

Climatic interpretation of tree-ring methoxyl d2H time-series from a central alpine larch forest

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We measured stable hydrogen isotope ratios of lignin methoxyl groups (d2HLM) in high elevation larch trees (*Larix decidua* Mill.) from the Simplon Valley in southern Switzerland. Thirty-seven larch trees were sampled and five individuals analysed for their d2HLM values at annual (1971-2009) and pentadal resolution (1746-2009). Testing the climate response of the d2HLM series, the annually resolved series show a positive correlation of $r = 0.60$ with June/July precipitation and weaker but negative correlation with June/July temperature. In addition, a negative correlation with June-August d2H in precipitation of the nearby GNIP station in Locarno is observed. The pentadally resolved d2HLM series show no significant correlation to climate parameters. The positive correlation of the annually resolved data to summer precipitation is uncommon to d2H measurements from tree-rings (Feakins et al., 2013; Helle and Schleser, 2004; McCarroll and Loader, 2004; Mischel et al., 2015; White et al., 1994). However, we explain the positive association with warm season hydroclimate as follows: methoxyl groups of lignin are directly formed from tissues in the xylem water. More precipitation during June and July, which are on average relatively dry month, results in higher d2H values of the xylem water and therefore, higher d2H value in the lignin methoxyl groups. Therefore, we suggest that d2HLM values of high elevation larch trees might likely serve as a summer precipitation proxy.

References:

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