UNMETAMORPHOSED LATE PROTEROZOIC MAFIC DYKES OF SALVADOR (BAHIA STATE, BRAZIL): GEOCHEMISTRY, PETROLOGY AND Sr-Nd ISOTOPES

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The unmetamorphosed mafic dykes of Salvador are located in the eastern portion of Bahia State (Fig. 1), and belong to the São Francisco Craton. The dykes intrude acid and basic granulites formed during the Transamazonian Orogeny (2.2 to 1.8 Ga; Cordani, 1973; Cordani & Brito Neves, 1982).

Two $^{40}Ar/^{39}Ar$ dates (D'Agrella Filho et al., 1989) of plagioclase from a dyke and biotite from a country-rock yielded 1,003 $\pm$ 33 and 1,021 $\pm$ 8 Ma, respectively. The latter age is considered representative of the intrusion time.

The dykes have a N-S trend with subvertical to vertical dips. Thickness is usually 2 - 3 m and ranges from a few cm to 50 m. The thickest dykes show typical grain-size variation, with chilled margins grading to coarse grained inner zones.

The investigated dykes have aphyric to porphyritic textures. In the fine grained ones (thickness < 2 m) and in the chilled margins of the thickest dykes (thickness > 10 m) predominate porphyritic and hyaline textures, while in the central parts of the last ones prevail slightly porphyritic to aphyric textures.

In general, the dykes are made up of plagioclase (labradorite), augite, opaques, and *scarse Fe-olivine* and pigeonite. Apatite and zircon may be present as accessory minerals. Biotite and amphibole thin rims of late crystallization appear around pyroxene grains.

According to De La Roche et al. (1980) and Bellieni et al. (1981) the dykes correspond to tholeiitic and transitional basalts, and subordinately, to andesi-basalts and lati-basalts. The dykes show a tholeiitic character and a distinct FeO_t enrichment. They are represented by two main

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rock-types which are characterized by low (<2% wt.) and high (2% wt.) TiO_2 and incompatible elements (LTI and HTI, respectively); only few samples have TiO_2 > 3 wt%. Most dykes have low mg-numbers (< 0.6), indicating that they do not represent primary melts: LTI = 0.43 - 0.70 (av. = 0.59 $\pm$ 0.07) and HTI = 0.39 - 0.53 (av. = 0.44 $\pm$ 0.04).

The distribution of major, minor and trace elements relative to MgO (Fig. 2) do not display well defined trends. In general, MgO decrease is associated with the increase of SiO_2, FeO_t, Na_2O, K_2O, P_2O_5, La, Y, Rb, Ba, Zr and Sr, and with the decrease of CaO, Cr and Ni. HTi-dykes present a more scattered distribution and are enriched in incompatible elements in comparison to LTi-dykes for similar MgO content.

Chondrite-normalized REE patterns for representative samples are reported in Figure 3. LTi-dykes are characterized by a slightly fractionated LREE, while HTi-dykes present an overall enrichment in REE, mainly in LREE, with respect to LTi-dykes. Both groups present, in general, small negative and positive Eu anomaly. The comparison between samples from the margin and central parts of the same dykes reveals that the central parts are slightly more fractionated and have lower values of Eu anomaly.

The initial (1.02Ga) Sr and Nd isotope ratios of representative LTi- and HTi-dykes are plotted in Figure 4. They have initial Nd ratios (Nd_0) similar to that of the Bulk Earth, and plot in the enriched quadrant of the mantle array. LTi-dykes present sistematically Nd_0 values lower than those of HTi.

The investigated dykes of Salvador are, in many aspects, similar to those of similar age (1.0 - 1.1 Ga) that occur in the Olivença-Ilhéus area, which however are related to isotopically time-integrated depleted mantle source(s) (Bellieni et al., 1991). The chemical, mineralogical and isotope results suggest that the late Proterozoic dykes of Salvador are typical of intraplate continental basalts.

