Growth and reworking of the late Archean continental crust in the North China craton

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Numerous U–Pb zircon geochronological data show that rocks of the Precambrian basement from the North China craton have two age peaks at 1.8–1.9 and ~2.5 Ga, respectively. Whether the most prominent peak at ~2.5 Ga really registered a period of major crustal growth in the North China craton is still uncertain. Here, we carried out *in situ* U–Pb and Hf isotopes of zircons and whole–rock chemical and Sr–Nd isotopic analyses for six Precambrian samples from the North China craton in order to understand crustal growth and reworking. The samples have U–Pb zircon ages of 1.8–1.9, ~2.5 and ~2.7 Ga, respectively. The two samples with U–Pb zircon ages of ~2.7 Ga have zircon Hf model ages (T^{Hf}_{DM}) and/or whole rock Nd model ages (T^{Nd}_{DM}) close to their U–Pb zircon ages. They are considered to represent juvenile crust generation, thus providing direct evidence that ~2.7 Ga is a period of crustal growth. The samples with U–Pb zircon ages of ~1.8 and ~2.5 Ga have T^{Hf}_{DM} and/or T^{Nd}_{DM} similar to those of the ~2.7 Ga samples, indicating that these samples also have a mantle extraction time of 2.7 ± 0.1 Ga. Specifically, the ~2.5-Ga tonalitic gneiss sample was considered to be derived by melting of the 2.7 ± 0.1-Ga lower crust. Since ~2.5-Ga tonalite–trondhjemite–granodiorites (TTGs) and calc-alkaline granitoids constitute about 80% of the exposure of the NCC and ~2.7-Ga xenocrystic and inherited zircons have been found in some of the TTGs and granitoids, we postulate that they are probably also derived mainly from the 2.7 ± 0.1-Ga crust. It is implied that 2.7 ± 0.1 Ga is a major crustal growth period in the North China craton, whereas the two most prominent age peaks at 1.8–1.9 and ~2.5 Ga may represent periods of reworking of the 2.7 ± 0.1-Ga crust, rather than juvenile crust generation.

Soil water movement in a unsaturted soil in the Xining Basin traced by isotopic and chemial methods

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The study area is located southwest of Xining Basin, China which is characterized by a semi-arid, temperate mountain climate. Average annual precipitation varies from 520.1mm to 528.2mm. It has an elevation of 2308m above sea level. The objectives were to (1) estimate the residual flux and age of soil water in the unsaturated soil. (2) Compare the effects of different soil hydraulic properties on soil water movement. (3) Evaluate the importance of evaporation in arid and semi-arid areas and determine the source of groundwater. Chemical and isotopic tracers proved to be effective in the hydrology research in dry regions where traditional hydrological means is difficult.

Using the chloride mass balance method [1,2], the residual flux and the age of soil water in the study area are estimated as 1.92mm/a and 389a, respectively. The soil water content goes in a nearly opposite trend to the concentration of chloride. Chloride concentration increase downwards and reaches the highest at about 330cm under the soil surface. Chloride concentration decreases dramaticaly from the depth of 330cm to 400cm but become stable below 400cm. This result implies that soil water moves at different rate in different parts of the profile because of different soil texture. $\delta^{18}O$ increases linearly downwards because of evaporation, and its maximum is at about 30cm under the soil surface. So the evaporation front is at about 30cm under the soil surface [3], $\delta^{18}O$ becomes nearly constant below 30cm because the seasonal effect is gradually weakened, which is equal to that of the local weighted annual precipitation. As a result, this study shows that soil water is recharged by the local precipitation.

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