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RECONNAISSANCE GEOCHRONOLOGY OF THE INFRASTRUCTURE OF PART OF THE SÃO FRANCISCO CRATON IN THE STATE OF BAHIA, BRAZIL,

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ABSTRACT New radiometric data on the São Francisco craton in Bahia State, Brazil, are presented which indicate a considerable antiquity (at least 2.5. b. y.) for rocks showing much evidence of fairly complex previous history. Similar rock units extend well to the south of the region studied, and the São Francisco craton is, therefore, one of the larger cratonic regions of the Earth's crust. A brief survey of the geology of the craton in Bahia State is given.

RESUMO São apresentados novos dados radiométricos sobre o cráton São Francisco no Estado da Bahia, Brasil, os quais indicam uma considerável antiguidade (mínimo de 2,5 b. a.) para rochas de história prévia razoavelmente complexa. Unidades rochosas similares estendem-se para o Sul da região estudada, e assim o cráton São Francisco é uma das maiores regiões cratônicas na crosta da Terra. Um breve esboço da geologia da cráton no Estado da Bahia é dado.

INTRODUCTION Relatively few reliable geochronological data have been published for the São Francisco craton (Almeida, 1967) of east-central Brazil. Most have been acquired using the K/Ar method, and reflect the effects of the Transamazonic thermotectonic cycle of 1.8-2.2 b.y. (Almeida et al, 1973). Some dates, however, indicate the presence of more ancient nuclei from the Guriense cycle (ca. 2.6 b.y.). Thus Cordani (1973) reports such ages from the sout- and central-eastern part, which he separated as the "Salvador craton". In the far western region, as well, ages of 2.5-3.0 b.y. have been obtained (PROSPEC S/A, 1973).

In this present reconnaissance study, some 40 whole rock samples of the western and central parts of the craton were analysed by the Rb/Sr and K/Ar methods. The results obtained confirm the importance of the Transamazonic cycle as a tectonothermal-magmatic event, but suggest that substantial areas have minimum ages of 2.5-2.7 b.y.

GEOLOGICAL SKETCH (Fig. 1) Formations assigned provisionally to the lower Precambrian occur widely in the State of Bahia. On the eastern side of the Chapada Diamantina (a mid-Proterozoic platform cover composed by a sequence of metasediments and metavolcanics) are encountered the Jequié (Cordani, 1973) or Eastern Bahia (Projeto RADAM) complex, and the Caraíba (Barbosa, 1966; Projeto RADAM) complex. The two complexes have formerly been represented separately since they differ in predominant metamorphic grade. The Jequié complex is largely in granulite facies, while the Caraíba one is mainly in amphibolite facies. In the field, some areas show interdigitation between the two complexes, and bodies of granulite showing a range of sizes are encountered within the Caraíba migmatite-gneisses. On the other hand, in some areas a sharp distinction is not possible, with transitions occurring on both regional and more localised scales. Furthermore, in the region between Itaberaba and Mundo Novo there is strong petrographic and field evidence within the Jequié complex for widespread superposition of amphibolite facies metamorphism (including migmatite formation) on an older one of granulite facies (represented by bodies showing typically granulitic texture and mineralogy). This is observed on a scale of a few meters or tens of meters.

Compositionally, the granulites of the Jequié complex show fairly wide variation, which Sighinolfi (1970) has tentatively ascribed, on the basis of trace element geochemistry, to a metasedimentary origin. Intermediate or acid types predominate, some with charnockitic affinites. A few interlayered remnants of quartzites, calc-silicate rocks, and amphibolites, are also known (Mascarenhas, 1973).

The Caraíba complex shows much lithological variation. The areally abundant migmatite-gneisses are mainly acid-intermediate. It is necessary to emphasize the common occurrence, on varying scales of surface outcrop, of supra-

