Ages of carbonatite and syenite from the Mianning-Dechang REE belt in the eastern Indo-Asian collision zone, SW China and their geological significance

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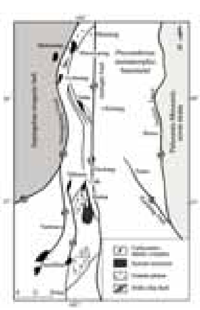
Himalayan magmatic activity in southwestern China forms a semi-continuous potassic igneous province in the eastern Indo-Asian collision zone, a high topographic relief area bounded by a series of Cenozoic strike-slip faults. The western Sichuan carbonatites (WSC) are associated with contemporaneous syenites, and form a 270-km long belt of Cenozoic carbonatite-alkalic complexes in the EIACZ. Unlike most known carbonatite plutons within plates, generated by anorogenic processes (e.g. rifting), the WSC occur in a continental collision zone, formed by the Indo-Asian continental collision since the Paleocene period.

From north section to south section (see Fig. 1), the analytical results are as follows: at Maoniuping, K-Ar dating on the bulk-rock and igneous minerals yields an age of 31.7±0.7 Ma for carbonatite, and an age of 40.8±0.7 Ma for syenites. At Muluozhai, the K-feldspar separates from the syenite yielded a $^{40}Ar/^{39}Ar$ plateau age of 31.2 ± 0.56 Ma. At Lizhuang, the K-feldspar separates from the syenite yielded a $^{40}Ar/^{39}Ar$ plateau age of 27.1 Ma. At Dalucao, SHRIMP dating on the zircons of the carbonatite and syenite yields an age of 12.99 ± 0.94 Ma and 14.53 ± 0.31 Ma, respectively.



In summary, formation ages decrease systematically from north to south, and their age sequence can be plausibly explained by assuming that a region of melting in the south plate moved north along the Yalongjiang fault relative to the left plate.

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Ca isotope ratios in the largest rivers in the world: Implications for the global Ca budget and weathering processes

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The oceanic Ca budget is balanced between the inputs of Ca (mainly riverine) and the outputs of Ca (biogenic carbonate). Initial measurements of Ca isotope ratios in several large rivers and marine carbonates (e.g. [1]) led these workers to conclude that the modern oceanic Ca isotope budget was in steady state. However, marine records of Ca isotope ratios show small but significant variations, implying that the oceanic Ca budget must deviate from steady state over long time-scales, due to effects related either to the inputs or outputs of Ca from the oceans. Recent measurements of Ca isotope ratios in Himalayan rivers and soil profiles (e.g. [3, 4]) have revealed that Ca isotope ratios are fractionated during the weathering process. In particular solute Ca from small rivers draining limestone were shown to have a different $^{44}Ca/^{42}Ca$ ratio (expressed as $\delta^{44/42}Ca$) than the Ca in the limestone they were draining. Given that at a global scale, 67% of riverine Ca is derived from carbonate weathering, this small offset could have significant implications for the $\delta^{44/42}Ca$ of large rivers and the oceanic Ca balance.

To resolve whether this discrepancy in Ca isotope ratios between limestone and river water was significant at a global scale, we have measured $\delta^{44/42}Ca$ in 22 of the largest rivers in the world. These include samples from different water stages, and a time-series for the Salween and Irrawaddy Rivers. $\delta^{44/42}Ca$ in the largest rivers in the world is remarkably homogeneous, with a flux weighted mean $\delta^{44/42}Ca$ of 0.39‰ relative to SRM915a. The implications of the homogeneity of the data, given the apparent fractionations observed in weathering systems at small spatial scales will be discussed. The implications for the global Ca cycle will also be considered.

[1] Schmitt *et al.* (2003) *EPSL* **213**, 503–518. [2] Ewing *et al.* (2008) *GCA* **72**, 1096-1110. [3] Tipper *et al.* (2008) *GCA* **72**, 1057-1075.