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Ammonium in ice cores – a new proxy for tropical South American temperature reconstruction

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Assessing future climate change depends on understanding of natural climate variability. High resolution ice core records may provide good proxies for past climate and atmospheric parameters, a kind of information especially valuable for the Tropics, where instrumental data and palaeo records are sparse. Stable isotope data from high-elevation ice cores have been interpreted with respect to past temperature variability. However, calibration attempts and modeling studies for South America point to a dominant sensitivity to precipitation at least on annual and decadal timescales. We propose instead the ammonium concentration as a new proxy for tropical South American temperatures. This proxy was developed using a highly resolved and carefully dated ammonium record from an ice core that was drilled in 1999 on Nevado Illimani in the eastern Bolivian Andes. The reconstruction reveals that Medieval Warm Period and Little Ice Age type episodes are distinguishable in tropical South America, adding evidence that these climate phenomena were not confined to the Northern Hemisphere. The last decades of the past millennium are characterized by warm temperatures that seem to be unprecedented in the last $\sim$1600 years.