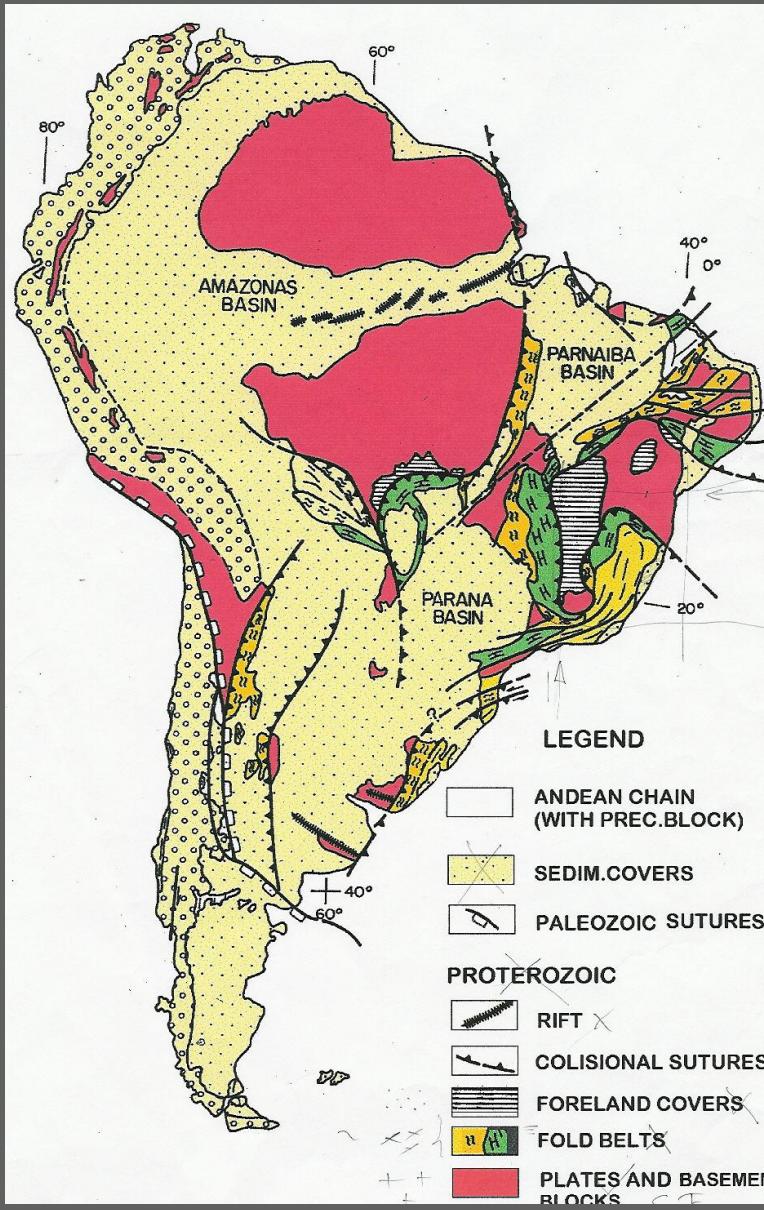


The background image shows a rugged, rocky terrain with distinct horizontal sedimentary rock layers. Sparse green vegetation, including small trees and shrubs, grows on the ledges and slopes. The sky above is a clear, pale blue with a few wispy white clouds.

