

2.124 Evaluation of the key factors in parameterization of HO₂ uptake coefficient on atmospheric aerosols.

Early Career Scientist

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Abstract:

Heterogeneous uptake of atmospheric gaseous species on aerosols surfaces play important roles in determining the fate of trace gases and physic-chemical property of aerosols in the atmosphere. Previous studies suggest that the aerosol uptake is potentially effective sink for HO₂ radicals, thus an accurate evaluation of the uptake coefficient of HO₂ is of great importance in atmospheric radical chemistry studies and in regional/global air quality modeling. However, large variable values of HO₂ uptake coefficients have been used in pervious modeling and mechanisms studies. In the present work, we evaluate the HO₂ uptake coefficient with a comprehensive parameterization considering the gas phase diffusion, aerosols surface accommodation and aqueous phase reactions terms. The dominant factors controlling the HO₂ uptake onto aerosols with different physical and chemical characters are investigated, and the impact of HO₂ aqueous phase productions is also evaluated. In addition, we also assess the uncertainties on the determined HO₂ uptake coefficients from utilizing different HO₂ accommodation coefficients (α_{HO_2}), since large range of α_{HO_2} values were reported from lab studies and used in modeling studies (0.1~1). The dependence of HO₂ uptake coefficient on the factors including particles size, aerosols compositions, aerosols acidity, and the utilized α_{HO_2} value are comprehensively discussed. The results emphasize the necessity of carefully treating the HO₂ uptake coefficients in modeling and aerosols multiphase chemistry studies.