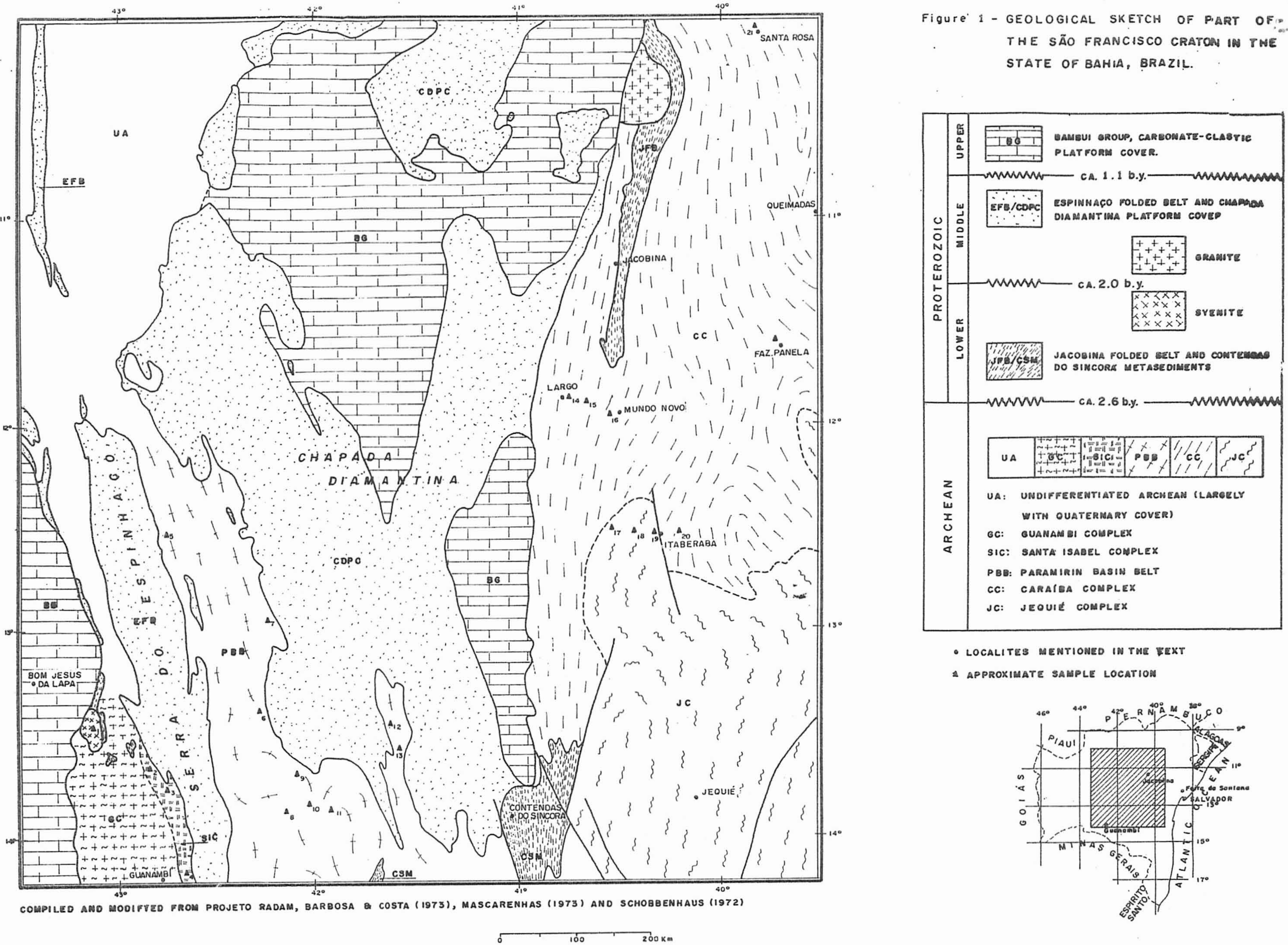

Fig. 1 Geological sketch of part of the São Francisco Craton in the state of Bahia, Brazil.

crustal material (amphibolites, quartzites, iron formations etc.) and granite bodies. Two prominent linear zones of basic-ultrabasic metamorphic rocks are observed, immediately to the west of the Jacobina group (a quartzite-schist folded belt, with subordinate basic volcanics, presently assumed to be of early Proterozoic age, based on K/Ar data) and a little to the east of the same group. Both zones extend south at least to the latitude of Itaberaba.

On the western side of the Chapada Diamantina, crystalline basement is found in an approximately NNW-SSE aligned belt in the basin of the Paramirin river, where the gneiss-migmatites of acid composition are predominantly in amphibolite facies, and include a few intercalations of acid-intermediate metavolcanic rocks, podiform basic-ultrabasic bodies and other metasedimentary rocks, besides syn- and late-tectonic granites. In this belt, there is no evidence of a former granulite facies metamorphism.

The Serra do Espinhaço, consisting of a mid-Proterozoic metasedimentary folded belt with minor metavolcanic contributions, separates the Paramirin basin from the next high grade basement outcroppings to the west. Here are encountered, in a westerly sense from the Serra do Espinhaço, a belt of gneiss-migmatites of intermediate and basic compositions in high amphibolite to granulite facies (with local relations of retrograde metamorphism), besides granite-tonalite bodies (named as Santa Isabel complex; Barbosa and Costa, 1973); a sequence of greenschist facies metasedimentary rocks cut by a syenite-granite intrusion (Barbosa and Costa, 1973), which disappears to the south; and an extensive granite-migmatite terrain (the Guanambi complex; Barbosa and Costa, 1973).

PREVIOUS GEOCHRONOLOGICAL STUDIES Távora et al. (1967) presented K/Ar ages for basement complex within the Paramirin river basin, ranging from 475 to 1100 m.y. For basement to the west of the Serra do Espinhaço ages between 520 and 1950 m.y. are reported.

Cordani et al. (1969) found for the Caraíba complex to the east of the Jacobina ridge ages between 1830 and 2250 m.y. by the K/Ar method. Granulites from Salvador area gave 1700 m.y., and a biotite gneiss from the extreme south-eastern portion of the Jequié complex gave 2450 m.y. In addition, 4 samples from widely separated areas of the Caraíba complex gave a Rb/Sr isochron age of about 2000 m.y. Almeida et al. (1973) pointed out that this must be a minimum age.

Cordani (1973) reports results of a study of the Jequié complex south from the region of Feira de Santana to the division with the States of Bahia and Minas Gerais. Rb/Sr isochron ages of 2670 m.y. and 2610 m.y. were obtained in granulites. There is strong evidence of overprinting by an event at about 1830 m.y. K/Ar ages mainly from amphibole range from 672 to 2850 m.y., with a concentration of dates between 1520 and 1891 m.y. Granulites from the Salvador area gave biotite ages between 1541 and 1705 m.y.

An unpublished report (PROSPEC S/A, 1973) has quoted ages obtained by an unspecified method on specimens from the intermediate-basic gneiss-granulite belt of the Serra do Espinhaço in the range of 2.5-3.0 b.y.

It has recently been brought to our notice that work in progress is confirming the great importance of granulites with Rb/Sr ages of 2.5-3.0 b.y. not only in the Jequié complex but also in the Salvador area (Sankara S. yer, personal communication).