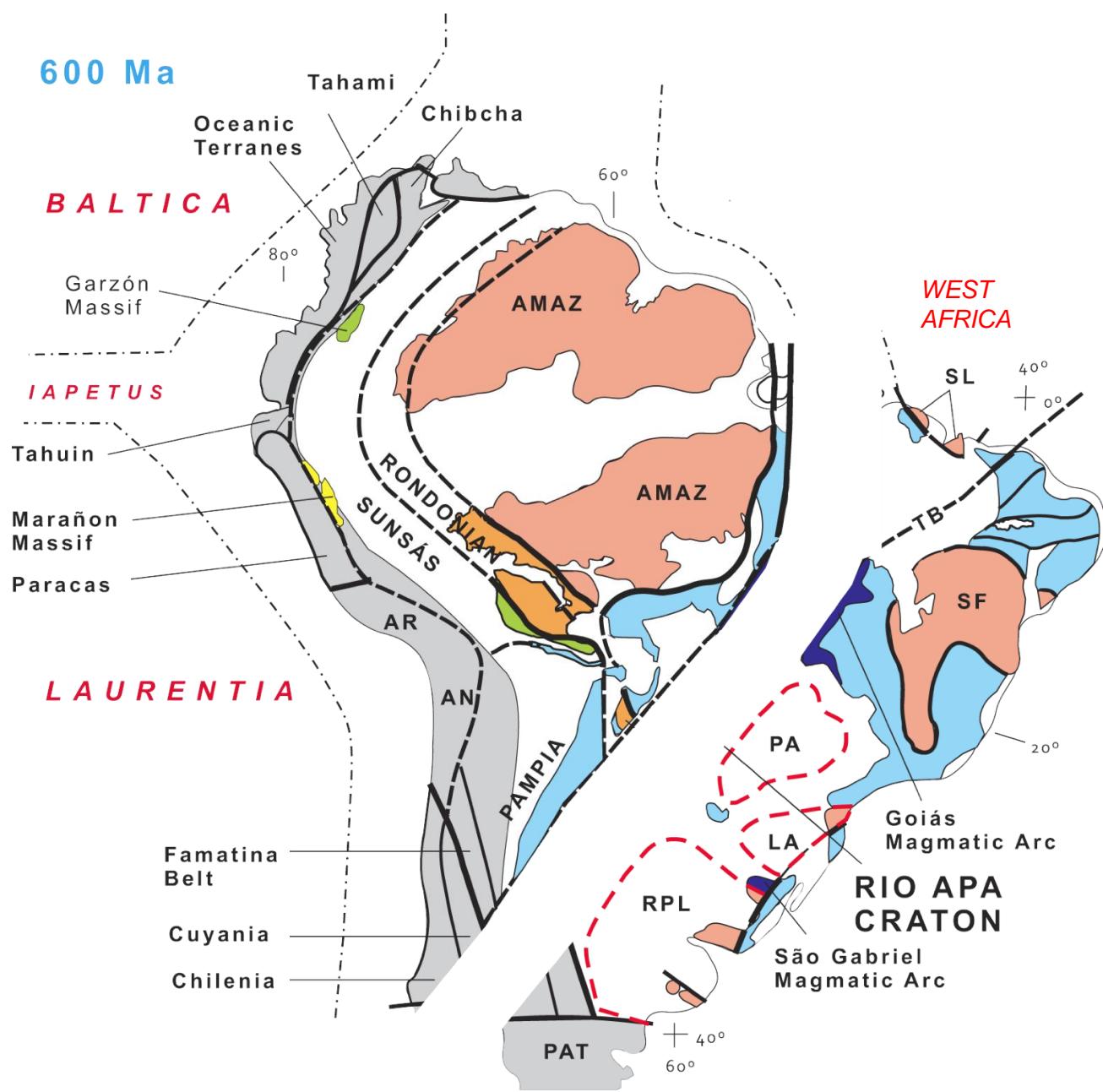
# Geotectônica do Brasil: uma síntese

Reinhardt A. Fuck  
Benjamim Bley de Brito Neves

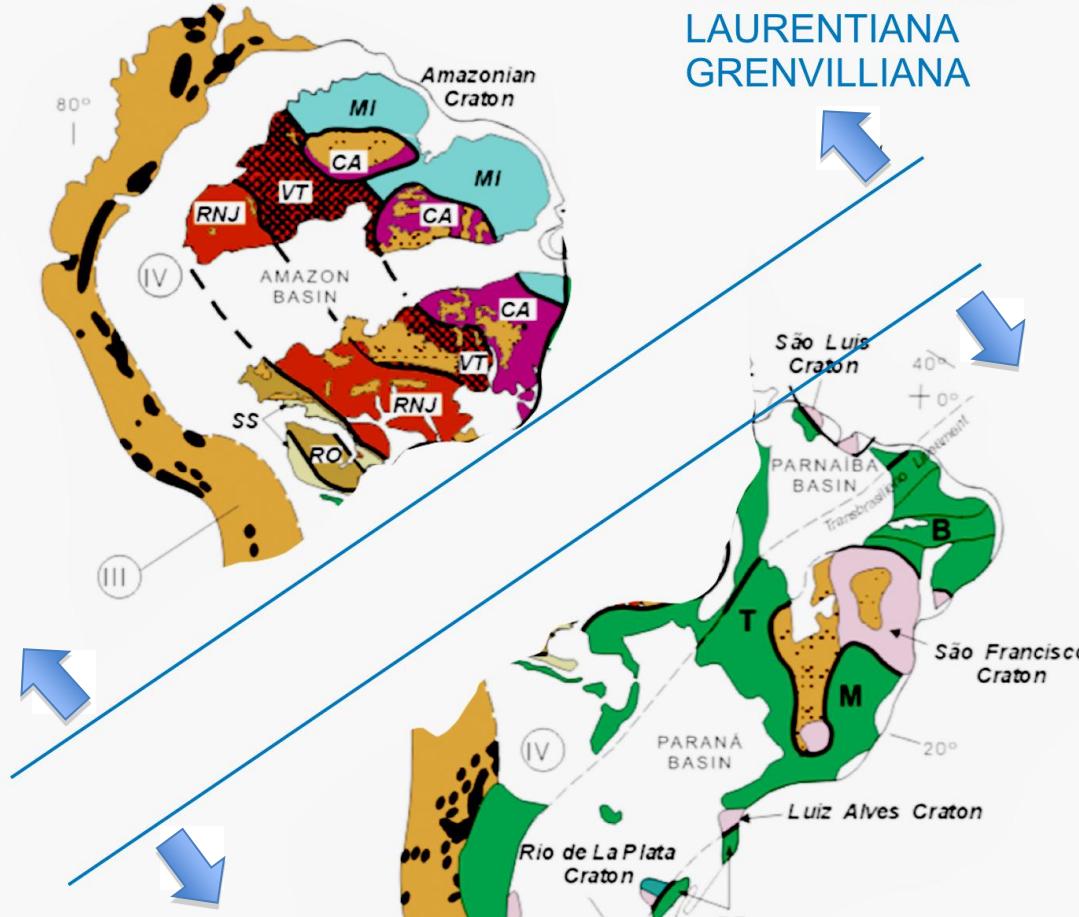
## América do Sul: Principais traços geológicos



