Doc-849

International Conference "Geochemical Evolution of the Continental Crust"

symo=0779857

, 1988

0779857

Abstracts

ORGANIZING COMMITTEE

Coordinator	C.B. Gomes
Members	C.T. Correia
	M.C.H. Figueiredo
	E. Ruberti
	J.B. Sígolo
	W. Teixeira
Collaborators	A. Carvalho
	C.M.C. Costa
	T.R. Fairchild
	A.L.F. Gomes
	R.C. Lemos
	K.R.B. Vancini

SPONSORING ORGANIZATIONS

International Association of Geochemistry and Cosmochemistry
Sociedade Brasileira de Geoquímica
Instituto de Geociências da Universidade de São Paulo
Fundação de Amparo à Pesquisa do Estado de São Paulo
Conselho Nacional de Desenvolvimento Científico e Tecnológico
Financiadora de Estudos e Projetos

dunitic-harzburgitic keels they provided platforms (tectospheres, c.f. Jordan, 1981) for further plate tectonic accretion and collision. Prior to this scenario the average MOR must have stood above sea level and consequently "dry recycling" of earth lithosphere prevailed, without formation of significant sialic crust.

References

Armstrong, R.A., Compston, W., de Wit, M.J. (1988) Extended Abstr. S.A. Geocongress, Durban, July (manuscript in preparation).

Barker, F., Arth, J.G., Hudson, T. (1981) Phil. Trans. Roy. Soc. Lond., A301:293-301.

Campbell, I.H. & Taylor, S.R. (1983) Geophys. Res. Lett., 10:1061-1064.

de Beer, J.H., Stettler, E.H., du Plessis, J.G., Blume, J. (1988) S. Afr. Journ. Geol. (in press).

de Wit, M.J. (1982) Jour. Struct. Geology, 4:117-136.

de Wit, M.J. (1983) Geol. Soc. S. Afr. Spec. Publ., 9:185-187.

de Wit, M.J., Hart, R., Hart, R. (1987a) Journ. African Earth. Sci., 6:681-730.

de Wit, M.J., Armstrong, R., Hart, R.J., Wilson, A.M. (1987b) Tectonics, 6:529-549.

de Wit, M.J. & Tredoux, M. (1988) In: H.M. Prichard et al. (eds.) Geoplatinum´87 Elsevier (in press).

Hart, R., Pyle, D., de Wit, M.J. (1987) In: R. Rodrigues-Clement & Y. Tardy (eds.) Geochemistry and mineral formation in the earth surface. Consejo Superior de Investigaciones Cientificas, Aguirre Press, Madrid.

Jordan, T.H. (1981) Phil. Trans. Roy. Soc. Lond., A 301:373.

McGregor, V.R. (1979) In: F. Barker (ed.) Trondhjemites, dacites and related rocks.Elsevier, Amsterdam, p. 133-147.

Tredoux, M., de Wit, M.J., Hart, R.J., Armstrong, R.A., Lindsay, N.M., Sellschop, J.P.F. (1988) Journ. Geophys. Res. (in press).

KOMATIITE AND THOLEIITE FLOWS IN THE HIDROLINA GREENSTONE BELT, CENTRAL GOIÁS, BRAZIL

sysno= 0779857

G. Rivalenti[1], V.A.V. Girardi[2], M. Coltorti[3], C.T. Correia[2], M. Mazzucchelli[3]

1.Istituto de Mineralogia e Petrologia, Università di Modena, Italy
2.Instituto de Geociências, Universidade de São Paulo, Brazil
3.Istituto di Mineralogia, Università di Ferrara, Italy

The Archean greenstone belt of Hidrolina is a severely tectonized and metamorphosed volcano-sedimentary sequence. Stratigraphically, it is distinguished into a lower (LS) and an upper (US) sequence. The lower sequence consists of three units: a) LS1, where the igneous flows are represented by peridotitic komatiites (MgO 28-48%); b) LS2, where the igneous component is peridotitic (MgO ~ 24-28%) and basaltic komatiite (MgO 9-11%); c) LS3, where pyroxenitic (MgO ~ 15%) and basaltic komatiites (MgO 9-11%) occur. The igneous flows in US are tholeiites (MgO 6-11%) interlayered with dacites and rhyolites.

