$\delta^{13}C_{carb}$ and $\delta^{13}C_{org}$ excursions in the post-glacial Sinian to Early Cambrian interval in Guizhou, South China

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The investigated area is located on the southeast border of the Yangtze platform. Five lithostratic units are recognized in ascending order: the Nantuo (NT), Doushantuo (DST), Dengying (DY), Gezhongwu (GZW) and Niutitang (NTT) formations. The DST Fm overlies conformably on the NT Fm characterized by glacigenous diamictite. In the basal part of the DST Fm is a ~4 m thick dolostone bed (so called cap carbonate). Upon this bed is the main part of the DST Formation dominated by phosphorite intercalated with dolostone and dolomitic pelite. The overlying DY Fm is composed of pure dolostone, followed by another set of phosphorite deposits called the GZW Fm. The GZW Fm is rich in small shelly fossils of Cambrian age, and covered by the NT Fm, a set of black shales with copious sponge fossils.

The values of $\delta^{13}C_{carb}$ show a wide range from -6.20‰ to 4.00‰, roughly consistent with that illustrated by Jacobsen & Kaufman (1999) for the same interval. The $\delta^{13}C_{carb}$ curve starts with a moderate positive shift after the glacigenous diamictite and then goes into a negative shift, which persists up to the boundary between the DST Fm and the DY Fm. The second positive shift of $\delta^{13}C_{carb}$ occurs within the DY Fm, followed by another negative shift in the GZW and NTT formations. The values of $\delta^{13}C_{org}$ vary from -21.99‰ to -33.58‰, leading to a maximum oscillatory amplitude of 11.59‰. Being similar to the $\delta^{13}C_{carb}$ curve in shape, the $\delta^{13}C_{org}$ curve also demonstrates two positive shifts in the NT Fm and the DY Fm, and two negative shifts in the DST Fm and the interval from the GZW Fm to the NTT Fm.

Some studies have provided paired analyses of $\delta^{13}C_{carb}$ and $\delta^{13}C_{org}$. Hollander & Mckenzie (1991) show that the temporal carbon-isotopic curves of calcite and particulate organic carbon in a modern eutrophic lake correlate with each other to some extent, and the carbon-isotopic difference ($\Delta B = \delta^{13}C_{poc-calcite}$) indicating the effect of photosynthetic isotopic fractionation increases in response to increasing concentration of dissolved carbon dioxide ($CO_{2(aq)}$). However, the timing of the peaks or valleys of $\delta^{13}C_{carb}$ and $\delta^{13}C_{org}$ curves may not always coincide due to other factors besides photosynthesis, which complicates the use of ΔB for evaluating the relative variations of $CO_{2(aq)}$ with geologic time (Kump *et al*., 1999). In our study, the coincidence of $\delta^{13}C_{carb}$ and $\delta^{13}C_{org}$ profiles suggests a dominating effect of photosynthesis on carbon-isotopic discrimination. Thus ΔB may be useful to understanding the relative changes of $CO_{2(aq)}$ that may have occurred in the investigated area during the post-glacial Sinian and the Early Cambrian. This work was supported by NSFC (Grant Nos. 40472014 and 40572017).

Cosmogenic $^{21}Ne/^{3}He$ in olivines and pyroxenes from a Pleistocene basalt flow, western Grand Canyon National Park, Arizona, USA

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The Bar Ten lava flow is a Pleistocene basalt flow located in the western margin of the Uinkaret Volcanic Field in Grand Canyon National Park (AZ, USA). It was chosen as a calibration site for the production of cosmogenic ^{3}He and ^{21}Ne ($^{3}He_c$ and $^{21}Ne_c$) because it has more than 600 m of relief and has negligible erosion due to a regional desert climate. Together with other calibration sites of CRONUS-EU, it was selected to evaluate how production rates are affected by changes in altitude and latitude. The lava flow erupted between 60 and 150 ka based on two $^{40}Ar/^{39}Ar$ and one thermoluminescence ages. Low K content, excess Ar, and abundant glass in this basalt flow have made it difficult to obtain more accurate ages. Cosmogenic samples were collected from stable primary surfaces at elevations of 1180 to 1820 m along a vertical transect between 36.2239 and 36.2417° N. He, Ne, and Ar were analyzed by step-heating of olivine and pyroxene separates and $^{3}He_c$ and $^{21}Ne_c$ components have been determined. We evaluated $^{21}Ne_c/^{3}He_c$ values, assuming that eruption age and erosion should have no effect on the ratio, if $^{3}He_c$ and $^{21}Ne_c$ are produced at constant rates relative to each other. $^{21}Ne_c/^{3}He_c$ varies from 0.19-0.20 for pyroxenes and from 0.35-0.39 for olivines. The difference between mineral phases may be due to differences in mineral composition affecting production of $^{21}Ne_c$; production of $^{3}He_c$ is less sensitive to variations in mineral composition. Olivines in our study contain 26-27 wt.% Mg, whereas pyroxenes contain 9-11 wt.% Mg. Lower Mg content decreases the production of $^{21}Ne_c$ and thus lowers the $^{21}Ne_c/^{3}He_c$ value for pyroxenes compared to that of olivines. Production rates based on elemental composition or on published calibrated values were scaled to our specific field site using several scaling methods. These production rates yield cosmogenic ages that are bracketed by the $^{40}Ar/^{39}Ar$ and thermoluminscence ages, but the independent dating techniques are thus far not accurate enough to specify which production rate and which scaling method is best suited for this calibration site.