PROBING ATMOSPHERIC CHEMICAL REACTIONS USING COMPREHENSIVE TWO DIMENSIONAL GAS CHROMATOGRAPHY

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The atmosphere is a highly complex, highly reactive chemical system. There are a huge variety of emission sources of chemical compounds, both natural and man-made, which have a broad range of reactivities and can be oxidised in the atmosphere. These oxidised compounds can eventually go on to form secondary organic aerosol (SOA), although the composition and climatic effects of SOA are still relatively unknown. In order to simplify the huge complexity of the atmosphere and to study the chemical reactions of individual compounds, smog chamber simulations can be carried out. Comprehensive two-dimensional gas chromatography (GC×GC) is an ideal tool with which to unravel the complex chemical composition of secondary organic aerosol formed in simulations due to the high peak capacity and sensitivity obtained and production of structured chromatograms that can increase the number of compounds identified. GCXGC has been coupled with both a Time of Flight Mass Spectrometry, to obtain an overview of the semi-volatile species in SOA, and to a Nitrogen Chemiluminescence Detector to study the formation of organic nitrogen species. By coupling these techniques to liquid chromatography and real time measurements such as Aerosol Mass Spectrometry, we can study the effect of using different starting materials and how the aerosol formed changes with age. This has led to a number of exciting discoveries such as the proposal of novel reaction pathways, the use of complex organic seed aerosols (not possible with low resolution techniques) and quantification of oxidised components within SOA.