The variation patterns of alkalis and alkaline earth metals (K, Na, Rb, Ba and Sr) and perhaps of Y are inconsistent with possible igneous trends: it is, therefore, inferred that these elements have been mobilized during metamorphism. On the contrary, Si, Ti, Al, Fe, Ca, P, Cr, Zr, Sc and V behave as essentially immobile elements (Fig. 1).

Mass balance calculations have permitted to distinguish the protoliths corresponding to mixtures of liquid and crystals from those that were essentially liquids (pre-metamorphic porphyritic lavas or cumulitic rocks, and aphyric lavas, respectively). Liquidus phases were olivine in LS1 and LS2, olivine and clinopyroxene in LS3, clinopyroxene and plagioclase in US.

CMAS plots of the aphyric protoliths (Fig. 2) show that: a) melting probably involved a source in spinel-peridotite facies; b) the peridotitic komatiites may correspond with mixtures of liquid of basaltic or pyroxenitic komatiite composition with source material; c) the LS3 pyroxenitic komatiites are formed by a melting degree close to the exaustion of clinopyroxene in the source.

The decrease of the CaO/Al_2O_3 ratio in the MgO range 28-38% (Fig. 3) is consistent with the possibility that these rocks are mixtures of liquid and source.

The models of melting in Figures 4 and 5 show that LS2 may correspond with 20-40%, LS3 with 20-28% and US with 18-20% melting of a spinel peridotite and that LS1 peridotitic komatiites are consistent with the mixing model suggested by the CMAS projections.

For the whole set of samples, Ti/Zr and P/Zr ratios are higher than chondritic, while Ti/P is lower (Figs. 4 and 5), suggesting that the source of the komatiite and tholeiites was depleted in Zr, Ti and P. The depletion may be calculated as extraction of 5% melt from a mantle with chondritic element ratios (Fig. 4, Zr plot). The source of LS3 and US is, on its turn, deplated in Ti, Zr and P with respect to that of LS1 and LS2. The variations in the source composition indicate small-scale heterogeneities of the Archean mantle.