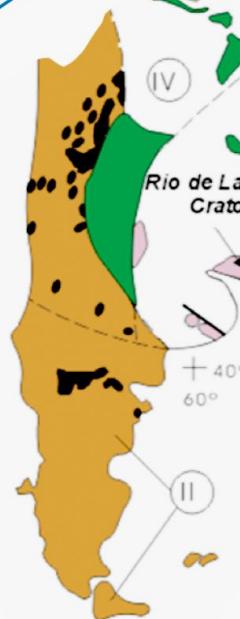
**600 Ma**

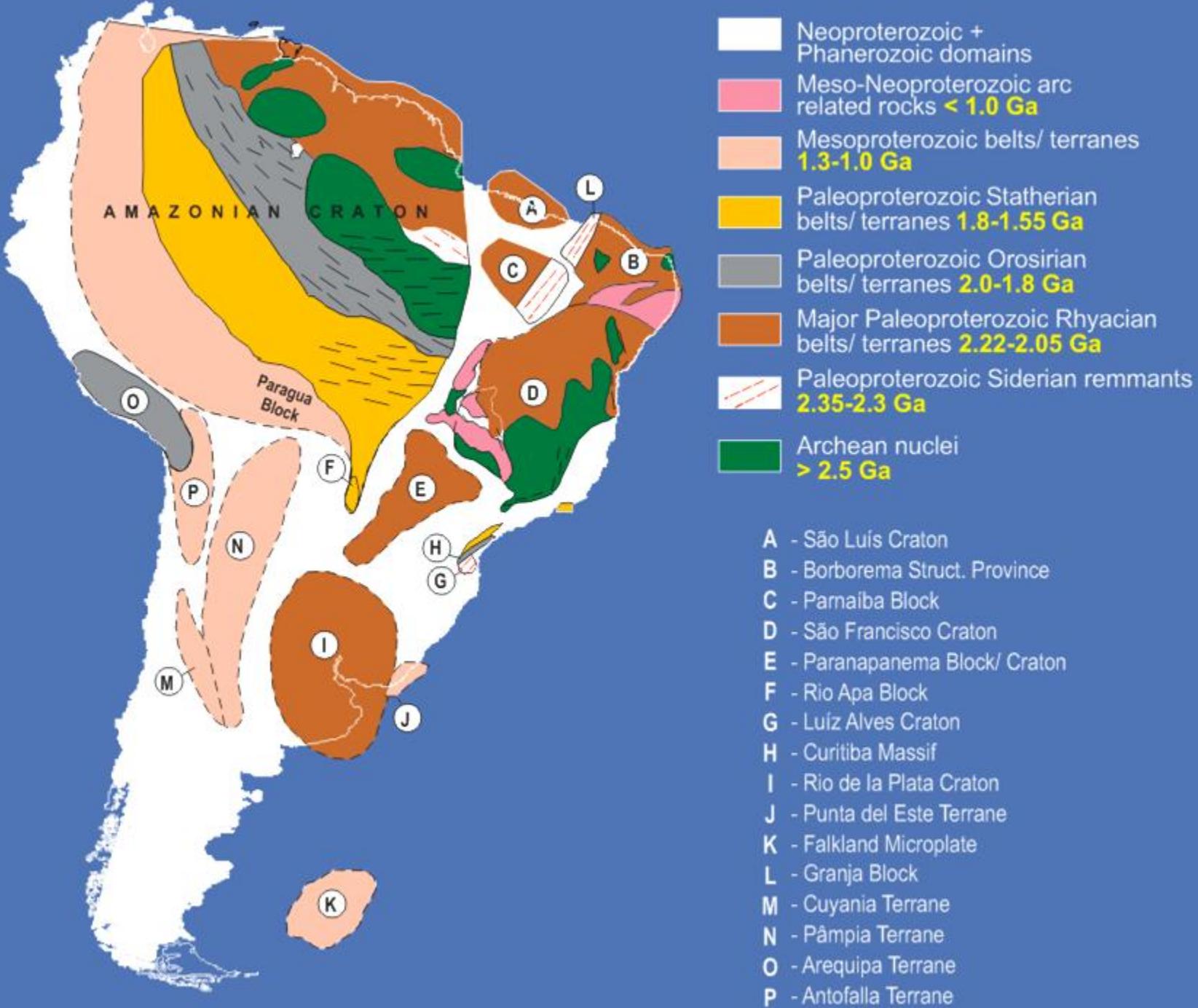


## AMÉRICA DO SUL LAURENTIANA GRENVILLIANA

