

Contents in Context

Environmental Chemistry, Vol. 2, no. 4, 2005

Coastal New Particle Formation: A Review of the Current State-Of-The-Art

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Environ. Chem. **2005**, 2, 245

Atmospheric aerosols play an important role in determining the earth's radiative budget, climate change and air quality levels. Much effort has been spent on quantifying the impact of aerosols on climate change; however, the largest gap in our knowledge relates to quantifying natural aerosol systems and the new particle formation process associated with these systems. The marine aerosol system is of particular interest due to the 70% ocean coverage of the earth's surface. Coastal new particle formation events are thought to be more frequent and of stronger intensity compared with open ocean events and thus have been studied in detail to identify possible processes leading to open ocean new particle production.

Direct Measurements of New-Particle Fluxes in the Coastal Environment

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Environ. Chem. **2005**, 2, 256

The formation of new secondary aerosol particles in the natural atmosphere is important in terms of controlling the background aerosol population, which significantly impacts on climate. The coastal zone is perhaps the strongest natural source of new secondary aerosol particles, driven by the release of biogenic vapours, which, after undergoing photochemical reactions, lead to the massive production of nucleation mode aerosols, with concentrations often reaching in excess of 10^6 cm^{-3} . Quantification of this source strength is important, particularly on a regional scale, in terms of estimating the impact of aerosols on climate.

Quantification of Coastal New Ultra-Fine Particles Formation from *In situ* and Chamber Measurements during the BIOFLUX Campaign

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Environ. Chem. **2005**, 2, 260

Secondary processes leading to the production of ultra-fine particles by nucleation are still poorly understood. A fraction of new particles formed can grow into radiatively active sizes, where they can directly scatter incoming solar radiation and, if partly water soluble, contribute to the cloud condensation nuclei population. New particle formation events have been frequently observed at the Mace Head Atmospheric Research Station (western Ireland), under low tide and sunny conditions, leading to the hypothesis that new particles are formed from iodo-species emitted from macroalgae.

Modelling Iodine Particle Formation and Growth from Seaweed in a Chamber

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Environ. Chem. **2005**, 2, 271

Iodine is an important trace species in the marine atmosphere. It contributes to ozone depletion and new particle formation. In recent years, its importance has been realised; however, there is still a gap in our knowledge, from a theoretical framework, of the dominant mechanisms leading to new particle formation and previous theoretical frameworks have not been adequately developed or well understood. This paper presents a state-of-the-art theoretical framework for evaluating the prediction of iodine oxide nucleation and subsequent aerosol growth.

Iodine and Halocarbon Response of *Laminaria digitata* to Oxidative Stress and Links to Atmospheric New Particle Production

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Environ. Chem. **2005**, 2, 282

Various organic iodine compounds (including CH_3I , CH_2ClI , CH_2BrI , CH_2I_2) are present throughout the marine boundary layer as a result of their production from seaweeds, phytoplankton, and photolysis reactions occurring in seawater. In air, these compounds rapidly photolyse to give atomic I which subsequently reacts with ozone to form iodine oxide, potentially leading to perturbations of the tropospheric oxidative capacity and nucleation of atmospheric particles. Recent research has identified molecular iodine as an additional source of iodine atoms to coastal areas. Here we study the relative roles and controls of gaseous organic and molecular iodine release from the seaweed *Laminaria digitata*.

Marine Organic Halide and Isoprene Emissions Near Mace Head, Ireland

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Environ. Chem. **2005**, 2, 291

Atmospheric aerosols have received increasing attention, not only because they include cloud condensation nuclei, essential for precipitation, but also because of their absorption and scattering of radiation, which may affect climate. The process of aerosol formation, however, is not well understood. This paper describes measurements of the fluxes into the atmosphere of several possible biogenic precursors to primary aerosol production.

Marine Aerosol Iodine Chemistry: The Importance of Soluble Organic Iodine

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Environ. Chem. **2005**, 2, 295

Ozone concentrations play a large part in controlling the oxidation capacity of the marine boundary layer, while the production of new aerosol particles affects atmospheric radiative balance. Iodine has a complex chemistry in the marine atmosphere which impacts on both these processes. Much of this iodine chemistry, especially the chemical speciation of iodine in aerosol, is only poorly understood. This study explores the occurrence and abundance of organic forms of iodine, a topic that has received very little attention to date.

Formation Pathways and Composition of Iodine Oxide Ultra-Fine Particles

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Environ. Chem. **2005**, 2, 299

Bursts of ultra-fine particles (diameter < 10 nm) in the daytime coastal marine boundary layer at low tide coincide with the observation of iodine oxide radicals. The detection of iodine in the particles suggests a direct link between the biogenic emission of iodine-containing vapours and subsequent particle nucleation and growth. These coastal aerosols are therefore most likely iodine oxide polymers. However, the reaction pathways leading to the homogeneous nucleation of these particles are currently an area of uncertainty, as is their final composition. These ultra-fine particles are potentially important as a source of cloud condensation nuclei, and as a major pathway for enriching iodine in marine aerosol.

The Occurrence of Thio-Arsenosugars in Some Samples of Marine Algae

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Environ. Chem. **2005**, 2, 304

Thio-arsenosugars, a novel group of arsenosugars, have previously been reported to occur in marine animals. This paper reports their presence in marine macroalgae and discusses their possible significance in understanding the environmental cycling of arsenic in marine systems.

Reflections on Aluminium: Some Thoughts on the Mesospheric Processing of Ablated Meteoric Al⁺

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Environ. Chem. **2005**, 2, 308

As the second most abundant main-group metal, Al is a prominent constituent of meteors. Other metal-containing products of meteoric infall have been implicated in noctilucent cloud nucleation and polar stratospheric cloud formation. Aluminium is also the principal metallic component of the space debris in low Earth orbit. Re-entry of this debris is an anthropogenic route to neutral and ionized Al atoms in the upper atmosphere, the consequences of which are as yet unknown. The calculations reported here suggest that natural mechanisms exist for the processing of Al⁺ to yield neutral Al-containing structures that are likely to be highly reactive with trace upper-atmosphere constituents.

A Comparison of Copper Speciation Measurements with the Toxic Responses of Three Sensitive Freshwater Organisms

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Environ. Chem. **2005**, 2, 320

A rapid Chelex resin method is shown to be a valuable speciation screening tool for use in a tiered risk assessment of copper toxicity in fresh waters. It is a more conservative measure than toxicity testing with sensitive biota, but a better indicator of toxicity than a dissolved copper measurement.

A Rapid Method for Determining Lipid Fraction Ratios of Hard Corals under Varying Sediment and Light Regimes

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Environ. Chem. **2005**, 2, 331

Monitoring the health of coral reef systems is vitally important to maintain and manage these threatened, complex and biodiverse natural ecosystems. Although total lipid content has been suggested as a potential index of coral condition, current methods of measurement are time consuming, technically challenging and expensive. These limitations have prohibited the application of coral lipid content as an impact-monitoring tool. The development of a practical and rapid method to determine lipid fraction ratios has the potential to lead towards an effective tool for coral reef monitoring.