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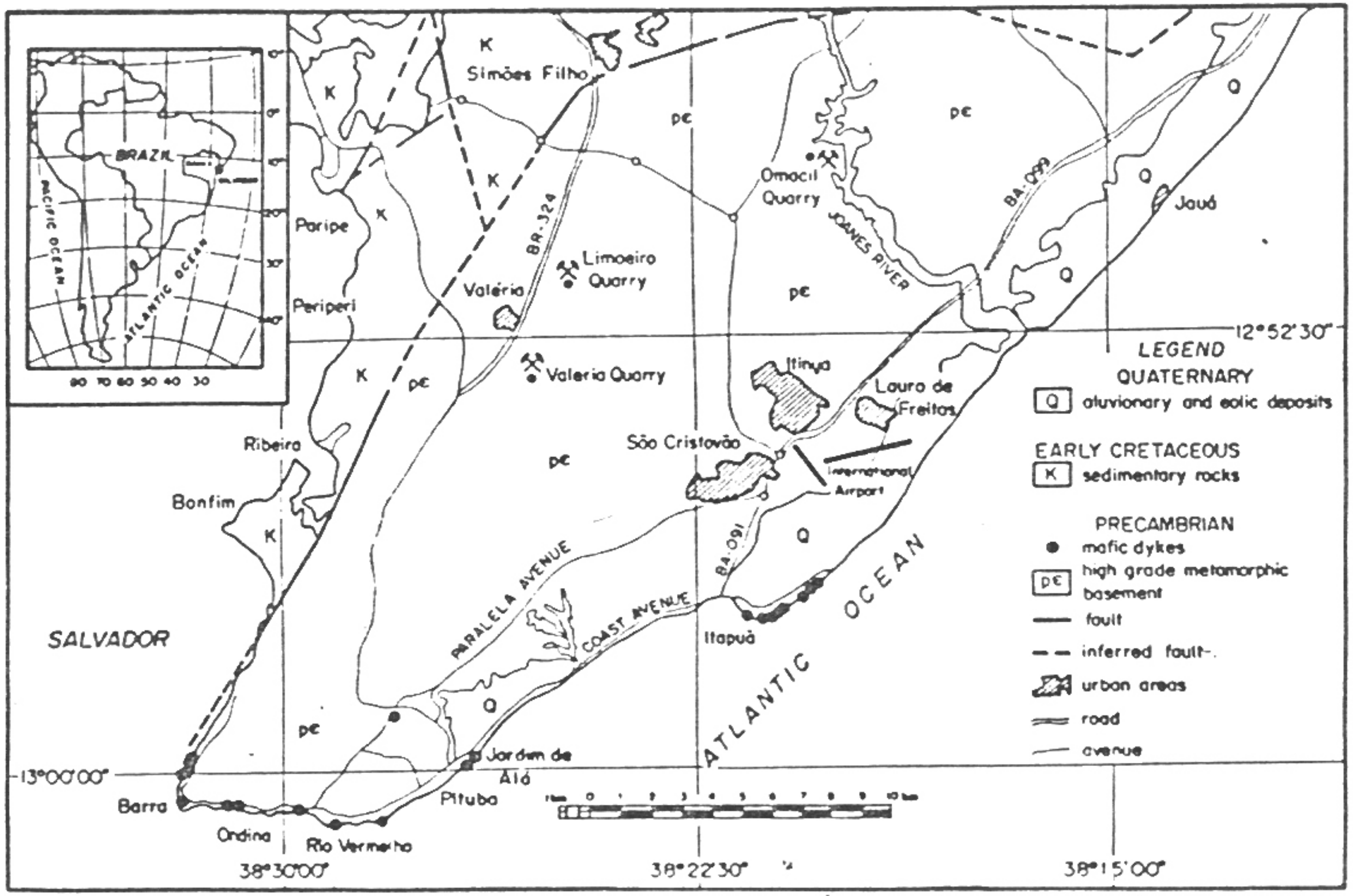

Figure 1 - Simplified geological map of Salvador region.