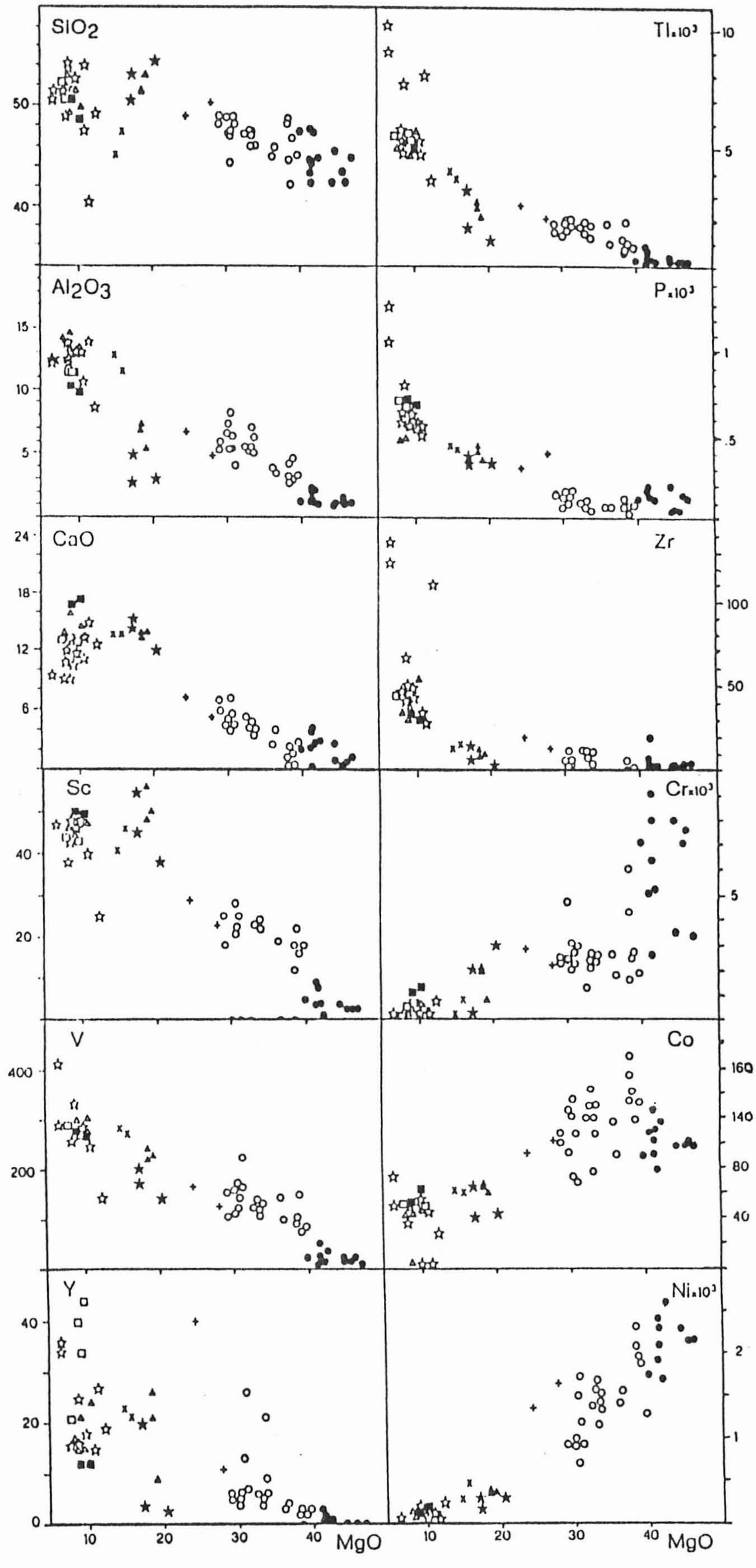

Figure 1 - Plot of MgO vs. SiO_2, Al_2O_3, CaO, (wt%), and Ti, P, Zr, Y, Sc, V, Ni, Co, Cr (ppm). Analyses are calculated anhydrous. Symbols: circles = LS1 peridotitic komatiites; dots = LS1 rocks enriched in ol; open squares = LS2 basaltic komatiites; crosses = LS2 pyroxenitic komatiites; black squares = LS2 mixtures of liquid and crystals; open triangles = LS3 basaltic komatiites; X = LS3 pyroxenitic komatiites; black triangles = LS3 mixtures of liquid and crystals; open stars = US tholeiites; black stars = US mixtures of liquid and crystals.

