

THE TECTONIC ASSEMBLY OF THE SOUTHERN SÃO FRANCISCO CRATON, BRAZIL: FACTS, FICTIONS AND NEW APPROACHING

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The tectonic assembly of the Southern São Francisco Craton terranes (SSFC - Figure 1) comprises a long crustal development ranging from Mesoarchean to Neoproterozoic times, which could be described by distinct episodes of crustal accretions and/or crustal reworking, some of them coupled in time. The Archean rocks of the SSFC, produced between 3.5 – 2.5 Ga. are, essentially, gneisses and granitoids (TTG suite), greenstone belt sequence (Rio das Velhas Greenstone Belt - **RVGB**), intrusive ultramafic-mafic (Ribeirão dos Motas Layered Sequence - **SARM**), and mafic dikes swarms. However, the most ancient records of the presence of continental crust in the SSFC terranes were indirectly obtained from detrital zircons, extracted from a graywacke of the Neoarchean **RVGB**, in the Quadrilátero Ferrífero (**QF**) region. These detrital zircons present an age of 3.5 Ga. point out by U-Pb ID-TIMS method (Machado *et al.* 1996). None igneous or metamorphic rocks from 3.5 Ga. ago were found in SSFC terranes, except by the migmatites of the Campo Belo Metamorphic Complex (**CBMC**), which present 3.2 Ga. zircons age, obtained by SHIRIMP U-Pb geochronology (Teixeira *et al.* 1998). This **CBMC** zircons crystallization episode, or crustal growth, probably does not represent the first emergence of the continental crust in the SSFC terranes, because there is older detrital zircons in the **QF** supracrustal sequences. However, this **CBMC** zircon crystallization episode is in agreement with the detrital zircons modal age, from the **RVGB** in the **QF** region, around 3.2 – 3.1 Ga. (Machado *et al.* 1996). These data imply that a significant tectonic episode of crustal growth, coupled or not with crustal reworked, occurred in both **CBMC** and Quadrilátero Ferrífero Metamorphic Complex (**QFMC**) terranes (Figure 1). Systematically, contrary to the **QFMC** terranes, the **CBMC** (Figure 1) presents ages ranging between 2.9 – 2.7 Ga. (Teixeira 1985; Teixeira *et al.* 1996). These ages were obtained from different methods (Pb-Pb, Sm-Nd, Rb-Sr and K-Ar). Such a

CMBC age agreement allows attributing to this terrain the quality of the most ancient preserved cratonic nucleus of the SSFC. The **CBMC** rocks present granulite facies metamorphism, though the metamorphism of the **QFMC** is, predominantly, of amphibolite facies, but retrograded greenschist facies metamorphism is widespread in both terranes, specially on the **QFMC**, which present more younger Rb-Sr and K-Ar ages ranging between 2.1 – 0.7 Ga. (Carneiro 1992, Noce 1995). This geological setting could be related to two hypotheses: 1) The Mesoarchean granulitic nucleus (**CBMC**) and **QFMC** would be two different terranes; 2) This situation would be tied up to tectonothermal processes related to late orogenic events (Transamazônico cycle) in the Paleoproterozoic times. There is no geological evidence if both terranes were linked or not in the Mesoarchean times. However, the crustal nucleation of them can have been beginning about 3.5 – 3.2 Ga. Starting from there, the subsequent events of crustal formation, for reworking or juvenile accretion, went allowing to enlarge the original platform area. It happened, especially in the Neoarchean times, when the broad the Rio das Velhas Tectonothermal Event (**RVTE**; Carneiro 1992; Carneiro *et al.* 1995; 1998; Machado & Carneiro 1992) took place. The main episode of building and assembling of the SSFC continental crust during the **RVTE** occurred between 2.78 – 2.70 Ga. It is well recorded in the **QFMC** and **RVGB**, especially in the Neoarchean felsic rocks of the Bonfim Metamorphic Complex (**BMC**; Carneiro 1992). At first, the relict spreading of the **RVGB** in the SSFC, coupled with calc-alkaline magmatism (Carneiro 1992; Quemeneur 1996) suggests a kind of collisional tectonic during the **RVTE**. This collisional episode could be linked the **CBMC** and **QFMC** terranes. The Neoarchean mafic-ultramafic dike swarms (Pinese 1997) closed the collisional stage of the **RVTE**. The size of this original platform is ignored; even so, a fragment of this platform

