# Oxygen Isotope Based Paleoaltimetry: Modern Data–Model Comparison and paleo–elevation history of Tibet

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The 1-D equilibrium thermodynamic model of Rowley et al [1] that predicts the relationship of $\Delta(\delta 18O_p)$, the difference between potentially high and near sea level isotopic compositions of precipitation, versus elevation is compared with low-latititude data sets collected by Gonfiantini et al. [2] from Mount Cameroon and the Bolivian Andes. The slope of a regression of station elevation versus predicted elevation for the data from Mount Cameroon based on 25 stations ranging from 10m to 4050m using local atmospheric conditions, which are warmer than the global low latitude mean temperature is 0.9992 with an $R^2$ of 0.9556. The mean deviation of station versus predicted elevation is 150m, this increases to 450m if the global mean curve of $\Delta(\delta 18O_p)$ and elevation, reflecting the strong influence of temperature on the predicted isotopic lapse rate. Comparison of the isotopic composition of precipitation with elevation from the Bolivian Andes, from Trinidad (200m) to El Alto (4080 m) [2] show a close correlation of station versus predicted elevations for most elevations. These comparisons suggest that simple 1-D model captures the first order controls on the relationship of isotopic composition and elevation, at least in low-latititude systems. Comparisons of measured isotopic compositions of rivers and streams support interpretations that surface waters reflect the precipitation weighted hypsometric mean elevation of the drainage basin above the sample site. This suggests that unevaporated lacustrine carbonates and potentially also fresh water bivalve compositions can be used to estimate paleo-precipitation weighted hypsometric mean elevations. Probability density functions (PDF) based on GCM-based paleoclimate reconstructions can be used to constructed paleo-global mean $\Delta(\delta 18O_p)$ versus elevation relations against which to compare data from the geologic record. Paleoaltimetry data from Tibet suggest a highly elevated plateau, at least in southern and central Tibet since at least 35±5 Ma [3]

**References**

[1] Rowley, D.B. et al., 2001 *EPSL* 188, p. 253-268.

[2] Gonfiantini et al., 2001 Chem. Geol., 181, 147-167.

[3] Rowley, D.B. & Currie, B.S., 2006, Nature, 439, 677-681