

## **Climate variability in the SW Ecuadorian Andes of the past two millennia: a contribution to IGBP-PAGES 2k**

Detecting the regional expressions of natural forced and unforced (internal) climate variability at interannual, decadal and centennial time-scales, and discriminating regional manifestations of natural forcing from anthropogenic forcing is one of the priority areas in current climate research. In this context, the spotlight is placed on the observation that, despite increasing greenhouse gas concentrations in the atmosphere, global temperatures have not increased in the past decade. It has been suggested that this enigmatic temperature stabilization might be attributed to natural unforced (internal) climate variability (prolonged cooling in the tropical E Pacific).

In 2013, the IGBP-Past Global Changes PAGES 2k Consortium has published the first quantitative global assessment of regional climate variability for the past 2000 years (PAGES 2k Consortium, 2013, *Nature Geoscience*). This unique community effort provides for the first time comprehensive observational (proxy-based) insight into the spatio-temporal structure of temperature variability during the Medieval Climate Anomaly and the Little Ice Age and thus allows for the detection and attribution of forced and unforced natural in the past 2000 years. However, PAGES 2k Consortium (2013) also demonstrates a significant gap of observational data in the tropics in general and tropical Central and South America (north of 20°S) in particular. This gap is very much in contrast to modelling and pseudoproxy studies suggesting that tropical South America is among the most important and promising areas to provide insight into this problem. Thus, the significance of well-calibrated, validated high-resolution proxy-based climate reconstructions from tropical South America is demonstrated and recognized.

The specific research questions are:

1. Do sediments proxies (TOC, TS, BSi, grain size, sedimentary pigments, Fe/Mn species,  $\mu$ XRF, hyperspectral imaging) of lakes in NP Cajas contain a climate signal (calibration, verification), and can this be used to reconstruct climate for the past 2000 years?
2. Can hyperspectral imaging data (400-1000 nm, 1 nm spectral and 40  $\mu$ m pixel resolution) be used for very high-resolution mapping of known sediment components (proxy[hyperspectral]-proxy[analytical] calibration)?
3. What is the structure and timing of regional subdecadal-centennial climate variability in tropical South America over the past 2000 years?
4. How does climate variability in this area compare with southern South America and North America (PAGES 2k)?

The major goals of this project are:

1. To establish a high-resolution (sub-decadal) quantitative climate (temperature) reconstruction from lake sediments in the National Park Cajas, SE Ecuador, for the past 2000 years.
2. To provide a regional synthesis in the context of IGBP-PAGES LOTRED-SA, the regional PAGES 2 k Consortium for South America.