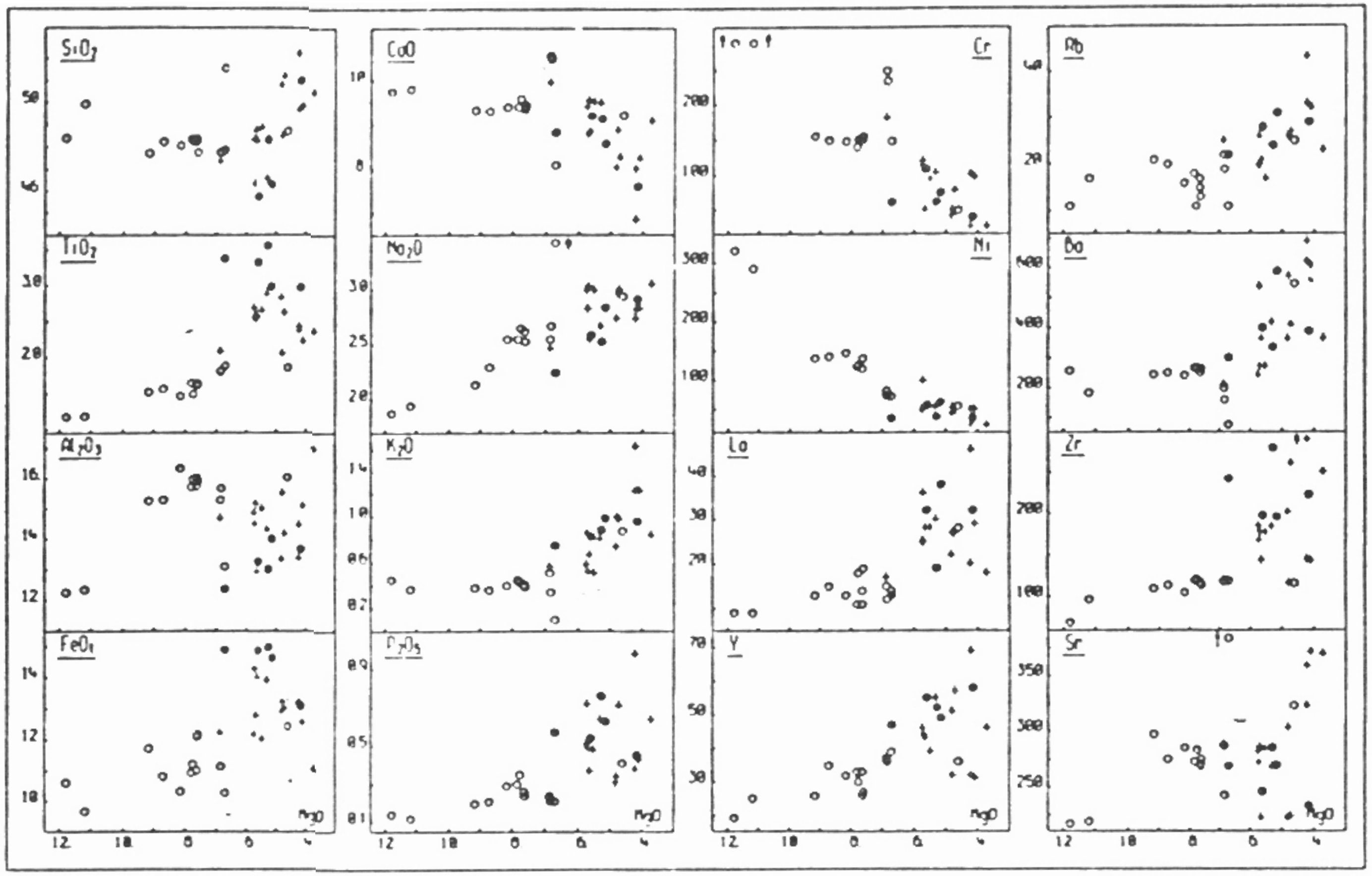

Figure 2 - MgO (wt%) vs. major, minor (wt%) and trace (ppm) element variation diagrams for Salvador mafic dykes. Open circles = TiO_2 < 2%; Crosses = TiO_2 : 2-3%; Solid circles = TiO_2 > 3%.

