

MAFIC DYKES IN THE SOUTHERN PART OF THE SÃO FRANCISCO CRATON: A TECTONIC REVIEW BASED ON K/Ar GEOCHRONOLOGY

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The São Francisco Craton (SFC) in eastern South America corresponds to a large, tectonically stable geotectonic unit, surrounded by late Proterozoic mobile belts (ALMEIDA, 1977). The southern region of the Craton is made up of gneissic-granitoid terrains (mainly amphibolite facies) associated with supracrustals, which can be separated by age into two crustal provinces (TEIXEIRA, 1985; TEIXEIRA et al., 1987), the older one formed during the Archean (3.2-2.6 Ga) and the younger in the early Proterozoic (2.4-2.0 Ga).

Mafic dyke swarms occur especially to the west and southwest of Belo Horizonte, Minas Gerais (e.g. RICHTER et al., 1975; MACHADO FILHO et al., 1983). They intrude the Archean and early Proterozoic basement complexes but not the late Proterozoic Bambuí sedimentary cover (Fig. 1). These dykes show NNW, NW, WNW, NNE and ENE trends and are up to 25 km long and generally a few meters wide (some up to 20 m).

Basalts, diabases and gabbros are characteristic of this magmatism. Some of these rocks show porphyritic fabric, but slightly to strongly metamorphosed dykes also occur, particularly within the Early Proterozoic province. Moreover, the development of saussurite, sericite, albite, epidote and chlorite has been identified in the majority of these dykes, suggesting some late hydrothermal and/or deuteric transformations.

Several dozen K/Ar determinations have been obtained in recent years at the Geochronological Research Center of the Instituto de Geociências, USP, on minerals (plagioclases, amphiboles) and whole rocks from the dykes. They have been interpreted using K/Ar diagrams and histograms, and in accordance with the crustal evolution proposed for the Craton. This evolution is based on Rb/Sr and Pb/Pb whole-rock isochrons, U/Pb Concordia diagrams, as well as on the detailed K/Ar pattern obtained for the basement rocks. (TEIXEIRA et al., 1987; MACHADO et al, 1989 a,b).

The available radiometric data suggest a minimum of five epochs for emplacement of the dykes (2.3 Ga, 2.1-2.0 Ga, 1.85-1.80 Ga, 1.70-1.60 Ga and 1.1-1.0 Ga) based on amphibole apparent ages and taking into consideration crustal evolution (Fig. 2). However, some argon rejuvenation processes related to middle and late Proterozoic tectonics east of the investigated area might also be associated with the range of apparent K/Ar amphibole ages on the studied dykes. On the other hand, the geochronology of the plagioclases and whole rocks appears to be mostly related to processes of argon loss, which took place in the area around 720-500 m.y ago.

In summary, the radiometric K/Ar results can be tectonically associated with crustal rifting of the continental mass during the Proterozoic (Fig. 3). The main period for rifting and basic intrusion seems to be related to the installation of the early Proterozoic crustal province and its evolution (~2.4-2.0 Ga), within the southern part of SFC (e.g. TEIXEIRA et

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al., 1987). At this time the dykes were variably affected by metamorphic episodes of the Transamazonico cycle (2.2-1.9 Ga). In turn, the mafic dykes with amphibole K/Ar ages around 1.70-1.60 Ga might be correlated with the evolution of the mid-Proterozoic intracratonic Espinhaço system. Moreover, the K/Ar ages on plagioclases of around 1.1-1.0 Ga may be of geological significance and are interpreted as a period of emplacement, since recent detailed $^{40}\text{Ar}/^{39}\text{Ar}$ and U/Pb ages indicate values of 1.1-0.9 Ga for dykes intruding the both basement of the SFC in Bahia and Minas Gerais as well as the assemblages of the southern segment of the Espinhaço system (e.g. RENNE & ONSTOTT, 1988; MACHADO & SCHRANK, 1989).

Finally, the grouping of late Proterozoic K/Ar ages in the range of 0.8-0.57 Ga is here associated with thermal overprinting within the SFC contemporaneous with the Brasília evolution marginal to the Craton. This overprinting phenomenon is also suggested by the partial resetting of K/Ar mica ages of the basement rocks which are exposed north west and southeast of Belo Horizonte. By the same token on the basis of the geochronological pattern obtained for the dykes, it is proposed that some of their metamorphic features might be related not only to the above late Proterozoic front, but also to a Mid-Proterozoic overprinting which also caused some rejuvenation of K/Ar ages around 1.3-1.2 Ga in micas and feldspars in basement rocks within parts of the investigated area.

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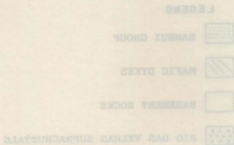
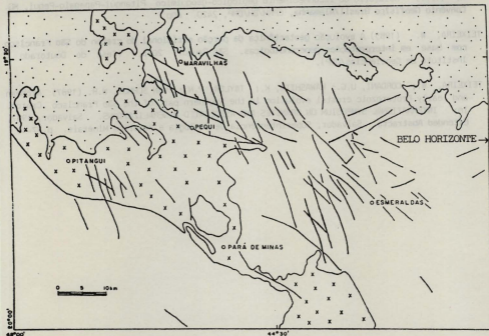


Figure 1 - Geologic outline of the investigated area.



LEGEND



BAMBUI GROUP



MAFIC DYKES



BASEMENT ROCKS



RIO DAS VELHAS SUPRACRUSTALS

Figure 1 - Geologic outline of the investigated area.

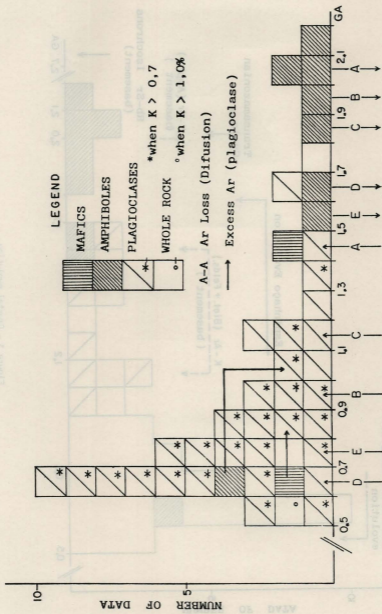


Figure 2 - K/Ar histogram.

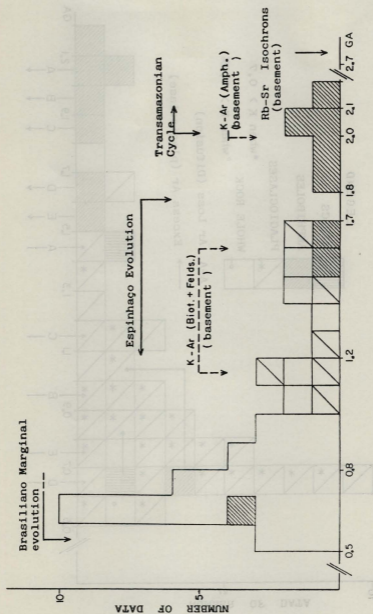


Figure 3 - Crustal evolution.