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Total OH reactivity in a mediterranean forest of downy oaks

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Forests emit large quantities of reactive molecules which can affect the concentration of the most important oxidizing agent in the atmosphere, the hydroxyl radical OH.
There are still many unknowns on how biogenic compounds interact with the atmosphere. Among those, we still lack to fully understand the species that can potentially influence the atmospheric oxidative capacity and thus the OH cleansing effect over several forested areas.
We conducted total OH reactivity measurements during spring 2014 inside and above the canopy height of a forest dominated at 80% by downy oaks in the Mediterranean basin (Observatoire Haute Provence site, France).
Downy oak trees are capable to emit almost exclusively isoprene (∼99%), the most abundant volatile organic compound and among the most reactive towards the OH radical.
We measured the total OH reactivity with the Comparative Reactivity Method together with atmospheric concentrations of the primary compounds emitted by the forest, main secondary species generated from the oxidation of isoprene, and main atmospheric constituents. We then compared the OH reactivity inferred by measured compounds and their oxidation rate coefficients with the measured total OH reactivity. This approach permits to identify the presence of any primary emitted biogenic compound, unknown before and relevant for OH oxidation; or any secondary generated compound whose associated chemical mechanism is not well established.
Our results show higher OH reactivity inside the canopy, with peaks up to 78 s-1, when isoprene concentration reached ∼20 ppb due to temperature and PAR increase. Such high level of OH reactivity has only been observed in the tropics so far.
Furthermore, our measured total OH reactivity closes the total amount of reactive species present in this specific forest, suggesting that we quantified precisely both the primary emitted species as well as the secondary generated products.