

## Use of stable isotopes in studies of forest-atmosphere H<sub>2</sub>O and CO<sub>2</sub> exchange

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Stable oxygen (<sup>18</sup>O/<sup>16</sup>O) and hydrogen (<sup>2</sup>H/<sup>1</sup>H) isotopes at natural abundance levels are useful tracers for studying water and carbon cycles in terrestrial ecosystems. Atmospheric water vapor contains fewer amounts of heavier water isotopes (<sup>2</sup>H and <sup>18</sup>O) relative to the source water. In the case of surface water loss via vegetation (transpiration), this preferential loss of lighter water isotopologues result in enriched <sup>2</sup>H and <sup>18</sup>O contents in leaf water. Meanwhile, CO<sub>2</sub> that diffuses into leaf intercellular space and later out of stomata become labeled by this enriched <sup>18</sup>O signature. Scientists have used this labile <sup>18</sup>O signal in studies of global carbon cycles and paleoclimatic reconstruction. Improving our understanding of leaf water <sup>18</sup>O enrichment allows for the development of better process-based models to investigate biosphere-atmosphere water and carbon dioxide exchange processes spanning from ecosystem to global scales. Discussions will be emphasized on how biotic and abiotic factors influence diurnal and vertical variations of <sup>2</sup>H and <sup>18</sup>O in leaf water and water vapor in forest air.