Soil leaf-wax n-alkane δD along altitudinal and latitudinal transects: Implications for paleoelevation and paleohydrology reconstructions

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δD values of leaf wax-derived *n*-alkane (δD_{wax}) preserved in soils or sediments could reflect spatial and temporal variations of precipitation δD (δD_p), which develops a way to paleohydrology reconstruction and a proxy for paleoaltimetry.

We find that soil δD_{wax} values track altitudinal variations of δD_p along four altitudinal transects in China that span variable environment conditions and vertical vegetation spectra [1]. An empirical δD_{wax}-altitude relationship, that is the average δD_{wax} lapse rate of -2.27±0.38‰/100m, would be used to estimate paleoelevation change. Additionally, a reversal of altitude effect in the vertical variation of δD_{wax} exists in the alpine zone of the Tianshan Mountains, which might be caused by atmospheric circulation change with altitude. This implies that the paleo-circulation pattern and its changes should be evaluated firstly when stable isotope-based paleoaltimetry is applied.

The apparent fractionation between leaf wax and precipitation (ε_{wax-p}) in the extreme humid Wuyi Mountains is quite negative (-154‰), compared to the humid Shennongjia (-129‰) and the arid (but with abundant summer precipitation) Tianshan Mountains (-130‰), which suggests aridity or water availability in the growing season is the primary factor controlling soil/sediment ε_{wax-p}. Moreover, this climatic dependency of soil ε_{wax-p} also is present along the N-S latitudinal soil transect. From the wet southeast to the arid northwest of China, values of ε_{wax-p} become more positive increasingly. This variation of soil ε_{wax-p} might be independent on temperature or elevation change, and could not be interpreted by the vegetation shift. Therefore, we suggest climate-specific ε_{wax-p} for δD_p reconstruction: -150‰ for extremely humid climate, -130‰ for moderately wet climate (or no water stress in growing season) and -100‰ for typical arid climate. Also, paleoelevation would be estimated using empirical (observation) or theoretical (Rayleigh model) δD_p-altitude relationship.

[1] Luo *et al.* (2011) *EPSL* **301**, 285–296.

Insight and analysis on the interior surface characteristic of a single fracture in granite sample

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New Measuring Method for Fracture

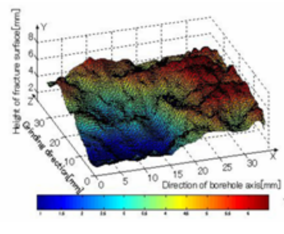
Fluid flow in a single fracture is an important research subject in CO_2 sequestration, hydrogeology, engineering geology and petroleum engineering [1, 2]. Recent years, some authors study mechanism on flow and transport in laboratory [1-5] and situ [6-8]. However, the main question that has still not been answered satisfactorily is: How to correlate fluid flow with fracture geometry and roughness. Therefore, we study a new method to measure and characterize the surface of fractures.

Results and Discussion

As shown in the research, fracture state *in situ* measurement applied in the experimental method is feasible.The fracture was visualized based on coordinate values of fracture Surface by the cross-sectional photographs of samples without separating the fracture surfaces (Fig.1). And New methods can show the view of fracture surface (Fig.2).

Fracture aperture is large around the borehole wall where fracture is thought to occur, and the farther away from the borehole wall, the narrower the fraction opening is.

There are more high opening angles (> 10 degree) around the borehole wall, and more low opening angles far away from the borehole wall. The fractal dimension of profiles of fracture surface is between 1.17 and 1.68.



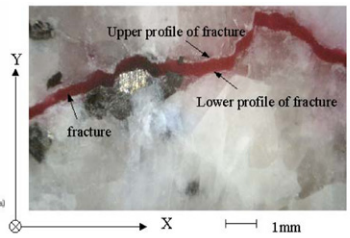


Fig. 1: Image of a single fracture.

Fig. 2: Lower surface of fracture

[1] Luo *et al.*(2009) *Geochim.Cosmochim. Acta* **73**: A802. [2] Qian *et al.* (2011) *J. Hydrol.* **399**: 246-254. [3] Qian *et al.* (2005) *J. Hydrol.* **311**: 134-142. [4] Qian *et al.*(2007) *J. Hydrol.* **339**: 206-219. [5] Qian *et al.* (2011) *Hydrol. Process.* **25**: 614-622. [6] Zhou *et al.* (2004) *Int. J. Rock Mech. Min. Sci.* **41**:402. [7] Qian *et al.* (2006) *Hydrogeol. J.* **14**: 1192-1205. [8] Qian *et al.* (2009) *Hydrogeol. J.* **17**: 1749-1760.