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A 500-year dual stable isotope tree ring chronology of a Late Glacial cooling event

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A recent discovery of over 250 subfossil pine trees in Zürich (dated 14 000 – 11 000 cal BP) has provided the opportunity to study the inconsistent warming transition from the last ice age to the current interglacial. This period (the Late Glacial) has been extensively studied through the development of mostly non-tree ring palaeoclimate proxy records due to the intrigue of numerous prominent climate oscillations. However, such existing (lake sediment and ice core) records often lack the temporal resolution required to interpret rapid environmental changes. Tree rings can help to resolve such events due to their high resolution (annually-resolved) growth banding and absolute dating potential. Moreover, the analysis of stable isotopes can strongly improve the climate signal implemented in tree-ring width. Since numerous environmental conditions are all integrated in the rather simple ring-width series, measurements of chemical tree responses (via stable isotopes) can greatly refine the climate-growth-dynamics.

In this study, we are developing a well replicated 500-year annually resolved dual stable isotope (δ18O, δ13C) chronology from tree-ring cellulose, in an effort to reconstruct the environmental dynamics of a short-term Late Glacial cooling event (13 950 – 13 450 cal BP) in an otherwise naturally warming world. We will present and discuss the biological response to this rapid climate oscillation in the face of low atmospheric CO_2 concentrations and other site conditions without any human fingerprint.