Carbon and Sr fluxes of river waters from a karstic and a granitic terrain in the Yangtze River system

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Two typical subtropical watersheds were chose in the Yangtze River, which have similar latitudes and climate, but distinct differences in basin lithologies. These features provide a good natural laboratory in which to investigate weathering processes, carbon and Sr fluxes in river waters. Total erosion rates, dissolved inorganic carbon flux and CO_2 uptake were 28.0 t km^{-2} yr^{-1}, 2.9×10^5 mol km^{-2} yr^{-1} and 2.3×10^5 mol km^{-2} yr^{-1} for the granitic terrain and 70.2 t km^{-2} yr^{-1}, 11.9×10^5 mol km^{-2} yr^{-1} and 6.4×10^5 mol km^{-2} yr^{-1} for the karstic terrain, respectively. These results indicated the karstic area plays an important role in uptake of CO_2 and DIC flux along the Yangzte River Basin. Our results revealed that the chemical erosion rate and Sr flux in the karstic terrain are twice and six times that of the granitic terrain. This indicates that the intensive carbonate weathering in the karstic area can provide much more Sr flux than that of silicate weathering in the granitic area. Our results support the conclusion the process of a non-steady state of rock cycling (e.g., the uneven distribution of dolomite through geological time) has an important meaning in elemental cycle and the global climate change (buffer effect).

Zircon U-Pb age and Hf isotope constraints on the petrogenesis of the Alpine Periadriatic intrusions

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The origin of the Tertiary Periadriatic magmatism, developed along the Alpine Chain and its relationship with tectonic evolution of the Alpine Orogeny is still controversial. Integrated zircon U-Pb age and isotope study is an effective method to decipher petrogenesis of granite and crustal evolution in orogenic belt. Here we carried out zircon LA-ICPMS U-Pb and Hf isotope analyses on granitoid rocks from the major Periadriatic intrusions of the Western and Central Alps, including the plutons of Biella, Miagliano, Novate, Bergell and the Adamello batholith.

The dated granitoid rocks of different lithologies from the Biella pluton, yield identical ages of 30.5–30.1 Ma and similar $\varepsilon_{Hf}(t)$ values of -5.9–-1.8. The Miagliano tonalite gives an age of 32.6 ± 0.5 Ma and $\varepsilon_{Hf}(t)$ value range from -5.2 to -1.3. The Novate pluton yields ages in the range of 26.5– 23.5 Ma with $\varepsilon_{Hf}(t)$ values vary from -8.5 to -2.5. The tonalites and the granodiorites from the Bergell plutons are dated at 32.1–30.3 Ma and 31.3–30.3 Ma, respectively. Their zircon $\varepsilon_{Hf}(t)$ values vary from -5.0±0.5 to -3.2±0.3. In the Adamello batholith, the trondhjemites from Corno Alto pluton (43.2–43.0 Ma) and the tonalites from southern Re di Castello Unit (43.3–42.9 Ma) are coeval. Both units exhibit relatively high $\varepsilon_{Hf}(t)$ values (5.0±0.6 – 7.7±0.3). Whereas the tonalite from Presanella pluton of north Adamello yield a young age (33.9±0.4 Ma) and low $\varepsilon_{Hf}(t)$ values (-7.5±0.4).

The new data, combined with literature data, support two main stages of magma generation in the Alpine Orogen are at 43–40 Ma and 33–30 Ma. These two stages are associated with two contributions of juvenile materials during partial melting of magma source. We tentatively propose that the oldest rocks of the Periadriatic magmatism (Adamello batholith) may be related to removal of a thickened mountain root resulting from previous subduction. Partial melting at this stage was generated by the upwelling of asthenosphere, while subsequent northward magmatism of the Adamallo batholith was ascribed to slab rollback. Then the ignition of the younger magmatism (33–30 Ma) along the Periadriatic Lineament is induced by slab breakoff.

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