Heterogeneous reactions of NO_3 and N_2O_5 with a range of organic substrates

SIMONE GROSS, DANIEL A. KNOPF, JACKSON MAK, RICHARD IANNONE AND ALLAN K. BERTRAM*

University of British Columbia, 2036 Main Mall, Vancouver, BC, Canada (*correspondence: bertram@chem.ubc.ca)

Although NO_3 and N_2O_5 are important nighttime species in the troposphere, reactions between these gas-phase species and organic particles remain unexplored with few exceptions. These heterogeneous reactions may be important for several reasons. For example, these reactions may change the hygroscopic and optical properties of organic particles, and they may be a loss pathway for condensed-phase organic compounds in the atmosphere, which has implications for source apportionment. We have investigated heterogeneous reactions between NO_3 and N_2O_5 and a range of organic substrates and films. These substrates and films are used as proxies for either organic particles or aqueous particles coated with organic films in the atmosphere. Substrates used in these studies include organic self-assembled monolayers, solid polycyclic aromatic hydrocarbon films, liquid organic films, frozen organic films, and soot. The main focus of these studies was to determine reactive uptake coefficients for NO_3 and N_2O_5 on these different substrates. Results from these studies will be presented. In short, we show that many of these reactions may be important under atmospheric conditions.

Luminescence banding in tropical coral skeletons quantified using novel whole-core microscanning

C.A. GROVE[1]*, R. NAGTEGAAL[1], T. SCHEUFEN[1,2], B. KOSTER[1], J. ZINKE[3] AND G.-J.A. BRUMMER[1]

[1]Royal NIOZ, Den Burg, The Netherlands (*correspondence: craig.grove@nioz.nl) (roel.nagtegaal@nioz.nl, bob.koster@nioz.nl, geert-jan.brummer@nioz.nl)

[2]UVA University of Amsterdam, Amsterdam, The Netherlands (t.scheufen@student.uva.nl)

[3]VU University, Amsterdam, The Netherlands (jens.zinke@falw.vu.nl)

Seasonal changes in luminescence intensity observed within massive tropical coral skeletons are attributed to variations in river discharge. The nature and cause of luminescence still remains unresolved; however the incorporation of humic acids is widely accepted. Using a novel technique designed to quantify the intensity of luminescence in the red, green and blue (RGB) spectra, we can extract the luminescent signal produced by humic acid concentrations from the luminescent aragonite skeleton. Normalising against aragonite luminescence is the equivalent of normalising geochemical proxies against calcium, e.g. Sr/Ca.

Spectral luminescence ratios (RGB) appear a far more reliable proxy to reconstruct discharge patterns than intensities as they remove problems associated with skeletal architecture, density and the luminescent aragonite. Correlations improve dramatically with the robust runoff proxy Ba/Ca, obtained by Laser Ablation ICP-MS, with long term trends becoming apparent which were previously masked by the decreasing density trend observed in many corals. Using NE Madagascar as a case study, long term trends in luminescence spectral ratios are increasing, reflecting changes in rainfall patterns and/or land use linked to deforestation. Short term extreme events over the last 30 years e.g. major cyclones, are revealed as erosive transport from the hinterland is amplified.