



The climate-isotope relationship of tree-rings at temperate, high-altitude and high-latitude sites

Matthias Saurer, Anne Kress, Olga Sidorova, and Rolf Siegwolf
Paul Scherrer Institut, Villigen PSI, Switzerland (matthias.saurer@psi.ch)

Tree-ring-width and latewood density provide climate information particularly at extreme sites where growth is limited by a single factor. It is not clear, however, if this general principle also holds for stable carbon isotope ($\delta^{13}\text{C}$) or oxygen isotope ($\delta^{18}\text{O}$) variations. With increasing number of isotope studies and developing isotopic networks (ISONET, MILLENNIUM), the influence of site conditions on the climate-isotope relationship can now be systemically investigated. Our studies with trees growing in Europe and Siberia indicate the following: (1) Significant climate-isotope relationships are found for temperate regions where neither temperature nor precipitation are strongly limiting growth (Saurer et al. 2008) (2) The climate signal does not depend as much on site conditions as it does for tree-ring width and latewood density (3) A particularly strong carbon isotope climate signal reflecting drought is found for an Alpine larch chronology (Kress et al. 2009) (4) Isotopes at high-latitude Siberian sites contain a mixed temperature-precipitation signal (Sidorova et al. 2009). Overall, we can state that stable isotopes in tree-rings provide complimentary information to tree-ring width and density and extend the geographical range as well as the derived climate parameters significantly.

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