RESULTS All ages were calculated using $\lambda_{Rb}=1.47 \times 10^{-11}$ year^{-1}. Ratios were normalised to $^{86}Sr/^{88}Sr=0.1194$. Eimer and Amend carbonate standard gave $^{87}Sr/^{86}Sr=0.7078$ and 0.7082 ± 0.0007. Analyses were performed at the Centre for Geochronological Research, University of São Paulo (most

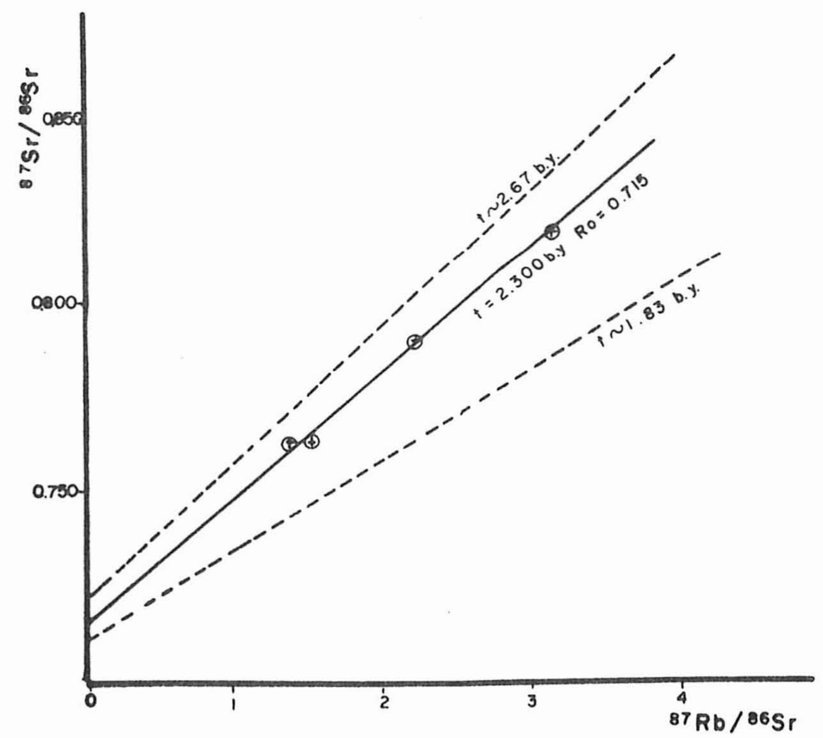

Fig. 2 Isochron for the Jequié complex in the region of Itaberaba. Pecked lines show extreme isochrons obtained by Cordani (1973).

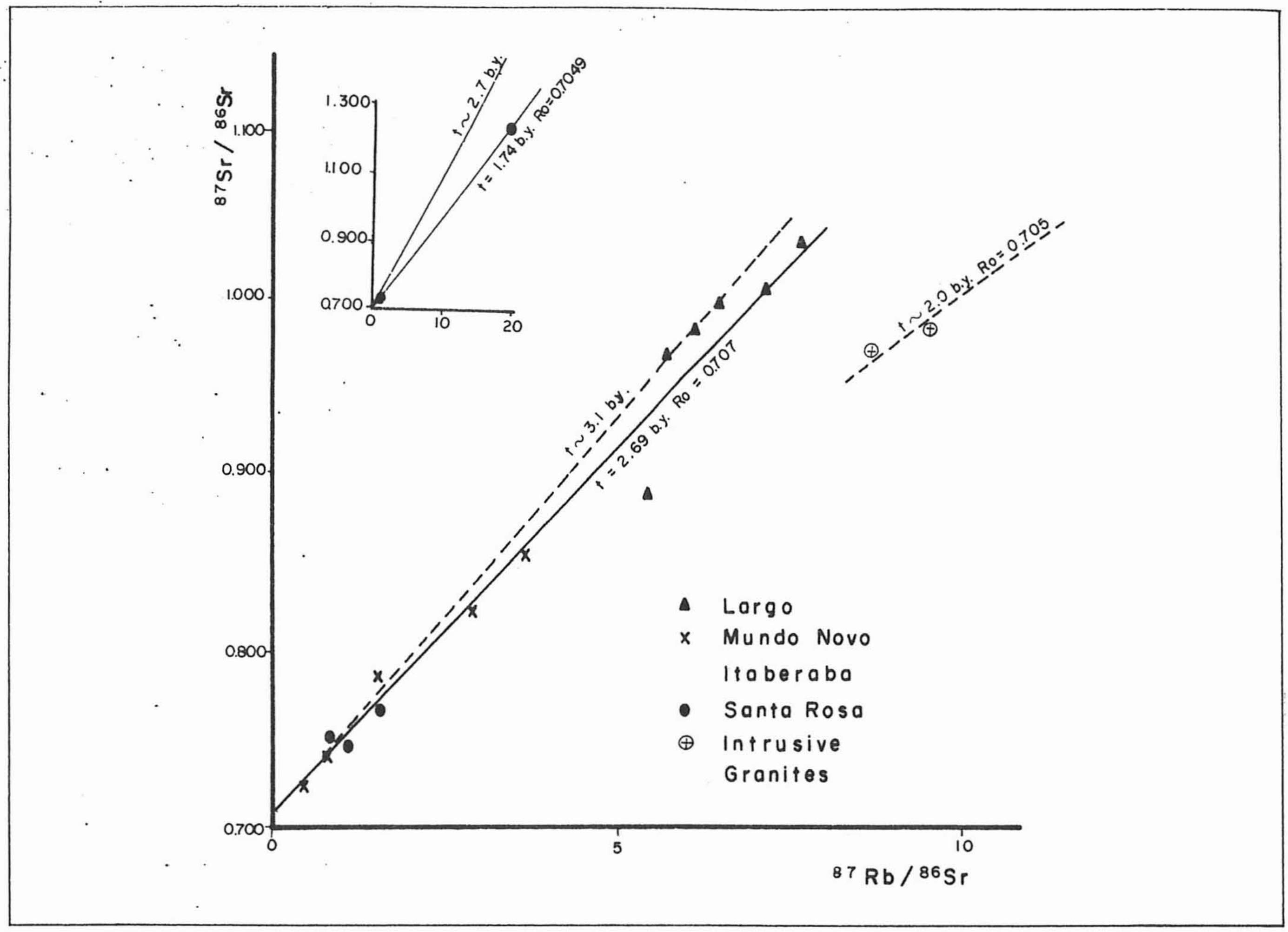

Fig. 3 Results for the Caraíba complex. Inset shows mineral isochron for the metasyenite of Poço de Fora.

