

The emplacement age of the Songshugou ultramafic massif: LA-ICP-MS U-Pb zircon dating

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The Songshugou massif is the largest Alpine-type ultramafic body in China, covering an area of ~50 km², which consists mainly of dunite (~80%) with minor harzburgite, dunite-pyroxenite, pyroxenite etc. It is located to the north of the Shang-Dan fault, intruding into the Proterozoic Qinling Group in the eastern Qinling Mountains, central China. There is a garnet amphibolite "coating" of ~2-10 meters thick, surrounding the ultramafic massif formed during thermal contact metamorphism [1].

The emplacement age of the Songshugou ultramafic massif is very important for understanding the evolution of the Qinling orogenic belt [2]. Published results however, range from 500 Ma to 1000 Ma [3-5], which led to different models for the early history of the Qinling orogenic belt and the interaction between the North and South China blocks, e.g., the effects of Jinning movement on the Qinling orogenic belt.

Here we show LA-ICP-MS U-Pb dating results for zircon from the garnet amphibolite, which yield a concordant age of 506 ± 7 Ma. The studied zircon grains are small in size (30 μ m~100 μ m), anhedral, with typical metamorphic characteristics of low Th/U values (< 0.1). The U, Th contents range from 260 ppm to less than 10 ppm. Cathodoluminescence images show two "generations" of zircon, with lighter cores and darker rims. The ages of the cores and the rims are identical to each other. Petrological observations suggest that the studied zircon grains were most likely formed during the amphibolite metamorphism induced by the emplacement of the ultramafic massif. Therefore the Songshugou ultramafic massif emplaced at ~500 Ma, instead of ~1000 Ma. This provides an important constraint on the paleozoic evolution of the Qinling orogenic belt.

References

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