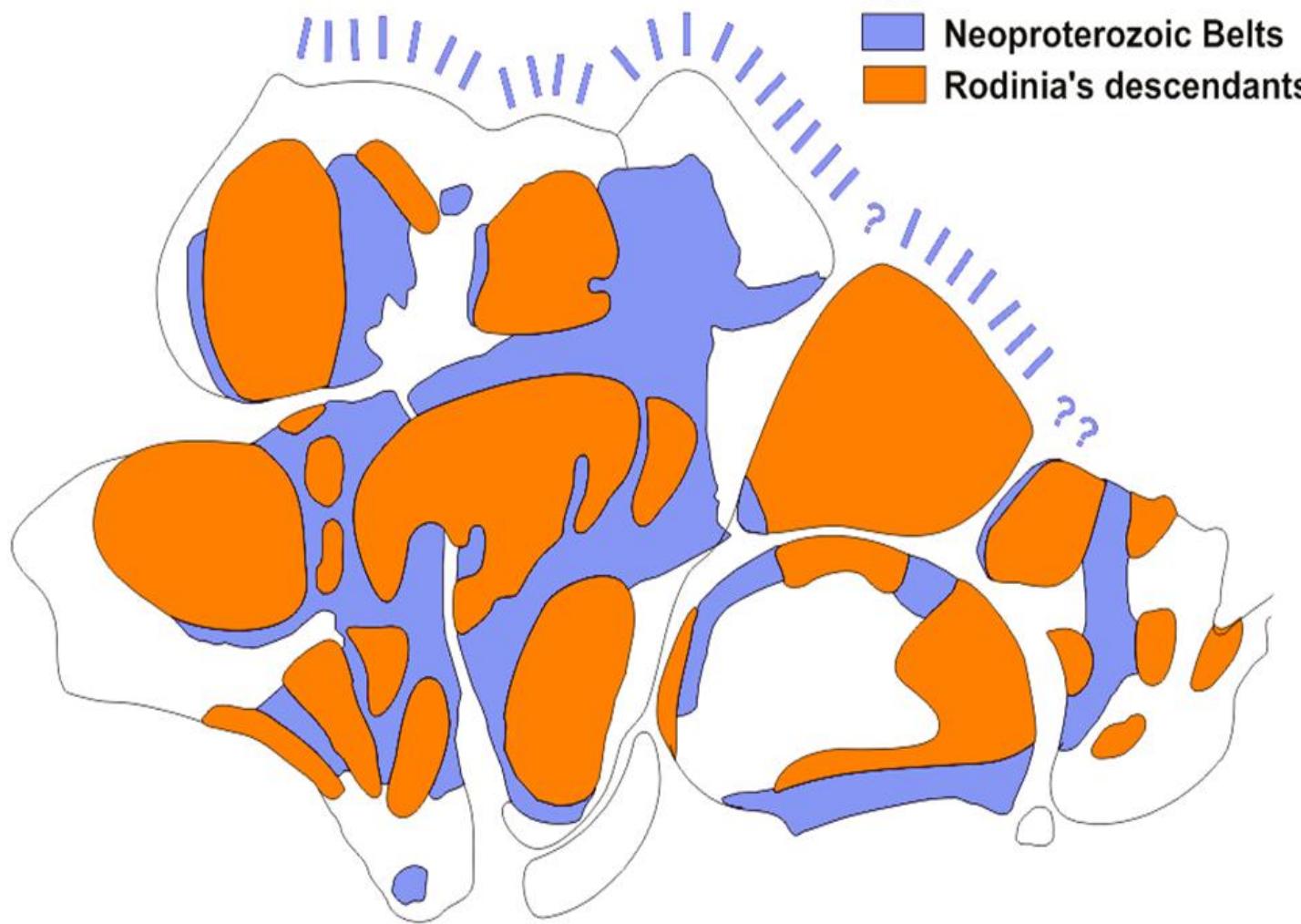


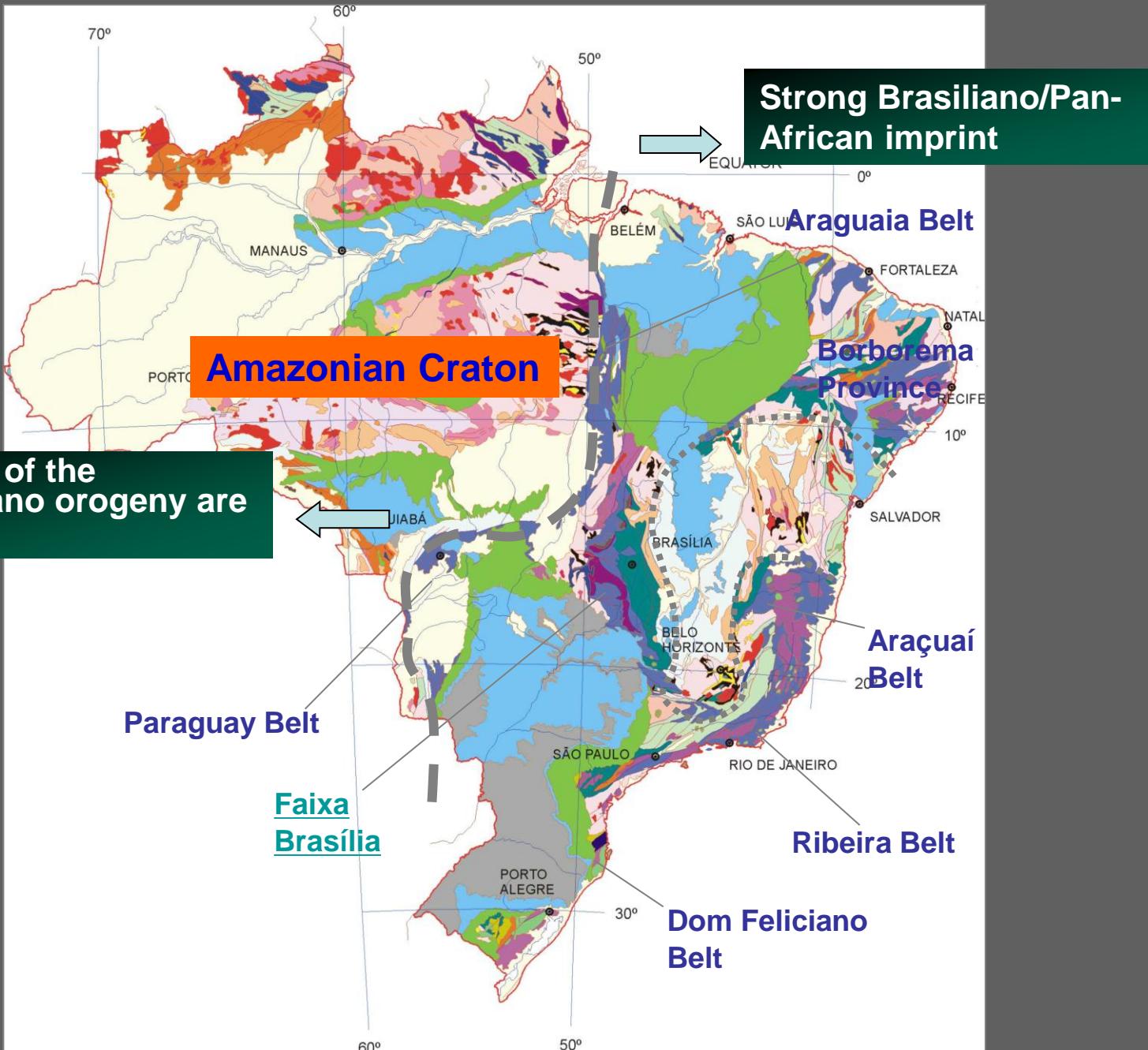
## AMÉRICA DO SUL AFRICANA PAN AFRICANA