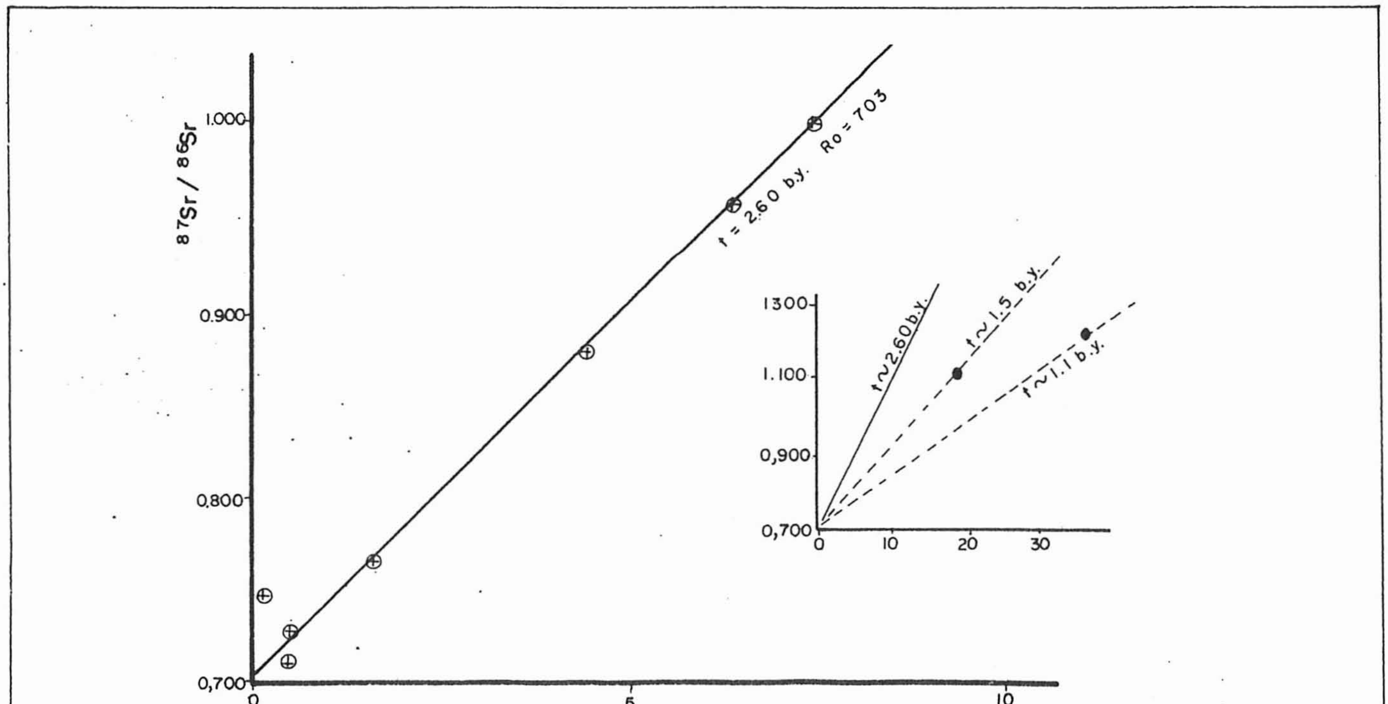

Fig. 4 Isochron for the Paramirin basin belt. Inset shows results for some granites.

Rb/Sr, by B.B.B. Neves, K.Kawashita and I. McReath) and at the Department of Earth Sciences, Leeds University (some Rb/Sr by A. Gledhill, and K/Ar by D.C. Rex). Methods used were standard and are amply described in the literature.

Jequié Complex The Jequié complex in the Itaberaba region has yelded an Rb/Sr whole rock isochron age of 2.30 b.y. with $R_o = 0.715$ (figure 2). Although the initial ratio observed is similar to those found by Cordani (1973), the age is somewhat lower than the maximun reported by that author. The samples were taken both from a layered granulite "pod" and from the enclosing amphibolitic-granulitic gneiss-migmatites, containing relicts of the granulitic mineralogy. The impression gained in this area is that the influence of amphibolite facies is stronger than further south within the complex. Two possibilities would explain the differences in ages found, besides the fact that only a small number of points are available to draw the isochron, with little variation on the $^{87}Rb/^{86}Sr$ ratios. In the first, a somewthat localised, probably Transamazonic rejuvenation and isotopic rehomogenisation took place. In the second, the area represents a crustal level which underwent slower uplift or remained deeper buried than the more southern sections.

Caraíba Complex In the region of Largo, Mundo Novo and Santa Rosa, migmatites and gneissic granites display considerable isotopic disequilibrium. This feature is particulary marked for gneissic granites from Largo (figure 3). Although it is not possible to define meaningful ages in this case, most of the points lie between lines defining t = 3.1 and 2.6 b.y. with R_o (assumed) of 0.705. Thus an age substantially older than Transamazonic is indicated for these rocks unless they suffered massive introduction of radiogenic strontium or loss of rubidium during the Transamazonic (or later) event.

Four samples (out of five) of migmatites from Mundo Novo-Itaberaba region yield an isochron defining t = 2.69 b.y. with $R_o = 0.707$. A granite and granite vein intrusive in the Caraíba complex in the Mundo Novo area indicate younger ages. With an assumed R_o value between 0.700 and 0.720, an age of about 2.0 b.y. would be obtained.

Northeast from Jacobina, near Santa Rosa, three samples of migmatites give ages between 2.3 and 3.0 b.y. assuming $R_o = 0.705$, and fall close to the 2.7 b.y. isochron defined at Itaberaba-Mundo Novo region. Further north, at Poço de Fora, a metasyenite yield an Rb/Sr mineral "isochron" (three points only) with t = 1740 m.y. and R_o= 0.7049 (M.C.H. Figueiredo, personal communication).