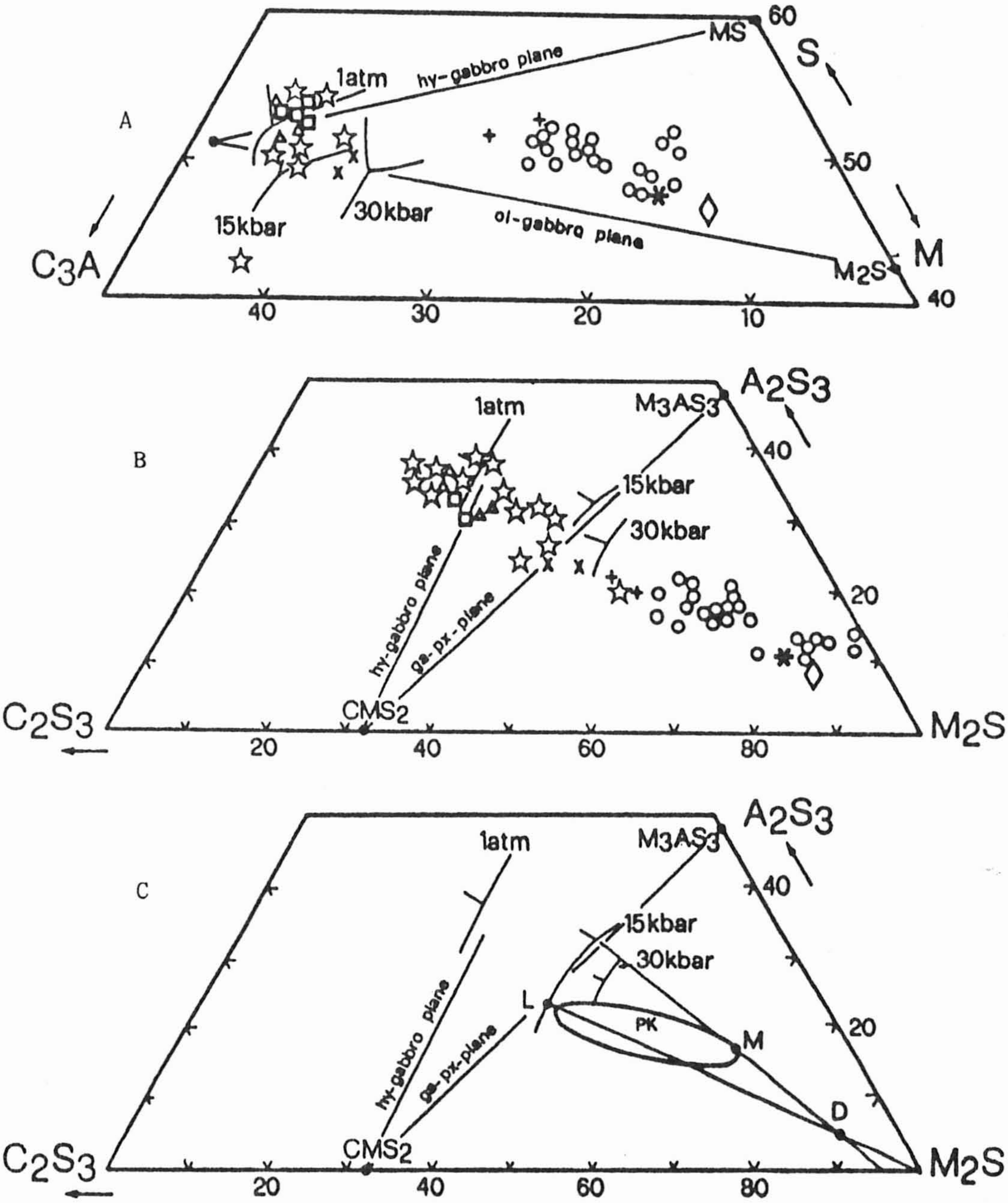

Figure 2 -- CMAS projection from diopside (a) and enstatite (b), according to O´Hara (1968). Mixtures of liquid and crystals have been omitted. Symbols as in Figure 1; diamond = undepleted mantle (Carter, 1970); asterisk = pyrolite (Green & Ringwood, 1967). (c) = model to explain the trend of the PK, according to Smith and Erlank (1982). M = undepleted mantle; D = depleted mantle; L = liquid composition at cpx exhaustion in the source of composition D. PK (contoured field) may be formed by mixing of L and any mantle composition between M and D.

