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Oxidation products of alpha-pinene: stabilized Criegee Intermediates and Extremely Low Volatility Organic Compounds in the CLOUD chamber and the boreal forest

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Atmospheric oxidation is an important phenomenon enhancing atmospheric aerosol particle formation as more oxidized compounds generally condense more readily due to their lower vapour pressure. By now, especially two oxidation processes have been identified as relevant for new particle formation: the oxidation of sulphur dioxide to sulphuric acid and oxidation of volatile organic compounds to extremely low volatility organic compounds (ELVOC, Ehn et al. 2014). The most significant atmospheric oxidants have been thought to be ozone, the hydroxyl radical and the nitrate radical but recently the importance of stabilized Criegee Intermediates (sCI) in atmospheric oxidation has been brought into discussion (Mauldin et al. 2012, Boy et al. 2013). The formation mechanisms of ELVOCs and the oxidation of sulphur dioxide by sCIs, have been investigated in recent laboratory studies (Sipilä et al. 2014, Ehn et al. 2014). In this study we explore the validity of those mechanisms in chamber and field measurements. The sCI, ELVOC and sulphuric acid concentrations were measured by a chemical ionization atmospheric pressure interface time-of-flight (CI-APi-TOF) mass spectrometer. The ozonolysis of alpha-pinene, the most abundant monoterpene in the boreal forest, was studied in measurements in the CLOUD-chamber in CERN and the ELVOC and sulphuric acid concentrations were compared with calculated yields of oxidation products. The ambient concentrations of sCI and ELVOC were measured at boreal forest site (Hyytiälä, Finland) and compared to corresponding calculated proxies. Both ambient and chamber measurements were found to be in good agreement with the calculated concentrations. More detailed discussion of the results will be presented in the conference.

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