An improved regional branched GDGT-based soil temperature calibration for the Tropical Andes of Colombia: Towards a global calibration for the tropics.

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Branched glycerol dialkyl glycerol tetraethers (brGDGTs) are bacterial cell membrane lipids that, when as preserved in soils and lake sediments, can be used to infer continental paleotemperatures. Although global calibrations capture a global relationship between the distribution of brGDGTs and temperatures, they underestimate temperatures observed in tropical regions. Furthermore, global calibrations have root-mean-squared errors (RMSEs ~4 °C) that are too large to capture small variations in paleoclimate variability in tropical regions, and some calibrations reach saturation at around 24-25 °C. We present a detailed regional calibration of soil brGDGTs along two altitudinal transects on both flanks of the Eastern Cordillera of Colombia in the northern tropical Andes that constrains the difference of soil and air temperatures with elevation. Additionally, we combined our data with existing data sets from the tropics to produce a global tropical calibration. These new regional and tropical calibrations reduce the RMSE to <1.2 °C and 1.9 °C, respectively, and allow the calculation of past temperatures >28 °C. This calibration should improve inferences of past tropical temperatures, particularly during warm climate epochs (i.e. Early Pliocene and Cretaceous).