2001 → In: Extend Abstracts São Paulo

NEW EVIDENCE OF RECURRING CONVERGENT MARGIN MAGMATISM IN THE EASTERN CENTRAL RONDÔNIA, BRAZIL.

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a-Financial support: FINEP/PADCT II (65.94.0249.00) and FAPESP (Process Nº 00/08033-5)

Background

The Rio Negro-Juruena Geochronological Province, "sensu" Cordani et al., 1979. Teixeira et al., 1989, Tassinari and Macambira, 1999, has been, traditionally regarded as a single geotectonic unit extending from ca. 1.80 to 1.55 Ga. More recently it has been divided by Santos et al., 2000 into two distinct provinces, the northern termed Rio Negro Province, and the southern part, Juruena Province.

Recent advances based on new geochronological and geological data, (Tassinari et al., 2000; Pinho et al., 1977; Van Schmus et al., 1998; Bettencourt et al., 1999; Rizzoto, 1999; Geraldes et al., in press; Payolla et al., subm; Santos et al., 2000), and references therein, have assisted in defining, in its Juruena segment, two distinct orogenies, such as: 1) the Alto Jauru orogen (1.79 – 1.74 Ga), interpreted as a SW extension in Mato Grosso state of the Rio Negro - Juruena Province and the equivalent units, in northern Rondônia, termed Jamari Complex, and Gneissic Migmatitic Jauru Complex (Scandolara et al., 1999) encompassing calc-alkaline and volcano-sedimentary arc related rocks, ranging in age from 1.76 and 1.73 Ga (Tassinari et al., 1999; Payolla et al., subm; Santos et al., op. cit., and 2) Cachoeirinha orogen (1.57 – 1.52Ga) (Geraldes, et al., in press), in Mato Grosso state. The absence of unequivocal evidence of episodic westward growth, including correspondent convergent-margin magmatism, in the Proterozoic SW margin of the Amazonian Craton, between the period < 1.7Ga and >1.6 Ga, led us to believe the existence of a long period of stabilization between 1.7 and 1.6 Ga, for the SW Amazonian Craton.

Meanwhile our preliminary new U-Pb zircon data ages record a previously undocumented major accretion arc-related magmatic event (yet to be proven at length), within the time interval, 1.65 and 1.63 Ga, thus constraining a probable north-northeastward trending recurring subducting zone (present-day coordinates).

U-Pb zircon data

U-Pb zircon ages were determined for two samples representative of the tonalitic gneiss and granulite associations (Fig. 1). The sample 98-JWB-3/A was collected in the Pedroca farm, 1.2 km south from Presidente Médici city along the BR-364 highway where a gray well-banded tonalitic orthogneiss occurs (Fig. 1). It exhibits discontinuous amphibolitic and medium- to coarse-grained quartz-feldspar bands. The zircons were separated from a homogeneous portion of the tonalitic gneiss, devoid of amphibolitic and quartz-feldspar bands. This rock is fine- to medium-grained, exhibits porphyritic texture and consists of andesine, quartz, biotite, epidote, allanite, Fe(Ti) oxides, orthoclase, apatite, zircon and sparse garnet with plagioclase rims. Four zircon fractions define an age of 1631+/-8 Ma (Fig. 2, Table 1), which is interpreted as the time of emplacement of the tonalitic protholith.

The sample 98-JWB-10/A was collected in a quarry in the Paraíso farm, 5 km southeast from Jaru city along the BR-364 highway (Fig. 3, Table 1). In this site occurs a migmatite, encompassing a paleossome (banded granulitic gneisses: mafic granulite and charno-enderbite), and a neossome (garnet bearing granitic gneiss). The zircons were separated from a homogeneous portion of the charno-enderbitic gneiss paleossome. The mineral assemblage consists of microperthitic orthoclase, plagioclase (oligoclase-andesine), quartz, orthopyroxene, green hornblende, biotite, garnet, apatite, Fe(Ti) oxides and zircon. Four zircon fractions define a discordia line which yields an upper intercept of 1655+/-11 Ma (Fig. 3, Table 1).