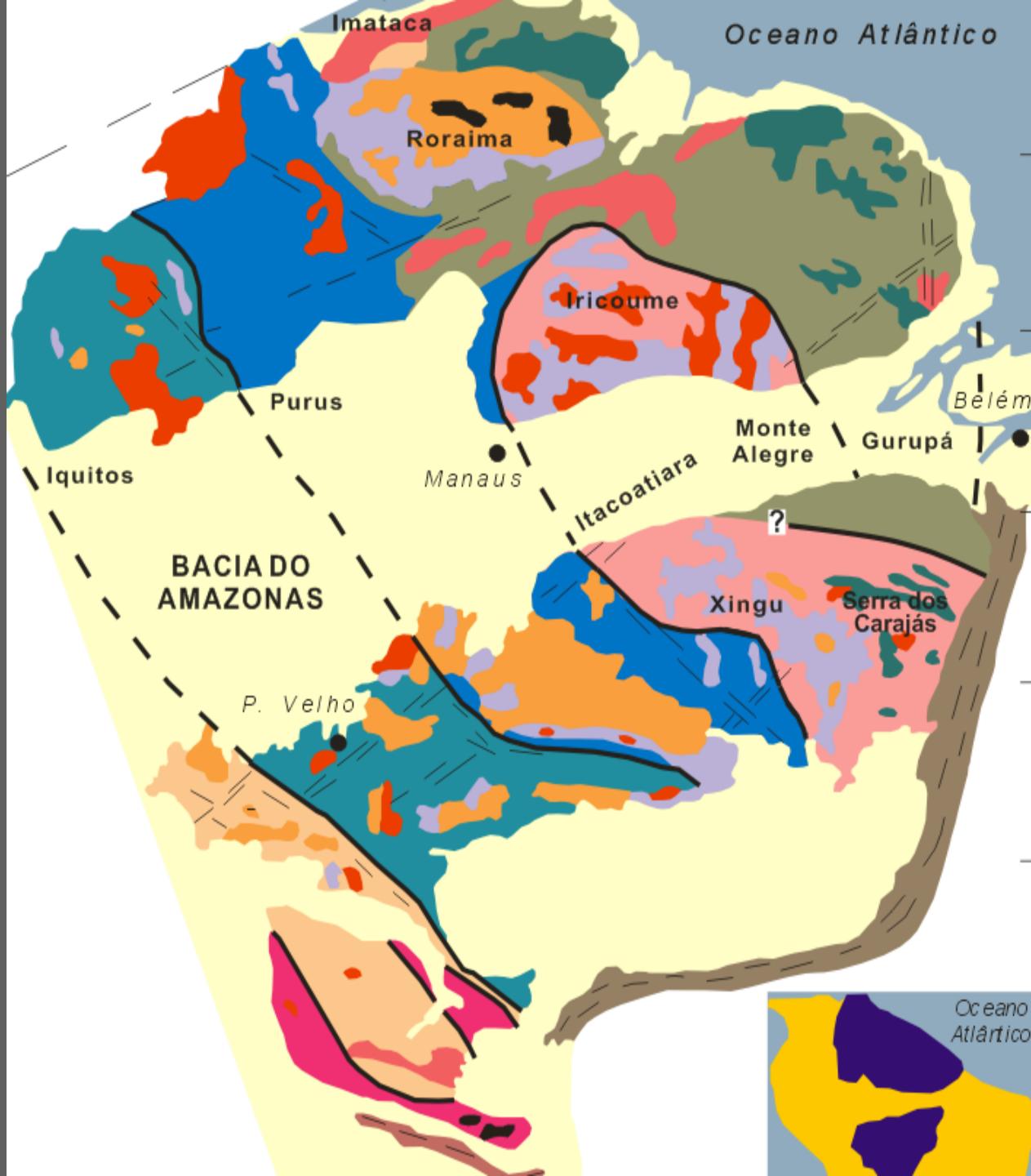


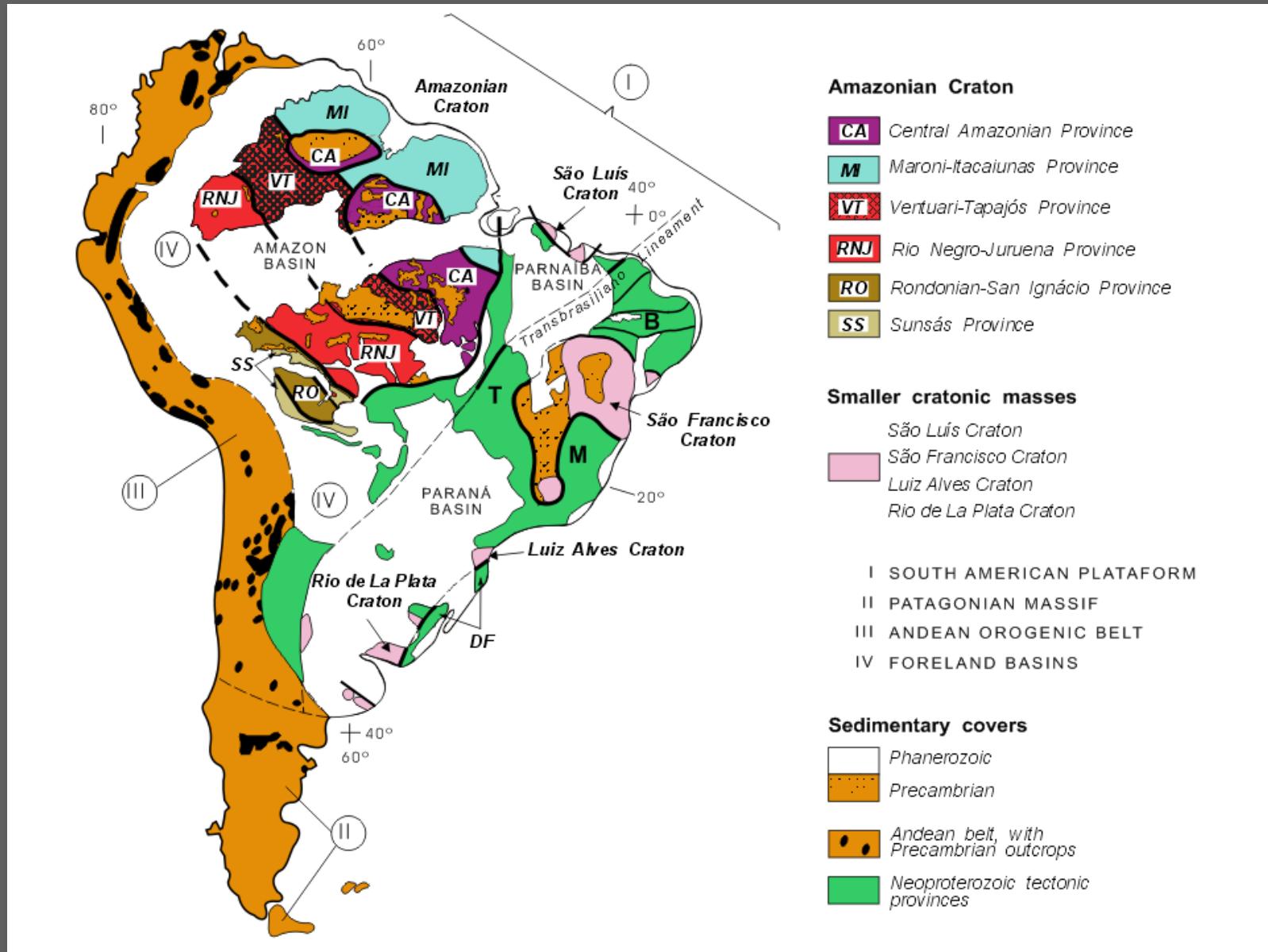
III Cadomian Belt  
■ Neoproterozoic Belts  
■ Rodinia's descendants