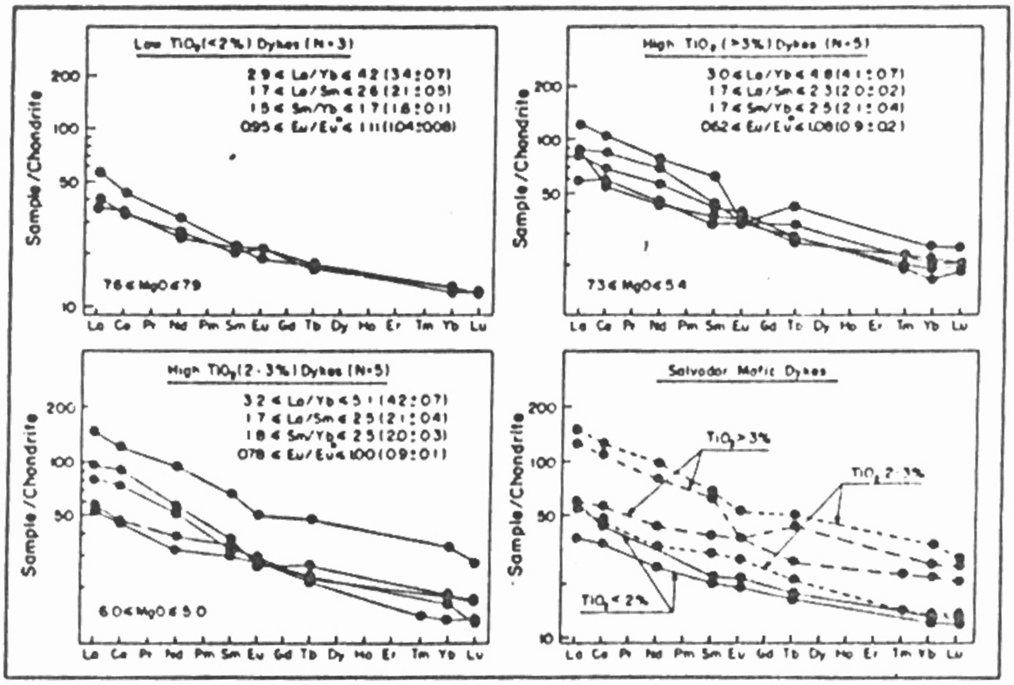

Figure 3 - Chondrite-normalized REE patterns for Salvador mafic dykes.

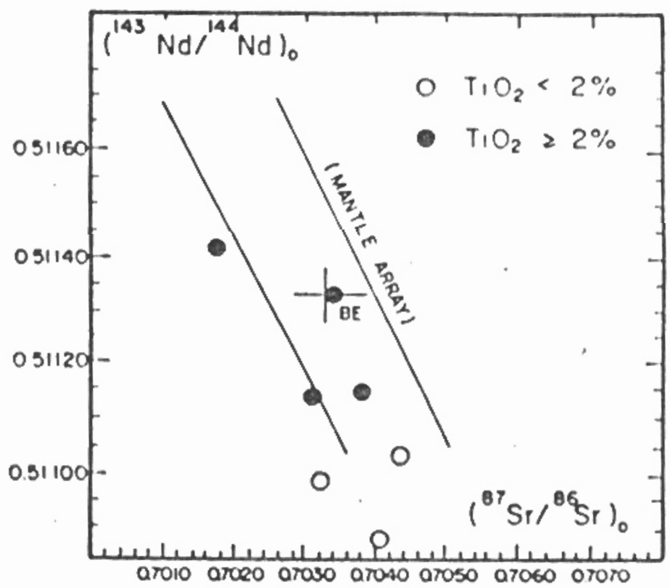

Figure 4 - Initial $^{87}Sr/^{86}Sr$ ratio vs. initial $^{143}Nd/^{144}Nd$ ratio diagram for Salvador mafic dykes. Sr and Nd isotope ratios calculated back to 1,020 Ma; BE = Bulk Earth.