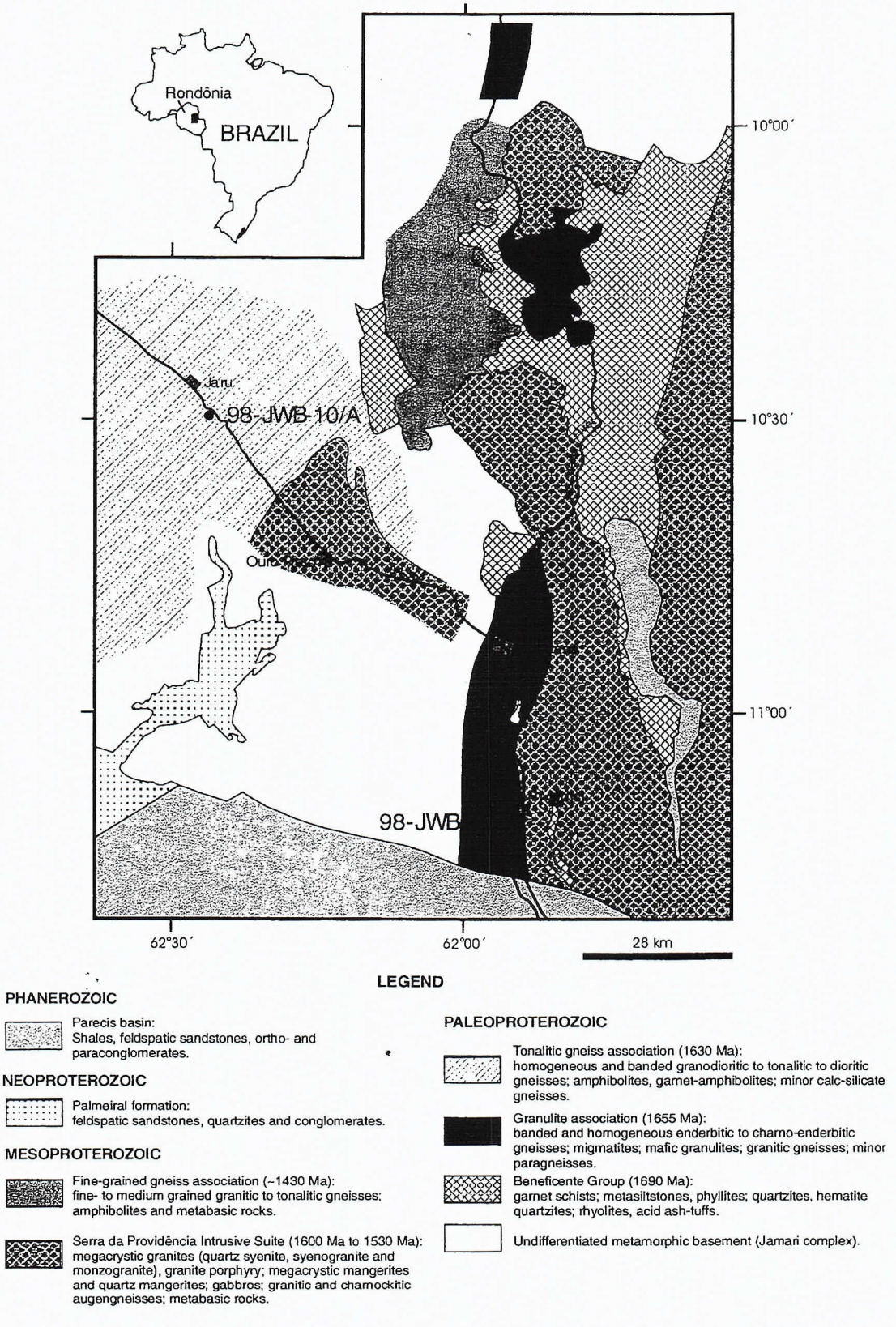

Figure 1. Geological sketch map of the study area showing the sample sites.

SPU	Magnetic fraction	207/205#	Error (%)	206/238#	Error (%)	206/204*	Pb (ppm)	U (ppm)	Weight (mg)	207/206 Age (Ma)
98 JWB3A										
680	NM (-3)	3,64436	0,603	0,26275	0,598	998,17	43,1	160	0,1299	1635 +/- 1
679	M (-3)	3,49313	0,921	0,25174	0,916	356,49	114	394,7	0,1186	1636 +/- 2
806	M (-2)	3,51019	1,57	0,25387	1,21	3487,43	103,7	414,9	0,09886	1629 +/- 2
807	M (-3)	3,58216	1,14	0,259602	1,13	3049,14	104,5	408,1	0,1092	1625 +/- 3
98 JWB10A										
682	M (-5)	3,92447	0,653	0,281946	0,605	6329,53	92,1	332,2	0,17	1642 +/- 1
681	NM (-5)	3,93955	0,68	0,281225	0,678	4127,93	104,7	378,1	0,116	1654 +/- 2
808	NM (-5)	3,65624	1,61	0,261023	1,61	3380,81	137,9	534,8	0,1062	1653 +/- 2
809	M (-5)	4,03548	1,14	0,286648	1,13	10075,45	135,3	480,9	0,1061	1663 +/- 2

Table 1 – U-Pb analytical data. SPU – laboratory number; Magnetic fractions: number in parentheses indicates the tilt used on Frantz separator at 1.5amp. current,: # - radiogenic Pb corrected for blank and initial Pb, U corrected for blank; * - not corrected for blank or non-radiogenic Pb.;Total U and Pb concentrations corrected for analytical blank; Ages: given in Ma using Ludwig Isoplot/Ex program (1998), decay constants recommended by Steiger and Jäger (1977).

