

EGU22-1922

<https://doi.org/10.5194/egusphere-egu22-1922>

EGU General Assembly 2022

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## Iron(III)-carboxylate photochemistry induces iodate reduction

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Aerosols and clouds are complex systems containing organic and inorganic species, which play central roles in atmospheric chemistry and physics, climate, air pollution and public health. Particularly chemical reactions which occur in the aqueous phase can change the composition and oxidizing capacity of the troposphere via the production and release of trace gas species. Iron(III)-carboxylate complexes impact the chemistry of the atmospheric aqueous phase due to their photochemistry which can trigger free radical chemistry generating reactive oxygen species (ROS), such as HO<sub>2</sub> and H<sub>2</sub>O<sub>2</sub>. Several studies have highlighted the importance of iodine chemistry due to its capability to influence both oxidative capacity and radiative balance of the atmosphere. A previous work of this group demonstrated a direct link between carbonyl compounds, ROS and iodine chemistry [1]. Furthermore, observed ratios of iodide to iodate in aerosol particles and cloud droplets of the troposphere are much higher than expected [2, 3]. This is indicative of active chemical recycling of iodine between the gas and particle phases, which may be driven by not well understood reductive processes involving iodate, which is thermodynamically the most favored iodine form in the aqueous phase under oxidizing conditions.

We performed coated wall flow tube experiments (CWFT) with aqueous films containing iodate and Iron(III)-citrate (fe-cit) using citric acid (CA) as a matrix since it is an established proxy for oxygenated atmospheric organic matter and with well characterized microphysical properties. The CWFT was coupled with a CE-DOAS instrument in order to detect I<sub>2</sub> [4] resulting from iodate reduction. The results suggest that photochemistry promotes efficient iodate reduction, linked to the photochemical turnover of the iron(III)-carboxylate complex and to the depletion of the iodine reservoir. We speculate that reduction of iodate is driven by H<sub>2</sub>O<sub>2</sub> according to the Bray-Liebafsky mechanism, where H<sub>2</sub>O<sub>2</sub> is provided by fe-cit photochemistry.

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