

Virtual ACOM Seminar

Probing the fate of atmospheric nitrous acid (HONO) via stable isotopes

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Links: <https://operations.ucar.edu/live-acom>

ABSTRACT

Atmospheric reactive nitrogen (RN) species including nitrogen oxides (NO_x), nitrous acid (HONO), nitric acid (HNO₃), ammonia (NH₃) and particulate nitrate (p-NO₃⁻) have significant implication for air quality, climate as well as human and ecosystem health. Understanding RN — the sources, chemical transformations as well as sinks — is a first order question in atmospheric chemistry. Stable isotopic composition analysis provides a unique tool to tracking these species and holds promise for constraining and quantifying their budget. Of particular interest, HONO is a major daytime precursor of hydroxyl radical (OH) that influences the atmospheric oxidative capacity and determines the lifetime of many trace gases. However, its budget remains poorly constrained due to huge uncertainties associated with various emission sources and secondary production mechanisms. In this talk, I will introduce the first method we developed for quantification of the isotopic composition N (¹⁵N/¹⁴N) and O (¹⁸O/¹⁶O and ¹⁷O/¹⁶O) of HONO, and discuss the utilization of the N isotopes to distinguish HONO among sources, as well as the combination of concentration measurements and N and O isotopic analysis to constrain potential mechanisms for RN cycling and oxidation chemistry in the atmosphere in both the lab and the field under a variety of environments. The improved quantification of HONO budget will advance our ability to better predict ozone (O₃) and secondary aerosols (SA) in various environments, ultimately contributing to promotion of O₃ and SA mitigation strategy and policy.