

## **Convergence of the Jiamusi Massif and Songnen-Zhangguangcai Range Massif in NE China by divergent double subduction**

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The tectonic evolution of the Mudanjiang Ocean between the Jiamusi Massif (JM) and Songnen-Zhangguangcai Range Massif (SZRM), including its subduction direction and closure time, is still in debate. To solve this problem, we undertook zircon U-Pb ages, whole-rock major and trace element data, and zircon Hf isotopic data for the Permian granitoids and gabbro-metagabbros in both sides along the suture zone, as well as detrital zircon U-Pb ages for the metasedimentary rocks from the Heilongjiang Complex. The granitoids (278~263 Ma) are derived from parital melting of Paleo-Mesoproterozoic crustal components, while gabbro ( $259 \pm 3$  Ma)-metagabbros ( $256 \pm 2$  Ma) are sourced from enriched lithospheric mantle that was metasomatized by slab-derived fluids, indicating their arc affinities. Age distribution of the detrital zircons from metasedimentary rocks indicates that they were sourced both from the JM and SZRM. Combined with field observation and the metamorphic age of these metasedimentary rocks, we conclude that their protolith were deposited between 230~180Ma in the forearc basin.

These igneous rocks and detrital zircon data, combined with previous studies, all suggest a double-side subduction history for the Permian-Early Jurassic geodynamic processes along the JM and SZRM, and continued convergence of these two massifs led to final closure of the Mudanjiang Ocean at ca. 180~160 Ma.

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