Discovery of crustal xenolith-bearing Miocene post-collisional igneous rocks within the Yarlung Zangbo Suture Zone southern Tibet: Geodynamic implications

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The Neo-Tethys Ocean has been consumed into north-dipping intra-oceanic and active margin subduction zones. Post-collisional potassic to ultrapotassic magmatism occurred between 11.8 and 17 Ma. No such magmatism was reported within the YZSZ. The purpose of this presentation is to document, for the first time, the 2006-2007 discovery of Miocene magmatic rocks within the YZSZ. A 12.9 Ma ultrapotassic dyke cutting through th Xigaze flysch and containing crustal xenoliths have been reported by Chan et al. (2007, HKTW22). The igneous rocks crop out in the Saga and Sangsang areas about 600 and 450 km west of Lhasa respectively. They consist of intrusions cutting through the ophiolitic upper mantle at Sangsang and the ophiolitic mélange and ophiolitic crust at Saga. The phenocrysts are made of amphibole and F-bearing biotite (Mg# 0.3-0.6; F up to 2.56 wt. %), phlogopite, K-feldspar (Or_{85-61}), plagioclase (An_{77-40}), garnet ($Al_{79-59}Gr_{5-26}Sp_{5-12}Py_{11-3}$, and pleonaste set in quartz-rich albite-oligoclase, apatite, and zircon fine-grained matrix. Partly resorbed xenocrysts of garnet ($Al_{67-74}G\ r_{5-7}Sp_{0.4-2}Py_{28-19}$). The xenoliths contain various amounts of K-feldspar (Or_{55-60}), plagioclase An_{5-57}), brown and green biotite (Mg# 0.42-0.85), rare phlogopite, kyanite, garnet ($Al_{36-77}Gr_{21-9}Sp_{5-6}Py_{31-6}$), quartz, muscovite, corundum, rutile, pleonaste, ilmenite, magnetite, hematite, magnesiohastingsite, epidote. Plagioclase grains contain up to 0.2 wt. % BaO and 0.47 wt. % SrO. The mineral chemistry of the xenoliths suggest that the high-Al content could be related to partial melting extraction of migmatitic liquids and the ferromagnesian assemblage correspond to basaltic protolith.

The geochemical data reveal that the host rocks are trachyandesites and trachydacites. The range in composition is: 44,5-64,7 wt. % SiO_2, 15,3-18 wt. % Al_2O_3, 1,5-5,2 wt. %, MgO, 1,4-11,7 wt. %, CaO, 2,5-4,9 wt. % K_2O, and 3,1-5,6 wt. % Na_2O. The intrusive rocks belong to the shoshonitic clan in terms of K_2O *vs* Na_2O and K_2O *vs* SiO_2 relationships and to ultrapotassic in the CaO vs Al_2O_3 space but have K_2O/Na_2O <2 (0.5-1.7). Trace elements show high contents in Ba (703-1288 ppm), Ce (48-137 ppm), La (up to 73 ppm), Rb (up to 201 ppm), Sr (262-1498 ppm), and Zr (148-230 ppm). The rocks show large variations in Ba/Nb (34-117), Rb/Ba (5-15), Sr/Y (20-105) but uniform Rb/Sr (0.14-0.18) and La/Ce (0.5-0.6). 143Nd/144Nd ratios vary from 0,512167 to 0.512439 and time corrected -9,01 to -3,71. Strongly fractionated Zr/Y ratios (11-18), high concentrations of LaPM (42-117), Ce_{PM} (21-75), Ti and other incompatible elements negative γNd, and their similarities to the average of the upper continental crust, suggest these rocks were largely derived from a continental source with possible lower crustal and lithospheric mantle components. They are likely derived from post-collisional partial melting of lower to middle crustal material underlying the YZSZ. 40Ar-39Ar geochronology on magmatic amphibole and biotite points to a Middle Miocene age, making them the youngest igneous rocks reported within the YZSZ. The presence of magma at depth south of the Gangdese belt by Miocene time could have an impact on further modeling of crustal thermal behaviour. The trachyandesites and trachydacites provide a unique window allowing a probe into the deep Indian crust underlying Tibet Plateau.