Carbonate-apatite bodies intruded into a thin supracrustal sequence in the area of Fazenda Panelas give K/Ar mica ages of 1952 and 1984 m.y., approximately concordant with an Rb/Sr mineral "isochron" with t = 2156 m.y. and $R_o = 0.710$, the middle point of the range 0.708-0.712 measured in carbonates. (M.A.F.T. Oliveira, personal communication).

Besides the widespread ca, 2.0. b.y. K/Ar ages reported in the literature, partial rejuvenation of rocks from the Caraíba complex by overprinting of Transamazonic events seems to be also represented by Rb/Sr mixed ages (ca. 2.1-2.4 b.y.) yielded by kyanite-bearing quartzites immediately to the east of the Jacobina group (E.F.J. de Sá et al., article in preparation).

Paramirin Basin Belt Most samples define an isochron with t = 2.60 b.y. and $R_o = 0.703$ (figure 4). Exceptions are a sample of dioritic composition (X--38) which falls above the isochron for reasons unknown. and two granites. These have such high $^{87}Rb/^{86}Sr$ values that any initial ratio between 0.705 and 0.720 would yield an age of approximately 1.1-1.5 b.y.

Santa Isabel Complex From the intermediate-basic gneiss-granulite belt to the west of the Serra do Espinhaço was obtained an age of 2.57 b.y. with $R_o = 0.707$. The syenite that intrudes low grade metasediments further north appears much younger, giving t = 2.08 b.y. with $R_o = 0.795$ (figure 5).

DISCUSSIONS AND CONCLUSIONS The results obtained point to a much larger extension of Archean terrains as the high grade infrastructure of the São Francisco craton than previously assumed (Almeida, 1967; Cordani, 1973).

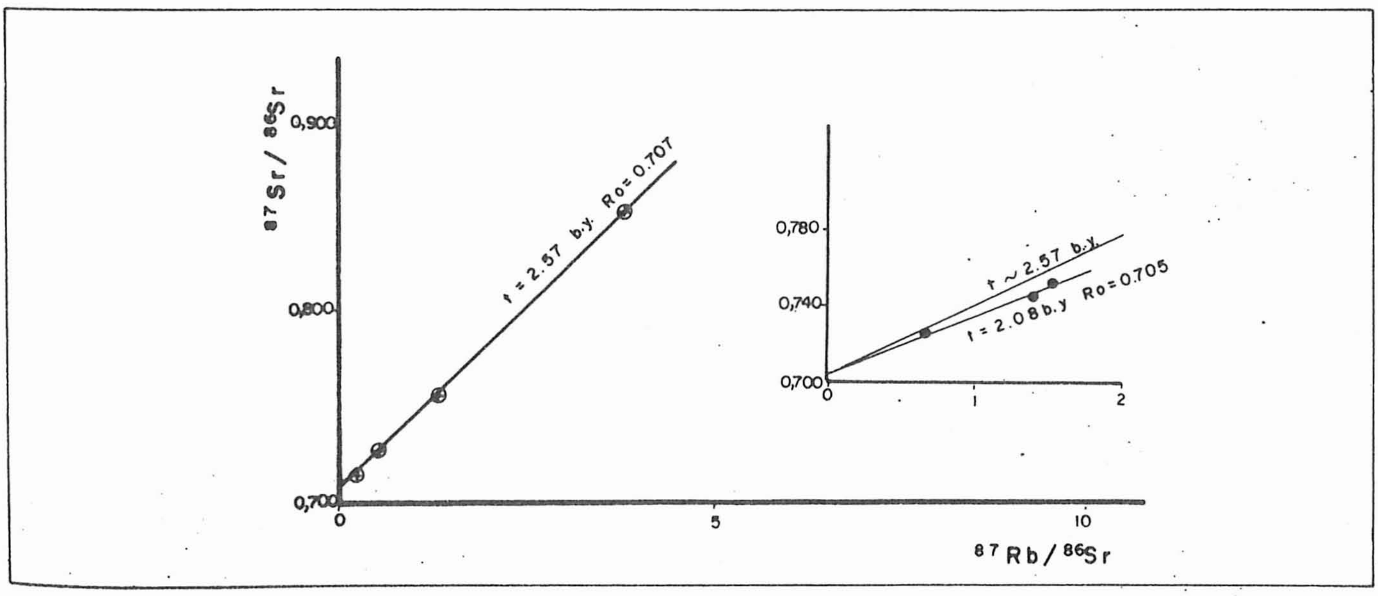

Fig. 5 Isochron for the Santa Isabel complex. Inset shows isochron for syenite of Bom Jesus da Lapa.

The 2.6 b.y. tectonic-metamorphic event (Guriense cycle) bears a major importance on the consolidation of the craton, in accordance with what is observed on several Archean regions of other continents (Bridgewater et al, 1973 a.b; Sutton and Windley, 1974; Clifford, 1970; Anhaeusser et al., 1969; Glikson and Lambert, 1976). Faint indications (Rb/Sr ages, assuming R_0 values close to hipothetical mantle growth values) suggests the possibility of still older nuclei, ca. 3 b.y., on some areas within the Caraíba and Jequié complexes and the basement west of the Serra do Espinhaço.

The wide variation in lithology of the Caraíba complex observed in different areas of occurence, and its complex structural pattern combined with the superposition of metamorphic events, suggest a long lived evolution of this complex. Supracrustal sequences appear conformably interleaved with acid gneisses and migmatites, in a situation broadly similar to the one described by Bridgewater et al. (1973, a.b) for the early Precambrian of Greenland. The linear zones of basic-ultrabasic rocks, with chemical characteristics resembling basaltic komatiites (M.T. Rocha and P. S. Linhares, personal communication), could represent older dyke swarms related to root zones of ancient greenstone belts. Such relationships may represent some kind of "tectonic mixing" of rocks of different ages during the 2.6 b.y. event.

