

## Publication

## Do 2H and 18O in leaf water reflect environmental drivers differently?

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We compiled hydrogen and oxygen stable isotope compositions ( $\delta^2\text{H}$  and  $\delta^{18}\text{O}$ ) of leaf water from multiple biomes to examine variations with environmental drivers. Leaf water  $\delta^2\text{H}$  was more closely correlated with  $\delta^2\text{H}$  of xylem water or atmospheric vapour, whereas leaf water  $\delta^{18}\text{O}$  was more closely correlated with air relative humidity. This resulted from the larger proportional range for  $\delta^2\text{H}$  of meteoric waters relative to the extent of leaf water evaporative enrichment compared with  $\delta^{18}\text{O}$ . We next expressed leaf water as isotopic enrichment above xylem water ( $\Delta^2\text{H}$  and  $\Delta^{18}\text{O}$ ) to remove the impact of xylem water isotopic variation. For  $\Delta^2\text{H}$ , leaf water still correlated with atmospheric vapour, whereas  $\Delta^{18}\text{O}$  showed no such correlation. This was explained by covariance between air relative humidity and the  $\Delta^{18}\text{O}$  of atmospheric vapour. This is consistent with a previously observed diurnal correlation between air relative humidity and the deuterium excess of atmospheric vapour across a range of ecosystems. We conclude that  $^2\text{H}$  and  $^{18}\text{O}$  in leaf water do indeed reflect the balance of environmental drivers differently; our results have implications for understanding isotopic effects associated with water cycling in terrestrial ecosystems and for inferring environmental change from isotopic biomarkers that act as proxies for leaf water.

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