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Modelling of Criegee Intermediates using the 3-D global model, STOCHEM-CRI and investigating their global impacts on Secondary Organic Aerosol formation

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Gas phase reactions of ozone with unsaturated compounds form stabilized Criegee intermediates (sCI) which play an important role in controlling the budgets of many tropospheric species including OH, organic acids and secondary organic aerosols (SOA). Recently sCI has been proposed to play a significant role in atmospheric sulfate and nitrate chemistry by forming sulfuric acid (promoter of aerosol formation) and nitrate radical (a powerful oxidizing agent). sCI can also undergo association reactions with water, alcohols, and carboxylic acids to form hydroperoxides and with aldehydes and ketones to form secondary ozonides. The products from these reactions are low volatility compounds which can contribute to the formation of SOA. The importance of plant emitted alkenes (isoprene, monoterpenes, sesquiterpenes) in the production of SOA through sCI formation have already been investigated in laboratory studies. However, the SOA formation from these reactions are absent in current global models. Thus, the formation of SOA has been incorporated in the global model, STOCHEM-CRI, a 3-D global chemistry transport model and the role of CI chemistry in controlling atmospheric composition and climate, and the influence of water vapor has been discussed in the study.