

Reconstructing past atmospheric CO₂ levels with pedogenic carbonates from the Chinese loess deposits

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The pedogenic carbonate pCO₂ paleobarometer has been widely used to reconstructed paleoatmospheric CO₂ concentrations [1]. Recent works (e.g., [2]) have improved this method by confining the most uncertain parameter – soil respired CO₂ concentration to a limited range, thus yielding more accurate pCO₂ estimates. In northern China, Quaternary loess-paleosol sequences, and the underlying Red clay sequences are well known for their great thickness, high resolution and richness of paleoenvironmental information. Paleosol layers containing carbonate nodules are commonly seen at most of the sections, which is ideal for us to study past CO₂ concentrations recorded in these pedogenic carbonates. We have reconstructed two early-Pleistocene pCO₂ curves with samples from two southern sections [3]. The successive decrease of our pCO₂ records are comparable to pCO₂ records derived from other proxies, which is broadly consistent with the increase in deep-sea δ¹⁸O and the overall decline of sea surface temperature at this time, but in contrast with the increasing peak interglacial pCO₂ recorded in ice cores for the last 0.8 million years. In order to increase the accuracy of our results, further research will focus on developing a proxy for soil respired CO₂ concentration. Field monitoring of seasonal climatic dynamics combined with laboratory methods, should be applied to determine the most appropriate time of the year during which pedogenic carbonate forms.

[1]Cerling, T.E., 1992: *Global Biogeochemical Cycles* **6**(3), 307–314. [2]Montañez, I.P., 2013: *Geochim. Cosmochim. Acta* **101**, 57–75. [3] Da J.W. et al., 2015: *Earth & Planetary Science Letters* **426**:69-75.