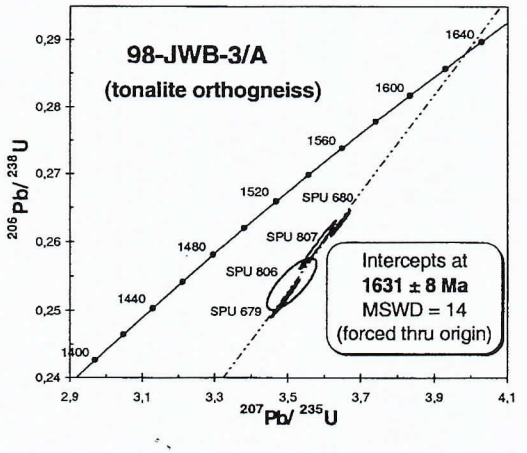

Figure 2 Concordia plot for sample 98-JWB-3/A

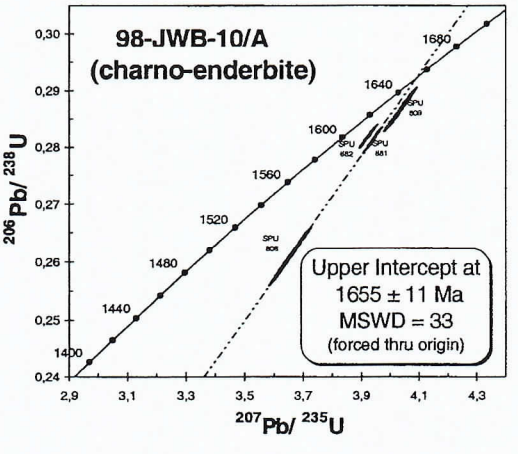

Figure 3 Concordia plot for sample 98-JWB-10/A

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The large uncertainty reflects the discordance of the zircon fractions or are induced by significant Pb loss during granulitic metamorphic episode or deformation during Sunsas event.

This finding open new prospective of better understanding of the orogenic events and correspondent individual stages as well as the temporal relationship between accretion and correlatable bimodal rapakivi magmatism. After further ongoing SHRIMP dating we hope that the 1.67 – 1.64 Ga geochronological gap will be closed.

Regional implications

A balance of recent achieved U-Pb geochronological data, within the time interval 1.8 and 1.52 Ga, suggests successive westward growth including, at least, three separate orogenic events. They are: 1) northern Rondônia segment and western Mato Grosso calc-alkaline arc-accretions at 1.75 and 1.70 Ga, and the recognized counterpart termed Jauru Orogen, at 1.79 and 1.74 Ga; 2) the proposed eastern-central Rondônia arc-accretion at 1.65 and 1.63 Ga, and 3)

Cachoeirinha orogen (Southern Mato Grosso), at 1.57 and 1.52 Ga.

Emplacements of temporal correlative in inboard settings, of bimodal rapakivi magmatism were instigated by these accretionary events, further north and northeast. They are poorly documented by the Roosevelt volcano-sedimentary sequences (1.76-1.75Ga) (Santos et al., 2000), Aripuanã volcano-plutonic sequences and bimodal deformed and underformed magmatic rocks at 1.79 and 1.68 Ga, Teles Pires acid to intermediate volcanic sequences (1.65 – 1.64Ga),and Serra da Providência Intrusive Suite (1.6-1.52Ga.).

The finding leaves it clear that the evolutionary geotectonic history of the SW- Amazonian Craton is becoming, day after day, very similar to the observed in Baltica and Laurentia more particularly in SW Sweden (Åhäll and Gower, 1997; Åhäll et al., 2000), during Gothian orogeny (1.75 – 1.55 Ga), which reinforces the recent models which postulate Laurentia- Baltica- Amazonian alignment along a continuous southern margin of a super continent as postulated by Dalziel, 1992, Hoffman, 1992; Sadowski and Bettencourt, 1996.

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