Lithospheric architecture of the Qinling orogen in Mesozoic: evidence from Nd isotopic composition of the Mesozoic granitoids

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The NWW-trending Qinling orogen, finally formed by the Early Mesozoic collision between the North China Block (NCB) and South China Block (SCB), is one of the most important orogens in Asia. It consists of four tectnoic units (or terranes), the southern margin of the NCB, North Qinling Belt (NQB), South Qinling Belt (SQB) and northern margin of the SCB from north to south. The orogenic architecture is an interesting and controversial issues. In this study we present newly whole-rock Sm-Nd isotopic data for the Early Mesozoic granitoids in this orogen, combined with data from literature, to display its Mesozoic crust architecture. Nd isotopic mapping of the granitoids identifies 5 Nd isotopic provinces. These provinces suggest an old crust architecture and a variation deep crust composition (basement). Different terranes show different compositions and the NQB exhibits younger deep compositions than other terranes, evidencing that it is an independent terrane. Significantly, our isotopic mapping reveals that the deep composition become more juvenile from west to east parallelling to the orogenic belt and displays an important NNE-SSW zoning architecture in deep crust, vertical to the NWW-trending tectonic in surface. This provides new deep composition evidence for the "Spaghetti Junction" model by geophysical exploration in the Qinling orogen. All the whole-rock Nd model ages (2.22–0.94 Ga) demonstrate that the major continental growth in the Qinling orogen took place during Paleoproterozoic to Mesoproterozoic and there is only a little juvenile accretion or continental growth occurred along both the Shangdan and Mianlue sutures during Phanerozoic. Thus, the Qinling orogen shows more collisional, but few of accretionary features, different from typical accretionary orogens such the Central Asian Orogenic Belt. Isotopic mapping is effective to delinear architecture of an orogen and to identify orogen type.