PRELIMINARY PETROGRAPHIC AND GEOCHEMICAL CONSIDERATIONS ON THE PRECAMBRIAN MAFIC DYKES OF THE ILHÉUS-OLIVENÇA AREA, BAHIA

M.A.F.Tanner de Oliveira[1]
G.Bellieni[2]
P.Comin-Chiaramonti[3]
A.J.Melfi[4]
E.M.Piccirillo[5]
C.Moraes-Brito[6]

GEOLOGICAL SETTING

Anorogenic dykes occur over 18 km of the coast of the state of Bahia. They show NNW trends and are remarkably concentrated in the area between Ilhéus and Olivença where they constitute one of the best mafic dyke exposures of Brazil (Fig. 1). The dykes cut granulites of the "Atlantic domain" (BARBOSA, 1986) and are associated with tensional tectonics of EW, WNW and ENE trends. They are vertical to subvertical, 20 cm to 30 m wide (most often 3 m wide), and exhibit structural features that suggest flow during emplacement from east to west.

CLASSIFICATION AND PETROGRAPHY

Classification of the mafic rocks (Fig. 2) is in accordance with the De La ROCHE et al. (1980) parameters, R_1 and R_2, modified by BELLIENI et al. (1981), and adding the high and low titanium qualifiers (HTi=$TiO_2 > 2.0\%$) (LTi = $TiO_2 < 2.0\%$). Thus, the mafic rocks were classified as tholeiitic basalts (HTi and LTi), transitional basalts (HTi-LTi), andesi-basalts (HTi), lati-basalts (HTi) and hawaiites (HTi).

The studied mafic rocks are mesocratic (dark gray, generally), aphanitc to phaneritic (fine to medium grained), porphyritic or aphyric, and with ophitic to intergranular textures. The major mineralogical composition is determined by plagioclase and pyroxene, but pyroxene predominates in practically all of the classified types, except for the hawaiites, in which plagioclase predominates. The plagioclase is labradorite. The

[1]Instituto de Geociências, Universidade Federal da Bahia, Rua Caetano Moura 123, 40210 Salvador, BA, Brasil.
[2]Dipartimento di Mineralogia e Petrologia, Università di Padova, Corso Garibaldi 37, 35100 Padova, Italia.
[3]Istituto di Mineralogia, Petrologia e Geochimica, Università di Palermo, Via Archiraffi, 90100 Palermo, Italia.
[4]Instituto Astronômico e Geofísico, Universidade de São Paulo, Caixa Postal 30627, 01051 São Paulo, SP, Brasil.
[5]Istituto di Mineralogia e Petrologia, Università di Trieste, Piazzale Europa 1, 34100 Trieste, Italia.

anorthite proportion is lower for the lati-basalts (53%) than for the hawaiites (61%). Augite is the most common pyroxene, but calcic augite and pigeonite have been recognized in the andesi-basalts and transitional basalts. Moreover, hypersthene is common in the transitional basalts as well as in the tholeiites. Olivine is commom in the hawaiites and is rare in the andesi-basalts and tholeiites. Magnetite and subordinate ilmenite are oxides present within the rocks and as phenocrysts (0.1 to 0.7% in frequency); in the aphyric types the oxides vary between 5% and 24%. Apatite and zircon are the accessory minerals. Primary hornblende has been found in the hawaiites and lati-basalts. Secondary minerals are uraninite, chlorite, biotite and saussurite.

GEOCHEMISTRY

Figure 3 shows the AFM diagram for the studied samples in which the observed trend is coherent with the tholeiitic field (in accordance with IRVINE & BARAGAR, 1971), with Fe-enrichment for the HTi types. A similar geochemical pattern is observed for the Itabuna-Itaju mafic dykes.

Figure 4 presents the REE distribution pattern normalized for chondritic values. The data plots are similar to the field for Columbia River continental basalts. In addition, the chemistry of LTi types resembles that for intraplate oceanic basalts (Hawaii types). The REE fractionation index (La/Nb) is approximately constant for the studied rocks (HTi = 3.96 and LTi = 3.38).

