

Estimates of Cl atom concentrations and hydrocarbon kinetic reactivity in surface air at Appledore Island, Maine (USA), during International Consortium for Atmospheric Research on Transport and Transformation/Chemistry of Halogens at the Isles of Shoals

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Abstract

Average hydroxyl radical (OH) to chlorine atom (Cl \cdot) ratios ranging from 45 to 119 were determined from variability-lifetime relationships for selected nonmethane hydrocarbons (NMHC) in surface air from six different transport sectors arriving at Appledore Island, Maine, during July 2004. Multiplying these ratios by an assumed average OH concentration of $2.5 \times 10^6 \text{ cm}^{-3}$ yielded estimates of Cl \cdot concentrations of 2.2 to $5.6 \times 10^4 \text{ cm}^{-3}$. Summed reaction rates of methane and more than 30 abundant NMHCs with OH and Cl \cdot suggest that Cl \cdot reactions increased the kinetic reactivity of hydrocarbons by 16% to 30% over that due to OH alone in air associated with the various transport sectors. Isoprene and other abundant biogenic alkenes were the most important hydrocarbon contributors after methane to overall kinetic reactivity.

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