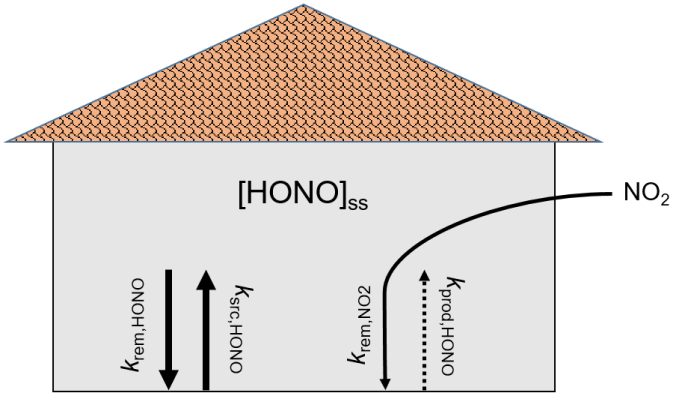
Collins D, Hems R, Zhou S, Alavy M, Siegel J, Abbatt J. 2018. Evidence for Gas-Surface Equilibrium Control of Indoor Nitrous Acid. *Environmental Science & Technology*, 52, 12419-12427.DOI: 10.1021/acs.est.8b04512.

Abstract

Nitrous acid (HONO) is an important component of indoor air as a photolabile precursor to hydroxyl radicals and has direct health effects. HONO concentrations are typically higher indoors than outdoors, although indoor concentrations have proved challenging to predict using box models. In this study, time-resolved measurements of HONO and NO_2 in a residence showed that [HONO] varied relatively weakly over contiguous periods of hours, while [NO_2] fluctuated in association with changes in outdoor [NO_2]. Perturbation experiments were performed in which indoor HONO was depleted or elevated and were interpreted using a two-compartment box model. To reproduce the measurements, [HONO] had to be predicted using persistent source and sink processes that do not directly involve NO_2, suggesting that HONO was in equilibrium with indoor surfaces. Production of gas phase HONO directly from conversion of NO_2 on surfaces had a weak influence on indoor [HONO] during the time of the perturbations. Highly similar temporal responses of HONO and semi-volatile carboxylic acids to ventilation of the residence along with the detection of nitrite on indoor surfaces support the concept that indoor HONO mixing ratios are controlled strongly by gas-surface equilibrium.



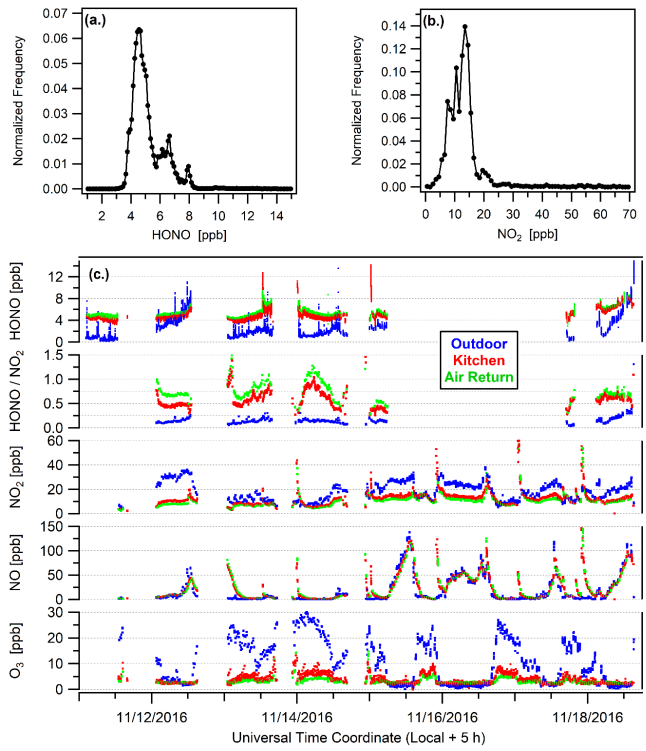


Figure 2. (a.) Histogram of [HONO] in the kitchen for all non-experiment periods. (b.) Histogram of [NO_2] in the kitchen for all non-experiment periods. (c.) Time series of trace gas measurements inside and outside the residence during all non-experiment periods. Times are given in the Universal Time Coordinate (UTC = local time + 5 h).

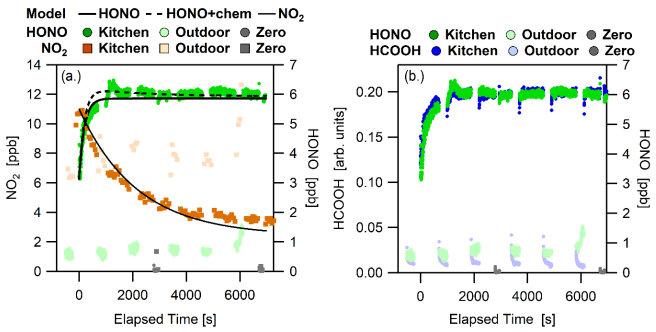


Figure 5. Measurements (markers) and model calculations (lines) of trace gases in the kitchen during ventilation experiments. The 'HONO+chem' model run (left panel) simulates HONO production by including k_{HONO}

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