

Rutile formation by arc-continent collision in South China

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Nb/Ta ratios in most terrestrial rocks are variably subchondritic ($<19.9 \pm 0.6$) [1], which is known as the terrestrial Nb–Ta paradox. Rutile has attracted considerable attention due to its role in fractionation between Nb and Ta [2]. The Jiangnan Orogen is located in the central part of South China and represents the Neoproterozoic boundary between the Yangtze Block northwestwards and the Cathaysia Block southeastwards. Nb/Ta ratios available for a suite of mafic dykes near the Neoproterozoic Shuangxiwu arc range from 19.6 to 24.5, which are predominantly superchondritic. Modelling reveals rutile existence during partial melting of spinel lherzolite mantle. This bears geochemical evidence for rutile stability in the mantle wedge. A compilation of literature data of all mafic rocks throughout the Jiangnan Orogen gives an interesting result. All superchondritic Nb/Ta ratios come from mafic rocks within or near the Shuangxiwu arc located in the eastern Jiangnan Orogen, whereas no superchondritic Nb/Ta has been reported in the central and western part. Crystallization ages for the mafic rocks with superchondritic Nb/Ta range from 860 Ma to 770 Ma, which means presence of rutile since 860 Ma. Further compilations of Sm/Yb and Ce/Y ratios of all the mafic rocks along the Jiangnan Orogen consistently show a peak at ca. 860 Ma, which is readily explained by significant crustal thickening at this episode and is contemporaneous with the time that rutile occurred. This crustal thickening event plausibly resulted from the Shuangxiwu arc accretion onto the adjacent continent. Collectively, rutile was generated beneath the arc during arc-continent collision in the process of continent formation.

[1] Münker et al. (2003) *Science* 301(5629), 84–87. [2] Tang et al. (2019) *Nat. Comm.* 10(1), 235.