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Measurements of VOC fluxes by dynamic plant and soil chambers in wheat and maize crop near Paris with a PTR-Qi-TOF-MS: Quantification and response to environmental and physiological drivers.

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Volatile organic compounds (VOC) play an important role in the chemistry of the atmosphere as precursors of secondary pollutants such as ozone and organic aerosols. A large variety of VOC are exchanged between plants (BVOC) and the atmosphere. Their fluxes are strongly dependent on environmental factors (temperature, light, biotic and abiotic stress) and vary greatly among plant species. Only few studies focused on BVOC emissions by agricultural plants and were mostly carried in North America. However, agricultural lands occupy 51% of the total country area in France, with wheat being one of the most important crop.
We used a PTR-Qi-TOF-MS (national instrument within the ANAEE-France framework) and dynamic chambers to measure BVOC emissions from plant and soil compartments of a wheat and a maize crop near Paris (FR-GRI ICOS site). More than 700 masses were detected thanks to the resolution and sensitivity of this new instrument. We analyze the emission response to light, temperature and stomatal aperture in order to explain the mechanisms of BVOC exchanges by wheat plants. We investigate the emission differences between soil and plant compartment, and between wheat and maize crops. Acetone (m/z 59.049) was the predominant volatile compound in the emissions from wheat. Both methanol (m/z 33.033) and acetaldehyde (m/z 45.033) were also quite abundantly emitted but were less than half the acetone emissions. Other masses detected in relative importance in this study were m/z 63.026 (possible DMS), m/z 93.033 (not identified), m/z 69.069 (isoprene), m/z 57.069 (not identified), m/z 83.085 (possible green leaf volatiles), m/z 73.064 (methyl ethyl ketone). Their emissions were around 7 times smaller than the emissions of acetone. On the other hand we observed a deposition for, mainly, m/z 75.044 (hydroxyacetone) and m/z 61.028 (acetic acid). Methanol presented both positive and negative fluxes witch could indicate either emission or absorption of this compound by the plant, respectively.