The relationship between gabbros and I-type granites in the southeast coast of Fujian, South China: Evidence from *in situ* zircon U-Pb dating, Hf isotopes and whole-rock geochemistry

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Two representative gabbro–granite complexes from Quanzhou (QZ) and Huacuo (HC) in the southeast coast of Fujian, South China have been selected for a detailed geochronological and geochemical study, aiming to probe the genetic relations between the acid and basic magmas.

These complexes are composed predominantly of I-type granitoids, with lesser amounts of hornblende gabbro (<5% of the total igneous rocks). Zircon U-Pb dating yields consistent crystallisation ages of 109 ± 1 and 108 ± 1 Ma for the QZ gabbros and granites, and an age of 111 ± 1 Ma for the HC gabbros, which is contemporaneous with the spatially coexisted HC granites. Both the gabbros and granitoids are enriched in light rare earth elements and large ion lithophile elements (e.g. Rb, Ba, Th and U), and depleted in high field strength elements (e.g. Nb and Ta). Moreover, they show similarly homogeneous Sr–Nd isotopic compositions. All these factors indicate that they are genetically related.

Although the Sr–Nd isotopic signatures of the QZ and HC gabbros seemingly point to an enriched mantle source (EM-1), they have highly variable zircon Hf isotopic compositions, with ε_{Hf} (*t*) values ranging from negative to positive (specifically –4.6 to +6.1 for the QZ gabbros and –4.8 to +11.6 for the HC gabbros). On the other hand, their associated granitoids show relatively high whole-rock $\varepsilon_{Nd}(t)$ values (–2.5 and –4.1 for the QZ and HC granites, respectively), and homogeneous and neutral zircon $\varepsilon_{Hf}(t)$ values (–1.9 to +1.8 for the QZ granite). Based on an integration of petrography, geochronology and geochemistry, we interpret the parental basic magmas of these gabbros have originated from a depleted mantle source, but experienced a significant crustal contamination by the felsic melts that gave rise to the associated granitoids. Contributions from such a depleted mantle source resulted in the growth of juvenile basaltic lower crust, the partial melting of which generated the parental felsic magmas of the QZ and HC complexes.

A new recognition of Grenvillian volcanic suite in the South China Block and its connection with Rodinia assembly

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Contrasting proposals have been suggested for the position of the South China Block (SCB) in the Rodinia reconstruction, which is partly due to a poor understanding of the SCB history during the late Mesoproterozoic to early Neoproterozoic. Here we report a newly recognized Grenvillian arc-volcanic sequence in the Shennongjia area, western SCB. It comprises alkali-, calc-alkaline basalts and tholeiitic andesitic rocks, and is dated at 1152±24 Ma. The alkali basalts have high TiO2, low Mg# (42-55) and positive εNd, and display OIB-like elemental patterns. By contrast, the calc-alkaline basalts have higher Mg# (57-68), Cr and Ni contents and large negative εNd, and exhibit pronounced depletion in HFSE. The andesites show Eu deficiency, HFSE depletion and small negative εNd.

The alkali-, calc-alkaline basalts are suggested to have been derived from depleted asthenospheric- and metasomatised lithospheric mantle sources, respectively, whereas the andesites from mafic lower crustal anatexis; the volcanic sequence was developed within an island-arc setting. Integrating with previously documented works, the western Yangtze craton is suggested to have comprised a collage of microcontinents during the Grenvillian period and underwent a westward lateral continental growth by subduction accretion and subduction-related collision. Increasing lines of evidence infer a western Yangtze-South Australia connection during Rodinia assembly, which provides a new insight into the SCB position in the supercontinent.

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