Figure 5 shows postulated chemical trends according to ANDERSON (1981). The sources of mid-oceanic ridge basalts and hotspots (principal layer of upper mantle enrichment) are delineated, the latter being associated with the generation of continental basalts (kimberlites, alkaline basalts, tholeiites). From this diagram it is clear that the continental crust is not the unique enriched source for continental basalts. In fact, in this diagram the studied basaltic dykes show a distribution which is consistent with continental tholeiites generated by partial melting of enriched mantle.

REFERENCES

ANDERSON, D.L. (1981) Hotspots, basalts and the evolution of the mantle. **Science, 213**:82-89.

BARBOSA, J. (1986) Constitution on lithologique et metamorphic de la region granulitique du sud de Bahia, Brésil. Paris, 401p. (Thése du Doctorat - Université Pierre et Marie Curie).

BELLIENI, G.; COMIN-CHIARAMONTI, P.; MARQUES, L.S.; MELFI, A.J.; PICCIRILLO, E.M.; STOLFA, D. (1984) Low pressure evolution of basalt sills from boreholes in the Paraná plateau (Brazil): petrology and geochemical aspects bearing on their mantle origin. **Neues Jahrbuch für Mineralogie Abhandlungen, 150**(3):273-306.

De La ROCHE, H.; LETERRIER, J.; GRANDCLAUD, P.; MARCHAL, M. (1980) A classification of volcanic and plutonic rocks using R_1 - R_2 diagram and major element analyses. Its relationships with current nomenclature. **Chemical Geology, 29**:183-210.

IRVINE , T.N. & BARAGAR, W.R.A. (1971) A guide to the chemical classification of the common volcanic rocks. **Canadian Journal of Earth Sciences, 8**:523-548.

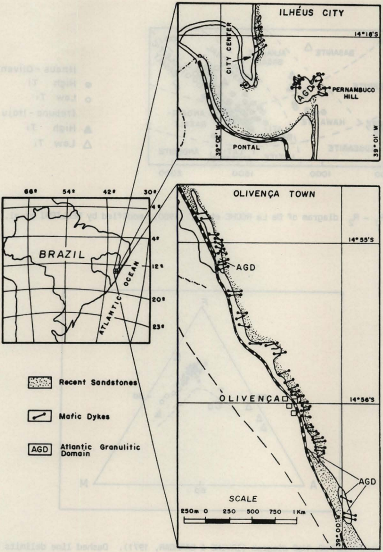

Figure 1 - Geologic setting of the Ilhéus-Olivença area.

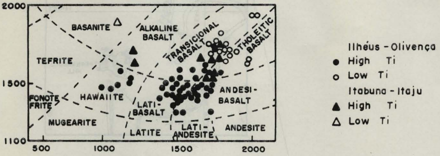

Figure 2 - R_1 - R_2 diagram of De La ROCHE et al. (1980), modified by BELLIENI et al. (1981).

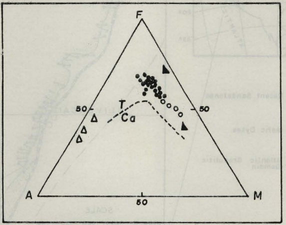

Figure 3 - Na_2O-K_2O/FeO_t/MgO diagram (IRVINE & BARAGAR, 1971). Dashed line delimits the calc-alkaline (Ca) and tholeiite (T) fields.

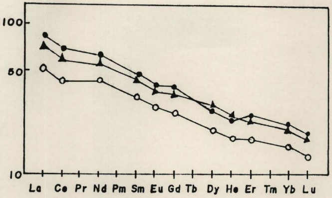

Figure 4 - REE distribution for the studied rocks. Values normalized for chondrites (symbols as in Fig. 1).

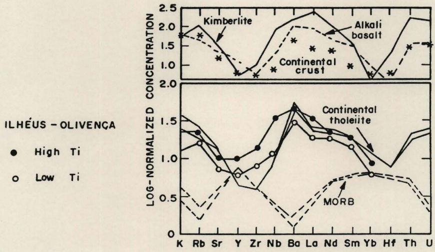

Figure 5 - Distribution of trace elements normalized for primordial mantle values (ANDERSON, 1981). For explanation, see text.