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Gas phase diffusion coefficients of reactive trace gases in the atmosphere

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Diffusion of gas molecules to the surface is the first step for all gas-surface reactions. Gas phase diffusion can influence and sometimes even limit the overall rates of these reactions. However, there is no database of the gas phase diffusion coefficients of atmospheric reactive trace gases. We have compiled and evaluated, for the first time, the diffusivities (pressure independent diffusion coefficients) of atmospheric inorganic (Tang et al., 2014) and organic reactive trace gases reported in the literature. The measured diffusivities are then compared with estimated values using a semi-empirical method developed by Fuller et al. (1966). The diffusivities estimated using Fuller's method are typically found to be in good agreement with the measured values within $\pm$30%, and therefore Fuller's method can be used to estimate the diffusivities of trace gases for which experimental data are not available. The two experimental methods used in the atmospheric chemistry community to measure the gas phase diffusion coefficients are also discussed.