

OH and HO₂ chemistry in the North Atlantic free troposphere

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Abstract

Interactions between atmospheric hydrogen oxides and aircraft nitrogen oxides determine the impact of aircraft exhaust on atmospheric chemistry. To study these interactions, the Subsonic Assessment: Ozone and Nitrogen Oxide Experiment (SONEX) assembled the most complete measurement complement to date for studying HO_x (OH and HO₂) chemistry in the free troposphere. Observed and modeled HO_x agree on average to within experimental uncertainties, particularly for HO₂/OH, an indicator of the fast HO_x exchange chemistry. However, observed-to-modeled HO_x differences vary as a function of NO_x and solar zenith angle > 70°. Some discrepancies appear to be removed by model adjustments to HO_x-NO_x chemistry, particularly by reducing HO₂NO₂ (PNA) formation and by including heterogeneous reactions on aerosols and cirrus clouds. These questions of HO_x-NO_x chemistry must be answered before issues of missing HO_x sources can be resolved.
