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Multicentury Reconstruction of Precipitations (1300-2014) in Eastern Canada from Tree-Ring Width and Carbon and Oxygen Isotopes

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Tree ring series enabling long hydroclimatic reconstructions are scarce in Northeastern America, mostly because most boreal species are rather thermo-dependant. Here we propose a new multi-proxy analysis (tree-ring, δ^{13}C and δ^{18}O) from one of the oldest *Thuja occidentalis* population in NE America (lake Duparquet, Quebec). These rare precipitation-sensitive, long-living trees ($>$ 800 years) grow on xeric rocky shores and their potential for paleo-hydroclimatic reconstructions (based on ring widths solely) was previously assessed. The objectives of this study are twofold i) to strengthen the hydroclimatic signal of this long tree-ring chronology by adding analysis of stable isotope ratios (δ^{13}C and δ^{18}O) and ii) to reconstruct summer precipitation back to 1300 AD, which will represent, by far, the longest high-resolution hydroclimatic reconstruction in this region. A tree-ring chronology was constructed from 61 trees sampled in standing position. Eleven trees were also sampled to produce pooled carbon and oxygen isotope chronologies (annually resolved) with a replication of five to six trees per year. Signal analysis (correlation between climatic data and proxy values) confirms that growth is positively influenced by spring precipitations (May-June), while δ^{13}C is negatively correlated to summer precipitation (June to August) and positively to June temperature. Adding δ^{18}O analysis will strengthen the signal even more, since wood cellulose should be enriched in δ^{18}O when high evapotranspiration conditions prevail. Based on a multi-proxy approach, a summer precipitation reconstruction was developed and compared to other temperature reconstructions from this region as well as to southernmost hydroclimatic reconstructions (e.g. Cook et al). A preliminary analysis of external and internal forcing is proposed in conclusion.