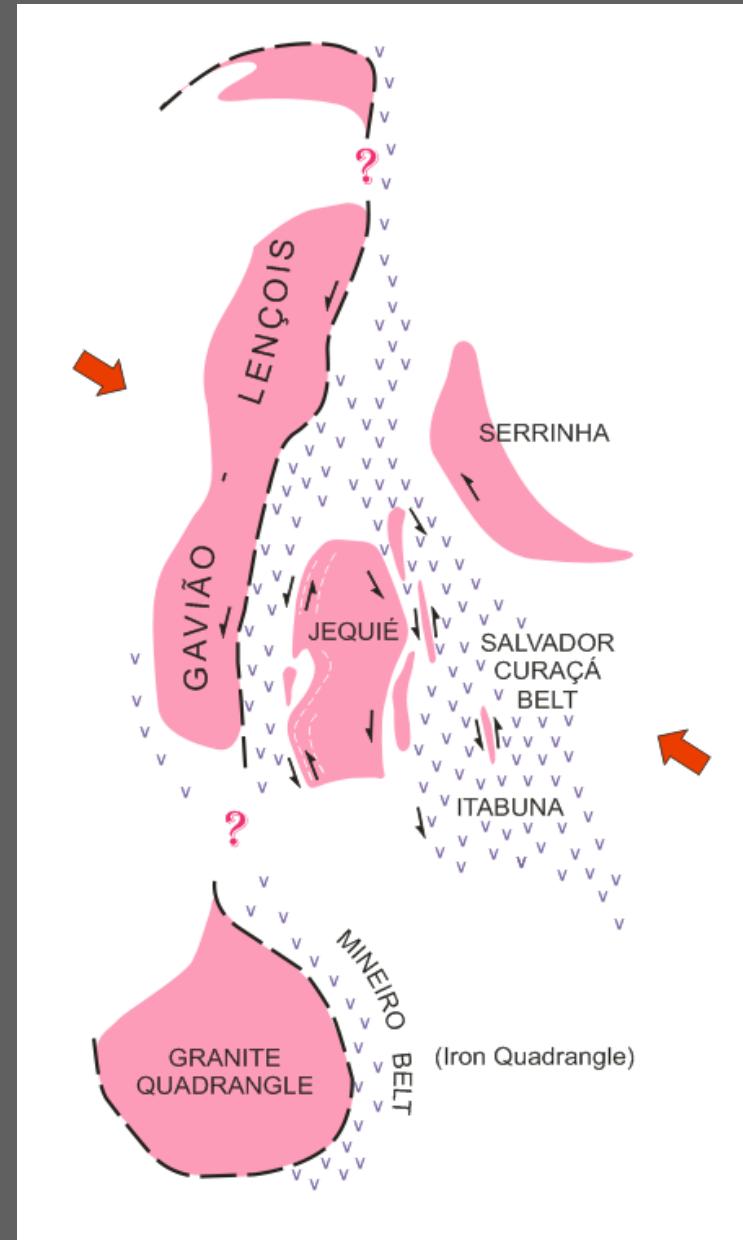
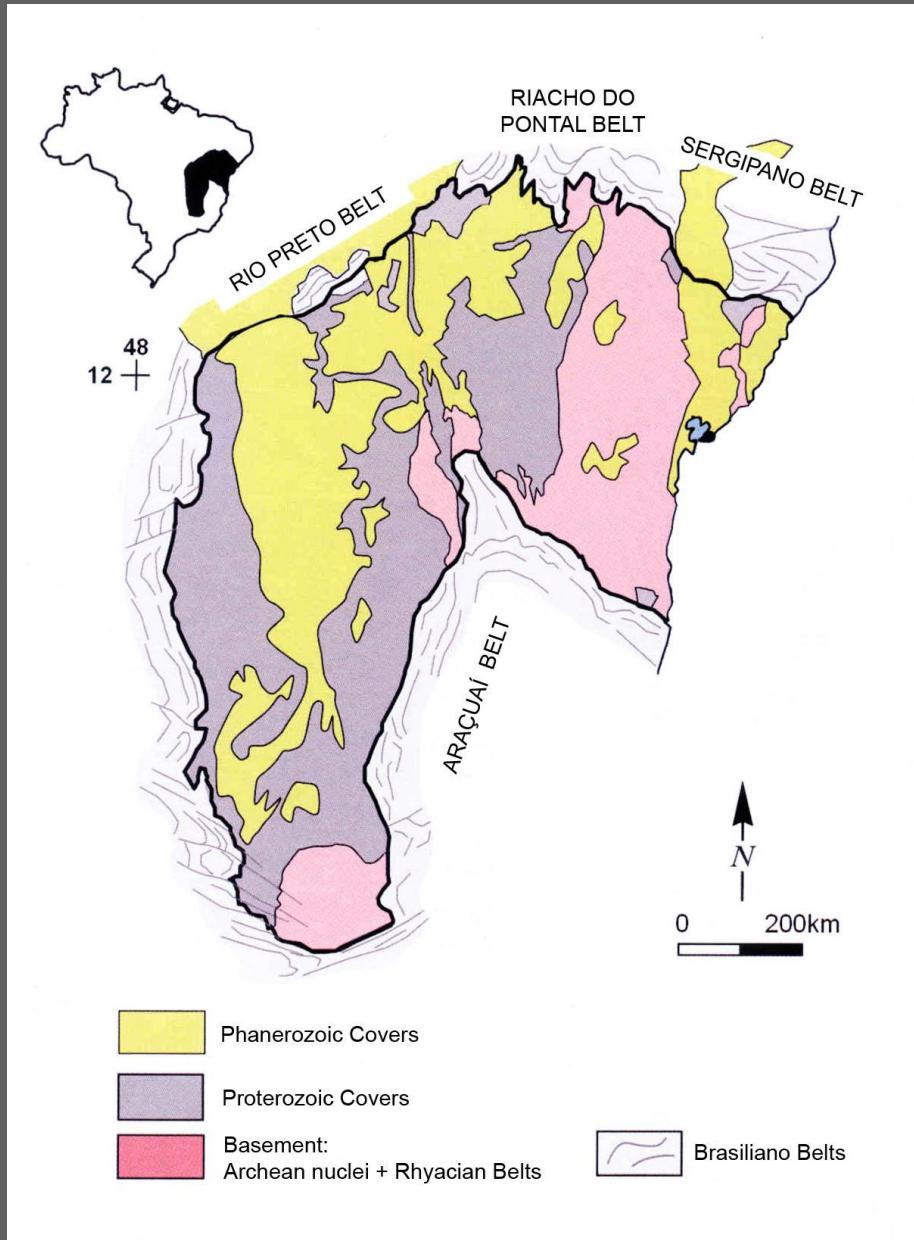


