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Isotope records from Neotropical trees and stem rosettes

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Relative little is known about long term Neotropical climate variability and with regards to tree ring stable isotope records, only a hand full of studies have been published. Recent developments however have demonstrated that wood from many Amazonian trees show seasonal rings and are far older than previously thought. We present examples from two globally significant Neotropical environments (the tropical alpine region or páramo and the Amazon rainforest). These environments are well known to be very sensitive to disturbances and variations in climate such as el Niño, and affects the livelihood of millions of people. There is enormous potential to study the impact of these climate anomalies on the vegetation by means of stable isotopes.
Pseudobombax munguba (Mart. & Zucc.) is a fast growing deciduous Amazonian pioneer tree that is common on the floodplains of white water rivers. It is known for forming porous wood with distinct annual tree-rings, which are the result of seasonal inundation. Due to the fast growth rate and the presence of well defined tree rings, this Amazonian tree is an ideal starting point for a study towards stable isotope records in Amazonian trees. We present the first tree ring 13C isotope record from the Colombian Amazon. The isotope data reveals a distinct pattern, revealing not only the seasonal changes and variations in the hydrological regime, but also gives unique insights in the local succession of a typical várzea forest.
The páramos of the Northern Andes present a huge area of globally significant but endangered high elevation tropical wetlands. They are regarded as the source of water which ultimately feeds the Neotropical lowlands such as the Amazon rainforest. The genus of Espeletia is endemic of the area and includes characteristic giant stem rosettes. Most stem rosettes retain dead foliage on the stems, which may serve as protection against frost and fire. The slow vertical growth rate and the compact nature of the rosette make it an potential interesting alternative for a tree ring analogous study. Very little is known about growth dynamics of these plants but it is common belief some species could reach an age of hundred years or more. Stem rosettes may offer a unique approach to study the impact of climate change above the tree line. In addition, the ENSO phenomenon results in strong hydrological changes in the páramo ecosystems, this presents to opportunity to assess the long term impact of climate on the páramo ecosystem. Leaf remains were sampled from Espeletia brassicoidea Cuatrec. at 3500m above sea level. 13C Analysis on the total organic matter shows a distinct pattern of seasonal oscillations revealing the age and growth dynamics of the plant and changes in water use efficiency which can be attributed to variations in precipitation.