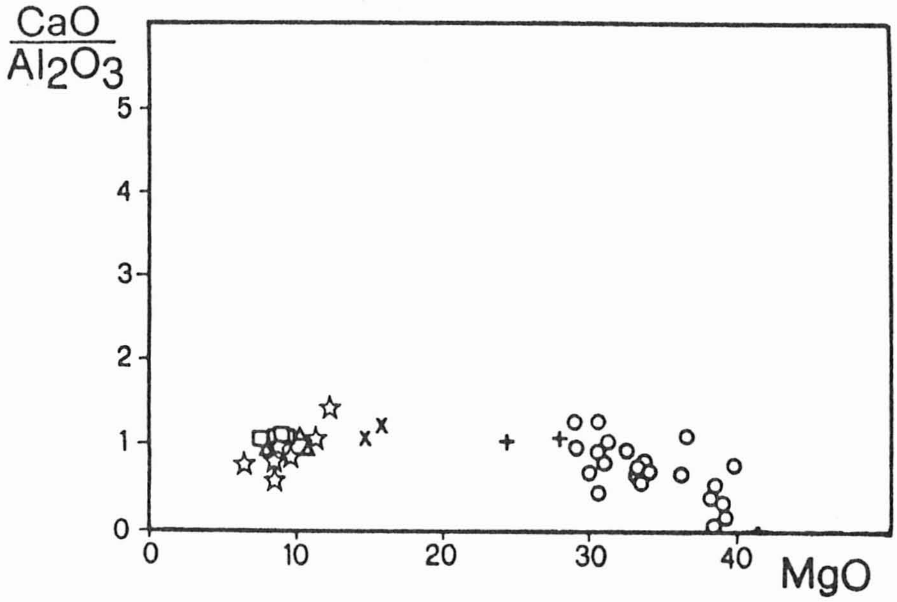

Figure 3 -- Plot of MgO (wt%) vs. the CaO/Al_2O_3 ratio for the samples approaching the composition of a liquid. Symbols as in Figure 1.

