Tectonic implication of detrital muscovite from Carboniferous sedimentary rocks in the Northern Dabie Mountains, China: Evidence from single grain Rb-Sr dating

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The Dabie ultrahigh-pressure orogenic belt represents the eastern part of the Qinling-Dabie orogenic belt in China, which was formed by collision of the North and South China Blocks during Early Mesozoic. Time of this collision has been constrained at ca. 230-220 Ma by numerous radiometric studies [1-2]. The Dabie belt is geologically made up of four tectonically juxtaposed zones, from south to north, the Susong HP zone, South Dabie UHP zone, North Dabie gneiss zone, and Beihuaiyang low-grade zone. UHP metamorphic mineral inclusions are found in garnet and zircon, indicating subduction of continental crust during the collision.

Low-grade metamorphic Paleozoic sedimentary rocks are exposed along northen margin of the Qiling-Dabie orogenic belt. Provenace and tectonic setting of these low-grade rocks are detated. Late Proterozoic and late Archean detrital zircon were found in the sedimentary rocks that indicate mixing sources of South and North China affinities [3]. This study presents results of detrital biotite and muscovite minerals of Carboniferous sedimentary rocks exposed in the northern margin of the Dabie Mountains. About 15% of detrital muscovite grains are phengitic in composition indicated in high Si/Al ratios of >3.3. Single grain Rb-Sr isotopic analyses show that either phengite or muscovite give about 400 Ma isochron age, while detrital biotite grains are scattered in two groups of Rb-Sr isotopic composition, likely suggesting different sedimentary sources of old crustal and juvenile material probably of magmatic rocks related to Paleozoic convegence along southern margin of the North China block. Whole-rock Nd isotopic composition of the sedimentary rocks also demonstrates a mixture of sedimentary sources of different ages, similar to the conclusions proposed previously [3]. Paleozoic detrital phengite can be originated from the North Qinling terrain where Paleozoic subduction and sebsequent collision have been proposed [4].

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Zn isotope measurements in freshwater and its use as a probe of anthropogenic contamination in the Seine River

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The recent development of MC-ICP-MS allows a precise and accurate determination of Zn isotopic compositions (1,2), and a total variation of about 2‰ for δ^{66}Zn has been determined among terrestrial materials. Despite its potential pollution impact on aquatic environments, only few studies exist on Zn isotopic ratios in natural waters and none for rivers. In this context, it is worth studying its behaviour and isotopic composition in the Seine river basin, a basin with significant anthropogenic input (250 persons/km^2). The human impact has been demonstrated by the continuous increase in Zn concentration from headwater to estuary both in the dissolved phase (17 times) and in the particulate phase (4 times).

We have developed a new two-column protocol for the direct ion-exchange separation of Zn from freshwater samples with very small dissolved Zn concentrations. This avoids the evaporation of large quantities of sample (>200 ml). The protocol is proven to be reproducible by tests on standard-doped distilled water and column-purified Seine river water, with an average yield of 100% and no isotopic fractionation (mean δ^{66}Zn for all purification tests is 0,005‰).

For Zn isotope measurements, the instrumental mass discriminations are corrected statically for each measurement session using a method of internal reference element doped sample-standard bracketing (Zn for Cu; Cu for Zn isotopic measurement) (3). Repeated measurements of Zn and Cu AAS standards during 15 months yielded a precision of 0,04‰ (2σ) for Zn and Cu. Preliminary results show a total variation of 0,58‰ for δ^{66}Zn in water samples of the Seine river basin, and a light isotope enrichment in anthropogenic sources. Isotopic characterizations of Zn in various phases (dissolved, suspended, colloidal) provide clues about both the source of metal pollution and the geochemical and biochemical processes in river water system.

References

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