Geophysical Research Abstracts
Vol. 12, EGU2010-9153, 2010
EGU General Assembly 2010

The Chemical and Microphysical Properties of Secondary Organic Aerosols from Holm Oak Emissions

Naama Lang-Yona (2), Yinon Rudich (2), Mentel Thomas (1), Buchholz Angela (1), Kiendler-Scharr Astrid (1), Kleist Einhard (1), Spindler Christian (1), Tillmann Ralf (1), and Wildt Jürgen (1)

(1) FZ-Juelich, ICG-2, Juelich, Germany (t.mentel@fz-juelich.de), (2) Department of Environmental Sciences, Weizmann Institute, Rehovot, 76100, Israel

Plant-emitted volatile organic compounds (VOC) undergo atmospheric oxidation, which leads to the formation of secondary organic aerosols (SOA). Large uncertainties exist about possible climatic effects on SOA formation from biogenic sources. Therefore it is important to investigate the impact of environmental conditions on the plants' emissions, on the formation of biogenic SOA, and on SOA properties in order to understand possible climatic impacts. The Mediterranean region is expected to experience substantial climatic change in the next 50 years and the possible effects on biogenic emissions are yet unexplored. To address such issues, the effects of temperature and light intensity on Mediterranean Holm Oak VOC emissions, as well as on microphysical properties and chemical composition of the resulting SOA have been studied in the Jülich plant aerosol atmosphere chamber.

We studied SOA formation from Holm Oak under conditions possibly simulating future climate warming. Monoterpenes dominate the VOC emissions from Holm Oak (97.5%) and temperature increase enhanced the emission strength and changed the emission pattern. Enhanced emissions lead to linearly enhanced SOA formation with a fractional mass yield of SOA (5.7$\pm$1%) independent of the detailed emission pattern. The particles are highly scattering with no absorption abilities. Their average hygroscopic growth factor was 1.13$\pm$0.03 at 90% RH with a critical diameter of droplet activation was 100$\pm$4 nm at a supersaturation of 0.4%. All microphysical properties were not dependent on the detailed emission pattern, in accordance with an invariant O/C ratio (0.57(+0.03/-0.1)) of the SOA as derived from high resolution aerosol mass spectrometry.

The temperature increase for the plants essentially led to stronger VOC emissions with the SOA mass being linearly related to the VOC concentrations. However, the increase of Holm oak emissions with temperature ($\approx$ 20 % per degree) was stronger than for Boreal tree species ($\approx$ 10 % per degree). Increasing mean temperature in Mediterranean areas therefore has a stronger impact on VOC emissions than in areas with Boreal forests. Possible implications of the findings to climate-vegetation interactions are suggested.