



Climate change and stable carbon isotopes: the path from trends to mechanistic scaling

John Marshall

(john.marshall@slu.se) Swedish University of Agricultural Sciences (SLU)

The $\delta^{13}\text{C}$ of photosynthate provides an annually resolved record of intrinsic water-use efficiency, which is the ratio of photosynthesis to stomatal conductance. This has made it possible to correlate $\delta^{13}\text{C}$ with rising temperatures and atmospheric CO_2 concentrations. But the attractiveness of this approach should be tempered by awareness of its limitations, including confounding due to height effects, nitrogen deposition, smearing due to reserves, post-photosynthetic fractionations, and especially mesophyll conductance. The literature has dealt with these issues as everything from quibbles to fatal flaws. This talk will argue that the problems are minor if $\delta^{13}\text{C}$ is used as an index of change over time, but they are more severe for quantitative scaling from physiological processes to global atmospheric composition. Progress on the quantitative scaling front will be highlighted.