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Occurrence of nitryl chloride in continental Europe: Are marine sources driving the formation of reactive halogens over Western Europe?

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Simultaneous observations of dinitrogen pentoxide, nitryl chloride, hydrogen chloride, particle composition and number density were made at the Taunus Observatory, Kleiner Feldberg during August 2012 to investigate the processes underlying the formation of nitryl chloride via the heterogeneous reaction of dinitrogen pentoxide with chloride containing aerosol.

Nitryl chloride production was observed on the majority of nights with a peak mixing ratio of 1 ppbv. The largest mixing fractions of nitryl chloride were observed during periods of relatively high particle sodium and chloride. Periods with the lowest peak nitryl chloride nocturnal mixing ratios (<100 pptv) were observed in conjunction with the lowest detected particle sodium. The dataset is consistent with the hypothesis that the magnitude of nitryl chloride production is linked to the nocturnal availability of both marine chloride and dinitrogen pentoxide. This dataset suggests that marine sources of chloride are a major factor in controlling the concentration and production of nitryl chloride over Western Europe.