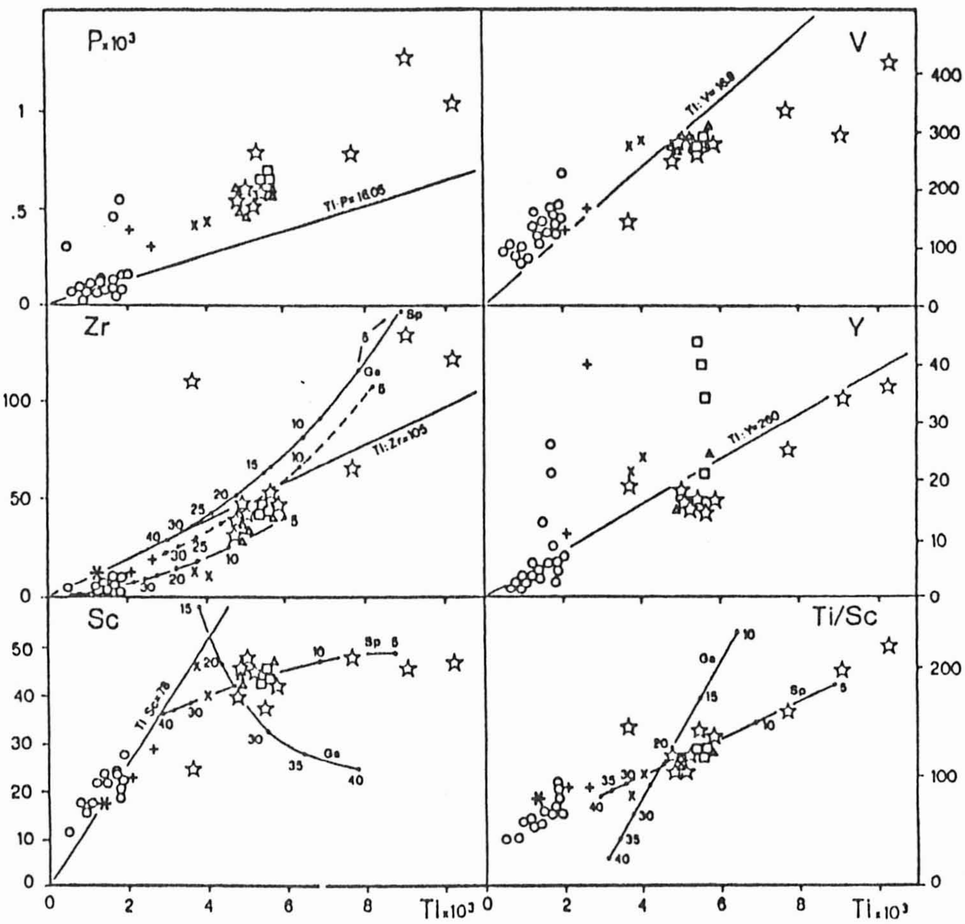

Figure 4 -- Plot of Ti vs. Zr, P, V, Sc, and Y (ppm) and vs. the Ti/Sc ratio for the samples approaching the composition of a liquid. Chondrite values are from Wanke et al. (1974), Jagoutz et al. (1979), Wood (1979) , and Nesbitt & Sun (1980). Symbols as in Figure 1.

The Zr, Sc and Ti/Sc concentration calculated in liquids formed by non modal partial melting of mantle in garnet- or spinel-peridotite facies is also reported. Model mantle (asterisk) is that of Jagoutz et al. (1979). The formula used is $C_1=C_0/[D+F(1-P)]$, where C_1 is the concentration of the element in the liquid; C_0 is the concentration in the source, D is the bulk partition coefficient for the source; P is the bulk partition coefficient for the melting minerals ("eutectic"); F is the proportion of melting. Mineral proportions assumed for the garnet-facies source are: ol=0.6, opx=0.2, cpx=0.1, ga=0.1. Mineral proportions assumed for the spinel-facies are: ol=0.6, opx=0.2, cpx=0.15, sp=0.05. The melting proportions for the garnet- and spinel-facies are, respectively: ol=0.15, opx=0.05, cpx=0.4, ga=0.4 and ol=0.15, opx=0.15, cpx=0.4, sp=0.3. In the Zr plot, the short-dashed and the long-dashed lines refer to melting of a source depleted by previous 5% and 10% melting, repectively.

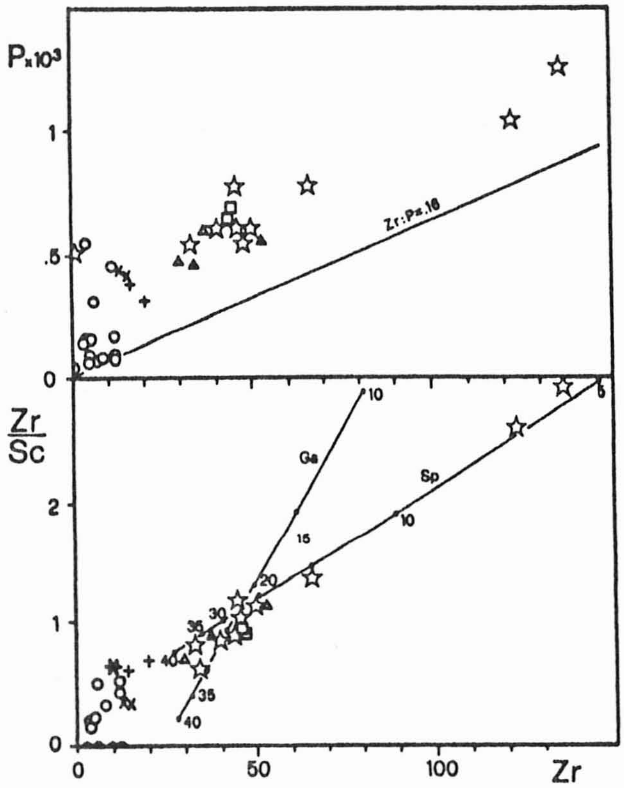

Figure 5 -- Plot of Zr vs. P (ppm) and the Zr/Sc ratio for the samples approaching the composition of a liquid. See the caption of Figure 4 for the model melting curve and for symbols.