

## **Geochemical constraints on subduction style in the Neoarchean: magmatic records from the northern Yangtze Craton, China**

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The Neoarchean is an important era during which plate tectonics began to operate widely on Earth. The style of plate subduction in the Neoarchean should be different from modern Earth because of the higher mantle temperature in the Archean. However, reliable record of plate subduction is scarce in the Archean, making it difficult to study the subduction style at that time. Here we report geochemical studies of felsic to mafic rocks from the Yangtze Craton, which record subduction at ca. 2.65-2.70 Ga with distinctive magmatic and geodynamic features from modern subduction system. The metaigneous rocks of felsic composition, trondhjemite gneisses (TTG), from the northern margin show high sodic contents, positive Eu anomalies, high (La/Yb)<sub>cn</sub> and Sr/Y ratios, low Yb and Y contents. The metaigneous rocks of mafic-intermediate composition from the northern margin are mainly calc-alkaline and show less fractionated REE patterns. They have similar zircon U-Pb ages of 2651±30 Ma to 2703±9 Ma, similar chondritic zircon  $\epsilon_{\text{Hf}}(t)$  values and whole-rock  $\epsilon_{\text{Nd}}(t)$  values of -1.6 to 3.4. Their zircon  $\delta^{18}\text{O}$  values are mostly 4.6-6.6‰, similar to or slightly higher than normal mantle values. Additionally, they all record a metamorphic event at ca. 2.47-2.50 Ga. The potassic granites from the craton interior are A-type and show similar zircon U-Pb ages and  $\epsilon_{\text{Hf}}(t)$  values to the felsic to mafic metaigneous rocks but obviously lower  $\delta^{18}\text{O}$  values from 3.6‰ to 5.4‰. The two types of rocks exhibit quartz  $\delta^{18}\text{O}$  values of 12.0-15.2‰ and 3.5-8.2‰, respectively. The trondhjemite gneisses and calc-alkaline metaigneous rocks were derived from partial melting of the subducted crust and the metasomatized mantle wedge, respectively. The A-type granites are the product of high-T magmatism in response to extensional tectonism. This demonstrates the development of subduction system in the northern Yangtze Craton during 2.65-2.70 Ga. The contemporaneous development of both slab-derived and mantle wedge-derived magmatism is a feature of the Neoarchean subduction that distinguishes it from the modern subduction. The lack of magmatism at 2.50-2.65 Ga but the reburst of TTG and metamorphism at 2.47-2.50 Ga imply that the Neoarchean subduction is intermittent.