constitutes part of the today well-known Neoproterozoic terranes of the SSFC (Figure 1). The tectonic evolution of the SSFC in Proterozoic times is characterized by intracratonic sedimentary basins of quartzite-carbonate-shale with minor contribution of the bimodal volcanics-quartzite-arkose and volcanics-graywacke in the Minas Supergroup (MS), Sabará (SG) and Itacolomi (IG) groups, Espinhaço (SE) and São Francisco (SFS) Supergroup. The MS comprises alluvial conglomerate, sandstone and carbonate rich BIFs, grading up into shallow-water marine pelites. Detrital U-Pb zircons and Pb-Pb (whole rock) ages of the MS suggest a Meso- to Neoproterozoic sources for their sediments (Machado *et al.* 1996), which were deposited during the first half of the Paleoproterozoic, until 2.42 Ga. (Babinsky *et al.* 1991, 1993). The SG, that overlies the MS, comprises turbidites, tuffs, volcanoclastics, and the zircons extracted from SG tuffs yield an age of 2.125 Ga. (Machado *et al.* 1992). The IG consists of coarse sandstone and conglomerate containing BIF clasts. The detrital zircons of IG yielded a U-Pb age of 2.1 Ga. (Machado *et al.* 1996), indicating synchronous sedimentation with the SG. The ES, which is more expressive out of the SSFC terranes toward to north direction, is essentially formed by sandstone deposited in an aborted rift environment (Dominguez, 1993; Martins Neto 1997). In the Quadrilátero Ferrífero area the Transamazonian cycle answers for the closing and deformation of the Minas basin. The Sabará and Itacolomi groups correspond to an association of flysch and molassa types sedimentation. The tectonic environment of this event had involvement of a collisional margin judging by the systematic occurrence of granitoids generated among 2.1 - 1.72 Ga. (Noce 1995). At the end of Meso- and beginning of Neoproterozoic, the SSFC was affected by a taphrogenesis stage (Brito Neves *et al.* 1997) followed by several episodes of fissural mafic magmatism. This process occurred before the SFS sedimentation on a glacialmarine environment. Finally, during the Brasiliano cycle, the SSFC borders were reworked. Several orogenic marginal belts were formed around de SSFC. These orogenic belts were intruded by calc-alkaline to peraluminous granitoid suites. According to the Sm-Nd results (Cordani *et al.* 1988), the tectonic model to be considered for this event implies in a belt of ensialic evolution under a transpressive tectonic regime (Endo & Machado 1997).

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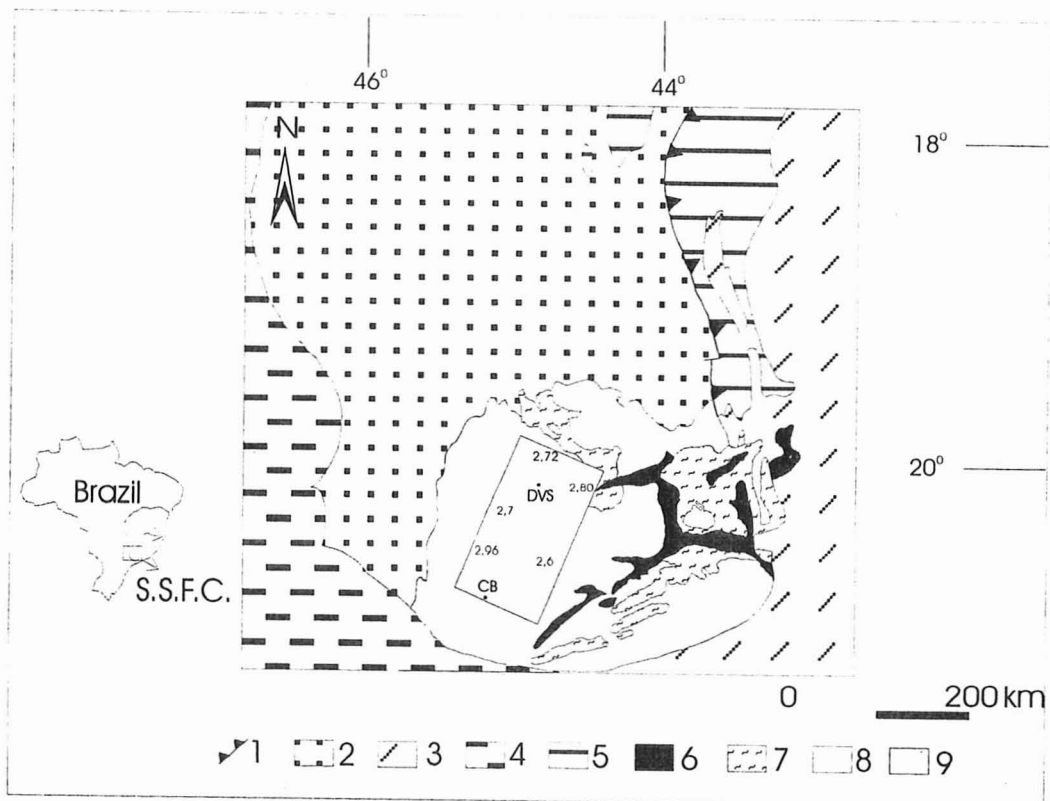


Figure 1 – Geology of the Southern São Francisco Craton. Keys: 1 – Thrust faults; 2 – São Francisco Supergroup; 3 – Costeiro Belt; 4 – Brasília Belt; 5 – Espinhaço Supergroup; 6 – Minas Supergroup; 7 – Rio das Velhas Greenstone Belt; 8 – Sialic Crust; 9 – Mesoarchean Campo Belo Terranes (numbers represent Rb-Sr whole rock isochronic ages).