Age relations between the amphibolite grade Caraíba complex and the more southerly Jequié granulite complex remain somewhat obscure. Field and petrographic data presently available point to an older age of the granulite facies metamorphism on the contact region between the two complexes. Further south, some granulites studied by Cordani (1973), which define a 2.6 b.y. isochron with $R_0 = 0.715$ show significant introduction of K-feldspar. The 2.6 b.y. event could therefore be interpreted as the age of microclinization, rather than that of the formation of the granulites as was suggested by that author. These data sugest a possible older age at least for some of the granulites of Jequié complex, as related to (at least) parts of the Caraíba complex.

On the other hand, broad transition zones sometimes observed between the two complexes are better explained by coeval evolution and vertical zonation between the Jequié complex (as the lower section) and parts of the Caraíba one (as the upper section), in a relationship analogous to the one proposed by Glikson and Lambert (1976) for the Australian Yilgarn and Pibara cratons. This would imply a north/western tilting of the eastern part of the São Francisco craton, with shallow levels exposed to the north or buried below the Chapada Diamantina sequence. In fact, greenschist facies metasediments and metavolcanics, interpreted as a greenstone belt by Mascarenhas (1973), are known from this region (Santa Luz, Queimadas), while the supracrustal remnants within the Caraíba gneiss-migmatites are of quite common occurrence. Vertical displacements associated to such a general tilting could have taken place as high angle faults like the ones described by Mascarenhas (1973) to the east and southeast border of the granulite complex.

Therefore, the two possibilites — that the Jequié complex is substantially older than the Caraíba or that they are of similar age, remain open and additional studies are necessary in order to clarify the problem. Parts of the Caraíba complex could be even older than the Jequié granulites.

The Paramirin basin gneiss-migmatite belt yield a low R_0 value (0.703) compared with the eastern complexes. This feature is suggestive that relatively little time elapsed between formation of the original rocks and metamorphism, and, furthermore, that little crustal reworking was involved in the formation phase. Supracrustal remnants locally include some podiform ultrabasic bodies but are scarce in comparisom to the situation in the Caraíba complex. Geochemical data indicate Na-rich acid compositions with possibilities of an orthometamorphic parentage (E.F.J. Sá, B.J. Fryer and I. McReath, article in preparation). Late tectonic granites are richer in K-feldspar phases. It is interesting to note that the K/Ar mineral systems remained open in this belt until ca. 500 m.y. ago. This feature fits into a geologic history implying a prolonged period of high heat flow perhaps coupled with a long term uplift event, besides the thermal imprint of a mid-Proterozoic tectonic cycle represented by the Serra do Espinhaço sequence. High heat flow and uplift of the Paramirin basement are also suggested by the evolution of the Chapada Diamantina platform cover and its extensive acid volcanism that took place at about 1.1 b.y. (E.F.J. de Sá et al., article in preparation).

The gneiss-migmatite belt west of the Serra do Espinhaço (Santa Isabel complex; Barbosa and Costa, 1973) is characterized by rather basic compositions, charnockitic affinities, amphibolite to granulite facies metamorphism, relatively low R_0 ratio (0.707) and even an isolated eclogite occurrence (Marchetto and Barbosa, 1973). Its relations with acid gneisses, migmatites and granites, to the east (Paramirin basin) and immediately to the west (Guanambi complex), and with greenschist facies metasediments cut by a Transamazonic syenite, to the north, are not yet definied on a fully reliable basis. The hypothetical interpretation of this belt as a highly metamorphosed earlier greenstone section (according to Glikson & Lambert's model; 1976) should be tested against geochemical data. In this model, the Na-rich gneiss-migmatites of the Paramirin basin could represent a coeval segment, belonging to a different crustal level, characterized by the abundance of "early sodic granites" and minor amounts of "late potassic granites" (Anhaeusser et al.; 1969).

Some workers (Cordani, 1973; Hasui et al., 1975) have previously considered the cratonic areas of Bahia State to be separable into two parts, the São Francisco craton to the west and the Salvador craton to the east. On the basis of K/Ar data then availabe (Távora et al.; 1967) (ages ca. 500 m.y.) the zone of separation was taken to be in the vicinity of the Paramirin basin, as a northern infrastructure extension of a late Precambrin folded belt. Geologic field evidence and Rb/Sr data are strongly against this hipothesis. The assumed "late Precambrian" structural trends do not cut across earlier metasedimentary sequences south of the Paramirin basin (Projeto RADAM; Mascarenhas, 1973), and the latest regional metamorphic event in this belt took place at 2.6 b.y. The 500 m.y. event must essentially reflect the closure of K/Ar systems at sufficient shallow crustal levels, perhaps including hydrothermal alteration phenomena (E.F.J. de Sá et al., paper in preparation).

The acid volcanism to the west of Chapada Diamantina has been tentatively ascribed as resulting from a continent-continent collision on geochemical grounds (Sighinolfi and Conceição, 1974; Conceição, 1974; potash-rich rhyolites). This again does not fit with field and geochronological observations, and this chemical character seems to have been imposed by late hydrothermal systems (E.F.J. Sá, B.J. Fryer and I. McReath, paper in preparation). In

