Role of deep-Earth water cycling in Cretaceous magmatism in southeast China

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Late Mesozoic magmatism in southeast China formed a >200,000 km^2 large igneous province dominantly comprised of felsic rocks with a subordinate mafic component [1]. These rocks provide an excellent opportunity to test the possible linkage between deep-Earth water cycling [2] and Phanerozoic continental crustal growth. Here we present petrological, whole-rock chemical and isotopic, and *in situ* zircon U–Pb–Hf–O isotopic data for Cretaceous plutonic rocks in Fujian Province in southeast China. The results demonstrate close spatio-temporal relationships and similar trace elemental and isotopic signatures between the Cretaceous felsic and mafic magmatic rocks, establishing that the juvenile Nd–Hf isotope compositions of the granitoids cannot be directly ascribed to massive mantle input. Hence, water-fluxed melting most likely contributed significantly to the complex geochemical features of these granitoids. We further evaluate the different petrological and geochemical features of the Early and Late Cretaceous granitoids, and present a case that water-fluxed melting drove large-scale granitic magmatism, whereby the switch in magma H_2O contents coincided with a change in Hf–Nd–O isotopic characteristics. Deep-Earth water cycling can therefore not only control the supply of H_2O for water-fluxed crustal melting, but also contribute to underplating of hydrous basaltic magmas at the base of the crust, where they can later become mobilised and incorporated into subsequent intra-continental crustal differentiation.

[1] Li *et al.* (2014), *Earth Sci. Rev.* **128**, 232-248. [2] Wang *et al.* (2014), *Nat. Comm.* **6**, 7700.