MODELLING OF THE LOSS OF NITRIC ACID TO AEROSOL AND CIRRUS CLOUD PARTICLES - DEVELOPMENT AND PRELIMINARY RESULTS

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Nitric acid is the major component of gaseous oxidised nitrogen in the UTLS region and provides a major sink of NOx by loss to the surface of aerosol and cirrus cloud particles. The relatively large surface area provided by cirrus clouds suggests that they may prove to be one of the main sinks for nitric acid. Although aerosol particles provide a much smaller surface area they are ubiquitous and therefore the relative losses of HNO3 may be comparable and need to be better understood. This will enable a better prediction of the lifetime of nitric acid in the upper troposphere to be made and hence improve the understanding of the oxidised nitrogen cycle. We are currently developing a suite of modelling tools to investigate the loss of gas phase HNO3 to cirrus clouds and aerosol particles. A microphysical model of cirrus clouds including both liquid water and ice phases, heterogeneous and homogeneous nucleation, condensational growth, and water and ice precipitation is being extended to include uptake of HNO3 to both the liquid and ice phases of the cloud. The model will be used to investigate the loss of HNO3 during a single pass through a cirrus cloud and predict the vertical re-distribution of oxidised nitrogen after precipitation or subsequent evaporation. An aerosol model is also being developed to investigate the timescales for HNO3 loss during out of cloud periods. We will present the development of these modelling tools to date, preliminary results and future progress.