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Is cryogenic vacuum distillation reliable for wood water extraction?

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Stable isotopes are becoming more and more widespread for studying the soil-plant continuum. Extracting water from plants and soil is now common in Eco-hydrological studies and is routinely done in different labs. Since water stable isotopes are used as tracers for investigating question such as plant water sources, response to precipitation, intra- interspecific species competition for water, the extraction techniques applied to plants are becoming more critical. Cryogenic vacuum distillation remains the control standard technique in most labs, although other approaches proved to be as efficient, less disruptive, and less time-consuming. However, increasing number of authors tends to question the standard status of this method when dealing with low water content or variable sample pore sizes.

To date, many studies showed how to complete a full extraction on soil materials and some plant materials, with more or less success, but studies investigating the extraction process itself on woody materials remained scarce. In this study, we questioned the accuracy of cryogenic vacuum distillation for water extraction on four woody species in order to understand possible caveats of the method and we scrutinized the specific reasons linked to woody material. We also proposed H_2O(liquid)-H_2O(gas) equilibration as an alternative method showing promising results for improving the common analysis bottleneck caused by water extraction despite its highlighted weaknesses.