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Comparable Monoterpene emission from pine forests across 500 mm precipitation gradient in the semi-arid transition zone

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Atmospheric volatile organic compounds (VOCs) have key environmental and biological roles, and can affect atmospheric chemistry, secondary aerosol formation, and as a consequence also climate. At the same time, global changes in climate arising from human activities can modify the VOC emissions of vegetation in the coming years.

Monoterpene emission fluxes were measured during April 2013 at two forests in the semi-arid climate of Israel. Both forests were dominated by Pinus halepensis trees of similar age, but differed in the amount of annual average precipitation received ($\sim$276 and $\sim$760 mm at the Yatir and Birya sites, respectively).
Measurements performed included leaf-level sampling and gas exchange, as well as canopy-level flux calculations. Leaf level monoterpene emissions were sampled from leaf cuvettes with adsorbent cartridges and later analyzed by GC-MS. Canopy scale fluxes were calculated with the Disjunct Eddy Covariance technique by means of a Quadrupole PTRMS and eddy-covariance system.

We report the differences observed between the two forests in terms of photosynthetic activity and monoterpene emissions, aiming to see the effect of the different climatic regimes at each location.
Significantly higher emission rates of monoterpenes were observed in the wetter site during mid-day, in both the leaf scale and canopy scale measurements. Remarkably, however, normalized to 30C and corrected for tree density differences between the sites indicated comparable emission rates for both sites, with higher emission rated in the evening hours in the dry site at the edge of the Negev Desert. Modeling the monoterpene emission rates using MEGAN v2.1 indicated better agreement with observations in the wetter site then in the dry site, especially with respect to fluxes during the evening hours.