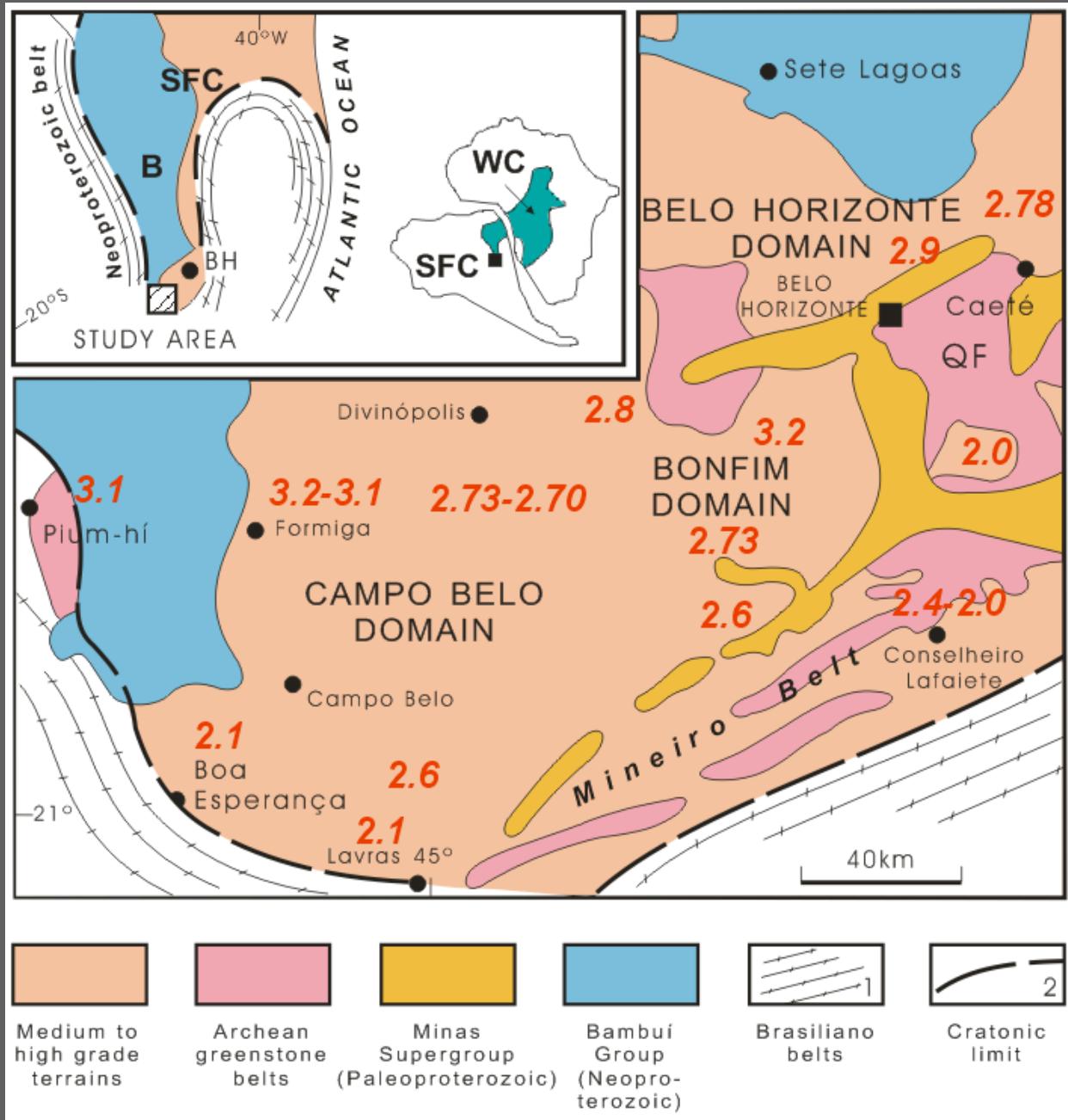


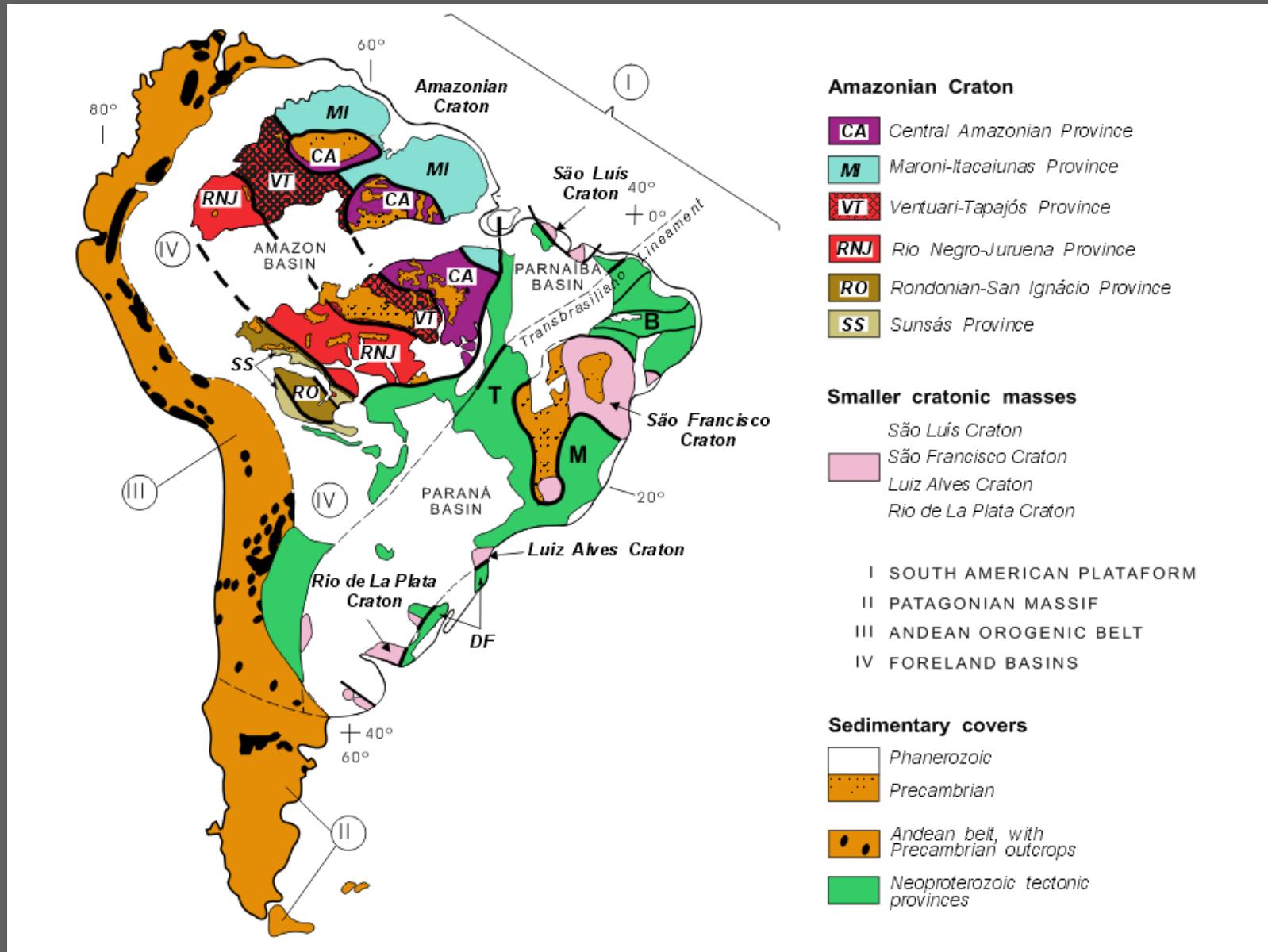






