respectively. Our research suggests the important roles of traffic and waste sources, which are unexpected in urban Beijing. The NH_3 source apportionment in Beijing in other seasons will be compared and discussed.