

Marine aerosol oxalic acid from in-cloud oxidation of glyoxal

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Oxalate was detected in 'clean sector' marine aerosol samples at Mace Head (53°20'N, 9°54'W) and Amsterdam Island (37°48'S, 77°34'E) in concentrations ranging from few ng m⁻³ to tens of ng m⁻³. Measurements went on in 2006 at Mace Head and from 2003 to 2007 at Amsterdam Island. The oxalate concentration in marine aerosol showed a clear seasonal trend at both sites, with maxima in spring-summer and minima in fall-winter, as other marine biogenic aerosol components (e.g. methanesulfonic acid, non-sea-salt-sulfate and aliphatic amines). These results suggest the existence of a natural source of oxalic acid over the oceans.

Observed oxalate was distributed along the whole aerosol size spectrum, with both a sub and a supermicrometer mode, suggesting the co-existence of different formation routes over remote oceanic regions.

Several formation processes can explain the presence of oxalate in marine aerosol. Here, it is proposed that the cloud mediated oxidation of gaseous glyoxal, recently detected over remote oceanic regions in concentrations of the order of 100 ppt, may be an important source of submicrometer oxalate in the marine boundary layer. Supporting this hypothesis, satellite retrieved glyoxal column concentrations over the two sampling sites exhibited the same seasonal concentration trend of marine aerosol oxalate. Furthermore, chemical box model simulations showed that the observed submicrometer oxalate concentrations were consistent with the in-cloud oxidation of typical marine air glyoxal mixing ratios, as retrieved by satellite measurements, at both sites.

Monoterpene emission dynamics from Arctic to Tropics

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Monoterpene emissions, while globally much smaller than isoprene emissions, can dominate emissions from certain regions and ecosystems [1]. As larger molecules, they are also much more likely to take part in secondary aerosol formation than isoprene.

The traditional monoterpene emission algorithm by Guenther *et al.* [2] was based on an assumption that the monoterpene emission can be described as evaporation from large storage pools. This leads to temperature dependent emission algorithm. However, quite soon it became obvious that monoterpene emission from certain plants and ecosystems showed more or less light dependent behavior [3, 4]. This was taken as indication that a part of the emission originates directly from synthesis. The ¹³C labeling experiments, in which rapid labeling of a part of monoterpenes is observed, further confirm the linkages between photosynthesis and part of the monoterpene emission [4, 5]. The importance of large storage reservoirs as important source of emission from many coniferous species is indicated by large unlabeled fraction of monoterpene emission from these plants [5]. Thus one can describe the emission using a scheme of parallel emission pathways.

By combining data on monoterpene emissions, content in plant tissue, and labeling patterns reported in literature we can generalize the emission dynamics within plant functional types. This will yield a more comprehensive picture on monoterpene emission dynamics from ecosystems ranging from Arctic to Tropics.

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[2] Guenther *et al.* (1991) *J. Geophys. Res.* **96**, 10799–10808.

[3] Staudt & Seufert (1995) *Naturwissenschaften* **82**, 89–92.

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[5] Ghirardo *et al.* (2010) *Plant Cell Environ.* **33**, 781–792.