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A CHARON PTR-ToF-MS study on the volatility of freshly formed biogenic SOA

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Scientific progress in aerosol chemistry is still hampered by the lack of analytical methods that characterize the organic composition of particulate matter directly and in real-time. As a consequence, dilution-driven and oxidation-induced changes of organic aerosol remain poorly characterized on the molecular level. Recently, the "Chemical Analysis of Aerosol Online" (CHARON) particle inlet has been introduced, enabling proton-transfer-reaction time-of-flight mass spectrometry (PTR-ToF-MS) instruments to directly characterize particulate-bound organics in real-time down to the molecular sum formula level. For this study, we coupled a CHARON PTR-ToF-MS instrument to a flow reactor to analyze secondary organic aerosol (SOA) formed by the ozonolysis of α-pinene, limonene and 3-carene, respectively. In addition, a thermodenuder was added between the reactor and the CHARON-PTR-ToF-MS instrument for measuring the volatility of SOA constituents and for comparing experimental data with predictions based on the 2D volatility basis set (2D-VBS). We found that the saturation mass concentration of the bulk aerosol can be predicted to within one order of magnitude based on the speciated chemical information obtained by CHARON-PTR-ToF-MS.
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