Ilex microdonta Reissek (Aquifoliaceae) trees in high summits of *Serra do Mar* mountain range in southern Brazil: a first approach for climate reconstructions

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KEY-FACTORS

- There is a lack of high-quality climate data in southern Brazil.
- Terrestrial stations don't have an equal spatial distribution.
- Climate data are usually short-term, with available data only from 1960.
- The regional climate variability within the *Serra do Mar* mountain range in Paraná state isn't well known yet.
- There are few studies on climate proxies in southern Brazil, especially with tree rings.
- *Ilex microdonta* Reissek (Aquifoliaceae) is the most important species of the mountain cloud forests of east Paraná state.
- *I. microdonta* has distinct and annual tree rings, that are sensitive to climate change (Miranda, 2015).
- Long-term chronologies from tree rings can provide a proxy-based data for climate reconstructions.
- We aimed to reconstruct minimum temperatures from the high summits of the *Serra do Mar* mountain range using tree ring chronologies as proxies, as a first approach for climate reconstructions in the high-altitude Atlantic Forest biome.

MATERIAL AND METHODS

- Site selection: *Mãe Catira* and *Sete* summits (1,430 m a.s.l.)
- Geographical coordinates: 24°21'17" S; 48°54'41" W.
- Tree-ring chronology: 30 trees - 214 years (1802-2016)
- Climate data source: Minimum temperature CRU dataset (longest available for site area: 1901-1999)

Reconstruction development:
- PCR methodology with PPR algorithm (PC-Reg software)
- Model evaluation: Minimum AIC criteria
- Climate mask selected: October to January (late spring to early summer)
- Model stiffness: Adjusted R^2, RE (Reduction of Error) and CE (Coefficient of Efficiency) statistics.

RESULTS

Reconstruction statistics: 34,29% of data variation explained by the model.

Calibration period	1920-1999	Verification period	1901-1919
R	0.343	R	0.759**
Adjusted R^2	0.317		
RE	0.343	RE	0.507
CE	0.343	CE	0.498

SOME INFERENCES

- There is an increase of average minimum temperatures for the climate mask (October to January – warmest months), starting from 1940.
- From the reconstructed data, it can be observed that there is a heat wave (or an increase of the minimum temperatures) from 1840 to 1880 in the region. Similar results were found from multi-proxy approaches in medium to high latitudes in South America (Villalba et al., 1996; Neukom et al., 2011).
- The higher correlations in the verification period corroborates and reinforces the results for the reconstructed period.
- These preliminary results, even though the low statistics, are the first record of climate reconstructions with tree rings in the high-altitude Atlantic Forest biome.
- There is a wide field for improvement with the technique in Brazil.
- We also reinforce the need to have better, longer, and more statistically efficient tree ring chronologies for climate reconstructions, to better understand the climate variability in these mountain sites of southern Brazil.

CRU dataset — Calibration period — Verification period — Reconstructed time-series ······ Chronology

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