



Tectonomagmatic evolution of the Archaean basement of the Quadrilátero Ferrífero province (southeast Brazil): the tonalite-trondhjemite-granodiorite (TTG) to calc-alkaline granodiorite-granite transition

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The Archaean Southern São Francisco craton (Quadrilátero Ferrífero, Brazil) is a typical dome-and-keel province characterized by kilometer-scale gneiss-granitic domes surrounded by elongated keels of folded supracrustal rocks. The tectonomagmatic evolution of the three largest domes in the craton (namely the Bação, Bonfim and Belo Horizonte domes) occurred between 3200 and 2700 Ma. The domes expose several phases of TTG gneisses and plutons intruded by leucogranite sheets, pegmatitic dykes and bodies of calc-alkaline (“potassic”) granodiorite and granite. LA-ICP-MS zircon U–Pb data allow three main periods of magmatism to be defined. These are described as the Santa Barbara (SB), Rio das Velhas I (RVI) and Rio das Velhas II (RVII) events (Lana et al., 2013). The oldest discernable evolution of the craton began at 3200 Ma (SB event) with the formation of TTG gneisses that are poorly preserved in the exposed record. This event is also attested by the occurrence of inherited zircons in younger TTGs as well as by the fact that zircons with a ca. 3200 Ma age represent a significant subset in the detrital zircon population of the greenstone belt succession. This evidence suggests that the Palaeoarchaeoan TTG crust has been reworked as well as eroded during tectonic denudation. The following magmatic event (RVI), which generated most of the TTG crust of the Southern São Francisco craton, took place between 2930–2870 Ma. Gneisses formed during this event have geochemical features similar to the middle-pressure TTG group defined by Moyen (2010) suggesting that they formed in equilibrium with a garnet-rich, plagioclase-poor amphibole-bearing residuum. These TTGs have K_2O/Na_2O between 0.3 and 0.7, Sr content between 250–500 ppm and Sr/Y lower than 150.

Finally, the RVII event occurred between 2780–2700 Ma producing both TTG-like and potassic (calc-alkaline) granitoids. In particular, calc-alkaline granitoids, distributed over an area of $\sim 25,000$ km², were emplaced during ca. 50 Ma interval between 2750–2700 Ma. The TTGs formed during the RVII event (ca. 2770 Ma) are characterized by higher K_2O/Na_2O ratios (>0.7) than those of previously formed TTGs and display overall geochemical features indicating that they were generated by partial melting of older TTGs. This interpretation is also supported by MC-ICP-MS Hf isotope data on magmatic zircons mostly suggesting crustal reworking with minor or no involvement of juvenile magmas. The timing of the latest TTG event coincides with felsic volcanism and deposition of turbiditic wackes of the main greenstone belt sequence. Two main amphibole-facies metamorphic events are recorded in the domes, the first one is coeval with the formation of RVII transitional TTGs (ca. 2780 Ma), the second with the genesis of calc-alkaline granitoids (ca. 2700).

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Moyen, J.F., 2011. The composite Archaean grey gneisses: Petrological significance, and evidence for a non-unique tectonic setting for Archaean crustal growth. *Lithos*, 123, 21–36.