Investigation into effect of climate variables on $\delta^{13}C$ in tree chronologies from Vermont

In New England, there is a distinct lack of long-term climate data, with instrumental records only covering the 20th century. The aim of this project is to develop an initial 110-year stable isotope ratio chronology (1900-2010) from tree rings for a site in the western Green Mountains, Vermont. Currently, there are no stable carbon isotope ratio chronologies developed from tree rings for sites in New England, despite their strength as a proxy record in moist mid-latitude sites and their value in determining past climatic conditions. For this study, tree cores were sampled in the summer of 2010 and processed using standard dendrochronological techniques. Further analysis of the tree cores will include processing of individual tree-ring samples (n=120) to alpha-cellulose, the preparation of samples off-line and the measuring of stable carbon isotopic ratios online via an ANCA Elemental Analyser coupled to a PDZ Europa 20/20 stable isotope ratio mass spectrometer. We will correlate the chronology with local climate data to determine the climate variables that have the greatest influence over the δ^{13} C values. In later analysis, this relationship will be used to reconstruct past climate. We hypothesize that the $\delta^{13}C$ time series will be most strongly correlated with maximum temperature during the warm season (June-August) and that the $\delta^{13}C$ ratios will be most strongly influenced by photosynthetic rate. The results of this project will establish the relationship between climate and ^{13}C ratios in the recent past, and provide the foundation upon which past climate (prior to the 20th century) will be constructed. The ^{13}C ratio chronology constitutes the necessary first step in gaining greater insight into past climate in western Vermont.