TABLE 1

WHOLE ROCK Rb/Sr ANALYTICAL RESULTS, EAST OF THE CHAPADA DIAMANTINA

SPK	FIELD Nº	ROCK TYPE OR MINERAL	LOCALITY	COORDINATES	Rb (ppm)	Sr (ppm)	$^{87}Rb/^{86}Sr$	$^{87}Sr/^{86}Sr$	ISOCHRON t (my)	AGE Ro	"CONVEN-TIONAL" AGE	OBS
1592	J–32	ACID GNEISS	Itaberaba	40°20'00" 12°31'00"	187.3	175.8	3.12± 0.06	0.821± 0.0005	2300± 100	0.715± 0.002	2500± 50	SEE FIGURE 2
1411	J–33	ACID GNEISS	Itaberaba	40°20'00" 12°31'00"	163.3	220.8	2.16± 0.04	0.792± 0.0010	2300± 100	0.715± 0.002	2680± 68	
1593	J–34	INT. GRANULITE	W Itaberaba	40°27'00" 12°30'00"	124.5	241.3	1.50± 0.03	0.764± 0.0013	2300± 100	0.715± 0.002	2635± 76	
1412	J–35	INT. GRANULITE	W Itaberaba	40°30'51" 12°28'36"	94.6	199.4	1.38± 0.03	0.763± 0.0021	2300± 100	0.715± 0.002	2800± 123	
1401	LG–1	GNEISS-GRANITE	Largo	40°45'16" 11°47'00"	130.9	66.6	5.84± 0.11	0.970± 0.0018			3017± 65	SEE FIGURE 3
1402	LG–2	GNEISS-GRANITE	Largo	40°45'16" 11°47'00"	163.3	61.9	7.89± 0.15	1.036± 0.0023			2800± 60	
1403	LG–3	GNEISS-GRANITE	Largo	40°45'16" 11°47'00"	120.4	55.1	6.51± 0.13	0.999± 0.0023			3011± 66	
1404	LG–4	GNEISS-GRANITE	Largo	40°45'16" 11°47'00"	121.6	49.9	7.26± 0.14	1.005± 0.0018			2760± 59	
1453	LG–5	GNEISS-GRANITE	Largo	40°45'16" 11°47'00"	134.6	64.2	6.21± 0.12	0.980± 0.0010			2950± 61	
1586	G–5	GNEISS-GRANITE	Largo	40°45'16" 11°47'00"	138.6	73.2	5.58± 0.11	0.893± 0.0017			2260± 50	
1587	G–6	GNEISS-GRANITE	Largo	40°45'16" 11°47'00"	121.8	83.2	4.31± 0.08	0.889± 0.0040			2840± 83	
1585	X–2	MIGMATITE	E Itaberaba	40°12'00" 12°31'00"	104.9	402.2	0.76± 0.02	0.741± 0.0057	2690± 100	0.707± 0.002	3155± 495	
1588	G–9	MIGMATITE	W Mundo Novo	40°41'00" 11°49'00"	60.9	427.7	0.41± 0.01	0.721± 0.0021	2690± 100	0.707± 0.002	2620± 340	
1408	J–24	MIGMATITE	W Mundo Novo	40°39'00" 11°50'00"	118.8	95.1	3.67± 0.07	0.857± 0.0012	2690± 100	0.707± 0.002	2754± 61	
1409	J–25	MIGMATITE	W Mundo Novo	40o39'00" 11°50'00"	96.4	97.2	2.90± 0.06	0.821± 0.0012	2690± 100	0.707± 0.002	2665± 64	
1589	G–12	MIGMATITE	W Mundo Novo	40°39'00" 11°50'00"	89.8	184.4	1.42± 0.03	0.782± 0.0012			3600± 91	
1590	G–13	GRANITE VEIN	W Mundo Novo	40°39'00" 11°50'00"	218.9	74.6	8.71± 0.17	0.968± 0.0025			2020± 45	
1410	J–27	GRANITE	Barra M. Novo	40°30'18" 11°50'42"	199.4	62.0	9.56± 0.19	0.979± 0.0020			1924± 42	
1450	MMC	MESOCR. MIG	Santa Rosa	39°50'00" 10°05'00"	98.7	333.4	0.86± 0.02	0.744± 0.0019			3028± 176	
1451	ML	LEUC. MIG	Santa Rosa	39°50'00" 10°05'00"	115.7	211.6	1.59± 0.03	0.763± 0.0022			2423± 111	
1452	MMC	MELAN. MIG	Santa Rosa	39°50'00" 10°05'00"	124.0	329.9	1.09± 0.02	0.743± 0.0022			2311± 152	

OBS: ASSUMED Ro = 0.705 ± 0.001

TABLE 2 WHOLE ROCK Rb/Sr ANALYTICAL RESULTS, PARAMIRIN BASIN

SPK	FIELD Nº	ROCK TYPE OR MINERAL	LOCALITY	COORDINATES	Rb (ppm)	Sr (ppm)	$^{87}Rb/^{86}Sr$	$^{87}Sr/^{86}Sr$	ISOCHRON AGE t (my)	ISOCHRON AGE Ro	"CONVENTIONAL" AGE	OBS
1505	B–2	GRANITE	S Livramento	41°53'00" 13°50'00"	76.0	440.0	0.50± 0.01	0.732± 0.0010	2600± 80	0.703± 0.002	3120± 30	SEE FIGURE 4
1469	B–4	MIGMATITE	SSW Itanagé	42°04'00" 13°49'00"	66.7	108.6	1.79± 0.04	0.765± 0.0011	2600± 80	0.703± 0.002	2235± 70.5	
1471	X–50	ACID GNEISS	S Caraguatai	41°40'00" 13°23'00"	144.7	57.0	7.55± 0.15	0.990± 0.0017	2600± 80	0.703± 0.002	2510± 54	
1449	X–56	ACID METAVOLC.	W Jussiape	41°40'00" 13°23'00'	138.4	90.1	4.52± 0.09	0.878± 0.0024	2600± 80	0.703± 0.002	2500± 67	
1448	X–58	ACID METAVOLC.	W Jussiape	41°40'00" 13°33'00"	158.4	72.3	6.49± 0.13	0.951± 0.0057	2600± 80	0.703± 0.002	2500± 80	
1468	X–107	MIGMATITE	N Boquira	42°48'00" 12°35'00"	71.9	552.6	0.38± 0.01	0.715± 0.0019	2600± 80	0.703± 0.002	1850± 70	
1474	X–38	DIORITE	São Timóteo	42°10'00" 13°51'00"	100.8	1622.6	0.18± 0.01	0.746± 0.0020			— —	
1473	X–33	GRANITE	SW Paramirin	42°18'00" 13°28'00"	339.2	56.4	18.12± 0.35	1.117± 0.0024			1530± 33	
1531	II–LIV	GRANITE	W Itanagé	42°06'00" 13°42'00"	231.5	19.7	31.37± 0.71	1.187± 0.0043			1087± 27	
1472	II–14	MIGMATITE	W Ibiajara	42°14'30" 13°00'00"	59.6	129.9	1.33± 0.03	0.713± 0.0020			417± 110	

OBS.: (*) ASSUMED Ro = 0.705± 0.001 (**) ASSUMED Ro = 0.710± 0.002

TABLE 3 WHOLE ROCK Rb/Sr ANALYTICAL RESULTS, WEST OF THE SERRA DO ESPINHAÇO

SPK	FIELD Nº	ROCK TYPE OR MINERAL	LOCALITY	COORDINATES	Rb (ppm)	Sr (ppm)	$^{87}Rb/^{86}Sr$	$^{87}Sr/^{86}Sr$	ISOCHRON AGE t (my)	ISOCHRON AGE Ro	"CONVENTIONAL" AGE	OBS
1510	J–84	ACID GNEISS	Riacho Santana	42°57'00" 13°36'00"	142.3	316.5	1.31± 0.03	0.752± 0.0010	2570± 220	0.707± 0.004	2200± 120	SEE FIGURE 5
1506	J–93	MIGMATITE	NW Igaporã	42°50'00" 13°42'00"	73.2	471.5	0.45± 0.01	0.727± 0.0012	2570± 220	0.707± 0.004	3200± 250	
1465	J–103	INTERM. MIGM.	E Guanambi	42°40'00" 14°12'00"	57.8	1059.9	0.16± 0.01	0.713± 0.0020	2570± 220	0.707± 0.004	3520± 900	
1466	X–75	MONZONITE	NW Igaporã	42°50'00" 13°43'00"	226.4	181.6	3.66± 0.07	0.854± 0.0018	2570± 220	0.707± 0.004	2712± 66	
1467	J–76	GRANITE	SE B. J. LAPA	43°10'00" 13°27'00"	336.1	647.8	1.51± 0.03	0.752± 0.0014	2080± 70	0.705± 0.001	2100± 87	
1541	J–78	SYENITE	SE B. J. LAPA	43°09'00" 13°27'30"	377.0	786.8	1.39± 0.03	0.747± 0.0010	2080± 70	0.705± 0.001	1760± 106	
1542	J–80	SYENITE	SE B. J. LAPA	43°07'00" 13°28'00"	339.7	1529.1	0.64± 0.01	0.725± 0.0011	2080± 70	0.705± 0.001	1530± 237	

OBS.: (*) ASSUMED Ro = 0.705± 0.001

TABLE 4 **MINERAL Rb/Sr ANALYTICAL RESULTS, EAST OF THE CHAPADA DIAMANTINA**

SPK	FIELD Nº	ROCK TYPE OR MINERAL	LOCALITY	COORDINATES	Rb (ppm)	Sr (ppm)	$^{87}Rb/^{86}Sr$	$^{87}Sr/^{86}Sr$	ISOCHRON t (my)	AGE Ro	"CONVENTIONAL" AGE	OBS
1540	P–1	PHLOGOPITE	Faz. Panelas	39°47'00" 11°28'00"	476.0	11.1	113.1± 3.1	4.37± 0.019			2165± 60**	
	HF–14	BIOTITE	Poço de Fora	39°46'00" 9°36'00"	943.0	137.0	20.019± 0.4	1.224± 0.02	1740± 5	0.7049± 0.0004		SEE FIGURE 3
	HF–14	HORNBLENDE	Poço de Fora	39°46'00" 9°36'00"	38.0	1140.0	0.0956± 0.001	0.7083± 0.002	1740± 5			
	HF–14	FELDSPAR	Poço de Fora	39°46'00" 9°36'00"	272.0	1774.0	0.4446± 0.008	0.7156± 0.001	1740± 5			

OBS.: (**) ASSUMED Ro = 0.710± 0.002

TABLE 5. **K/Ar ANALYTICAL RESULTS**

ROCK TYPE	MINERAL	LOCALITY	COORDINATES	% K	Vol.^{40} Ar RAD scc/g x10^{-40}	% ^{40}Ar RAD	AGE (m.y)
Carbonate -Apat. Vein	BIOTITE	Faz. Panelas	39°47'00" 11°28'00"	8.784	11.9934	99.2	1952± 80
Carbonate -Apat. Vein	PHLOGOPITE	Faz. Panelas	29°47'00" 11°28'00"	8.816	12.3872	98.6	1984± 80
Gneiss	HORNBLENDE	Faz. Panelas	39°47'00" 11°28'00"	0.237	0.3387	97.0	2006± 80

conclusion, if there were earlier separation between two cratonic blocks, junction must have taken place at least 2.6 b.y. ago.

Unpublished geochronological data(Y. Hasui, personal communication) for the southern part of the São Francisco craton at Minas Gerais State confirm the areal importance of the 2.6 b.y tectonic-metamorphic event and characterize the São Francisco craton as a very large (up to a half million of sq. Km) Archean block on the Earth's crust. On the other hand, K/Ar mineral ages again show a marked spread until late Precambrian times.

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Key to sample location (Figura 1)

(1) J–76, J–78, J–80
(2) J–84
(3) J–93, X–75
(4) J–103
(5) X–107
(6) X–33
(7) II–14
(8) X–38
(9) II–LIV
(10) B–4
(11) B–2
(12) X–50
(13) X–56,X–58
(14) LG-1 to LG-5, G–5, G–6
(15) J–24, J-25, J-26, G–9, G–12, G–13
(16) J–27
(17) J–35
(18) J–34
(19) J–32, J-33
(20) X-2
(21) MMC, ML, MML

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