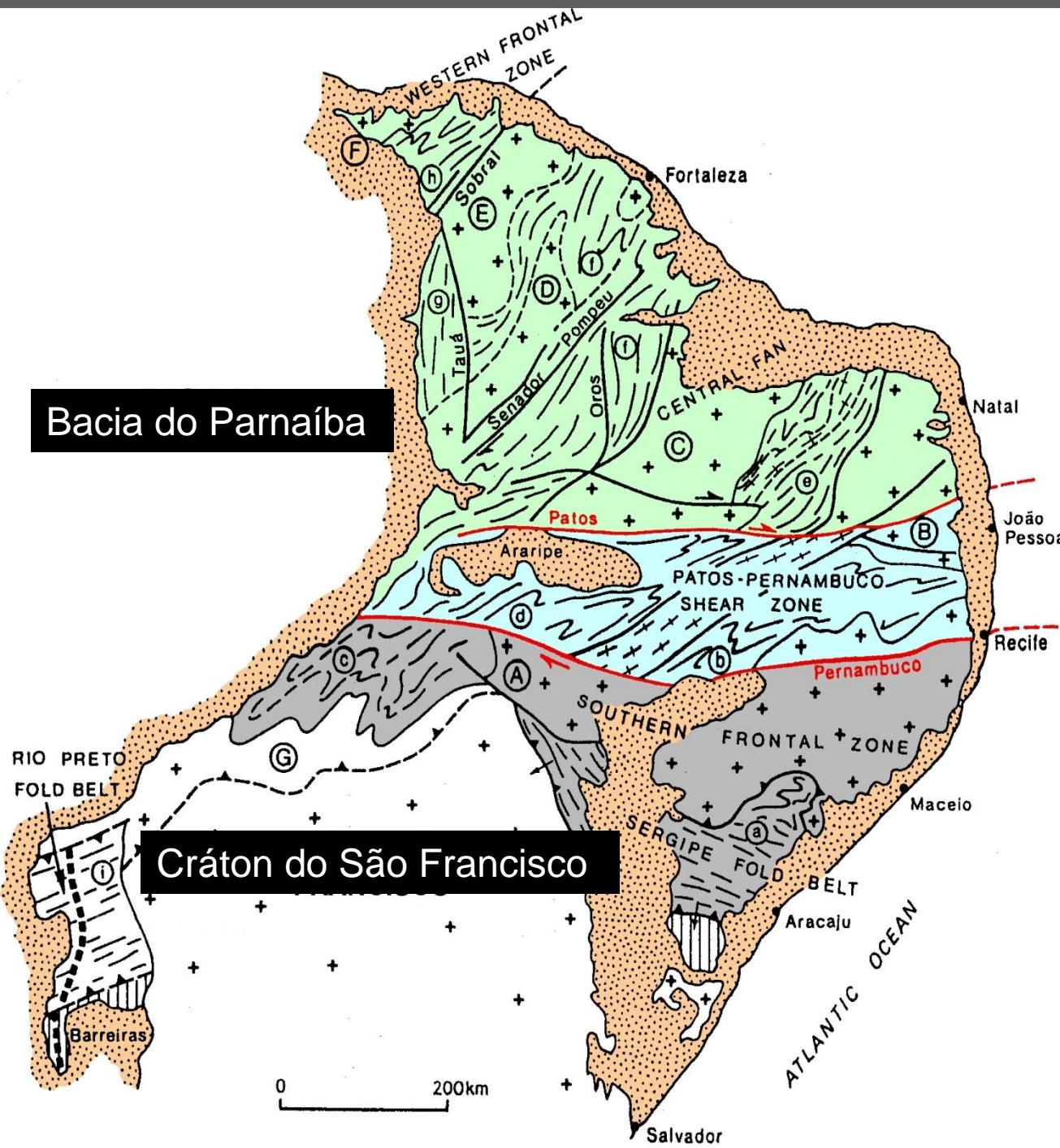






# Província Borborema

Bacia do Parnaíba

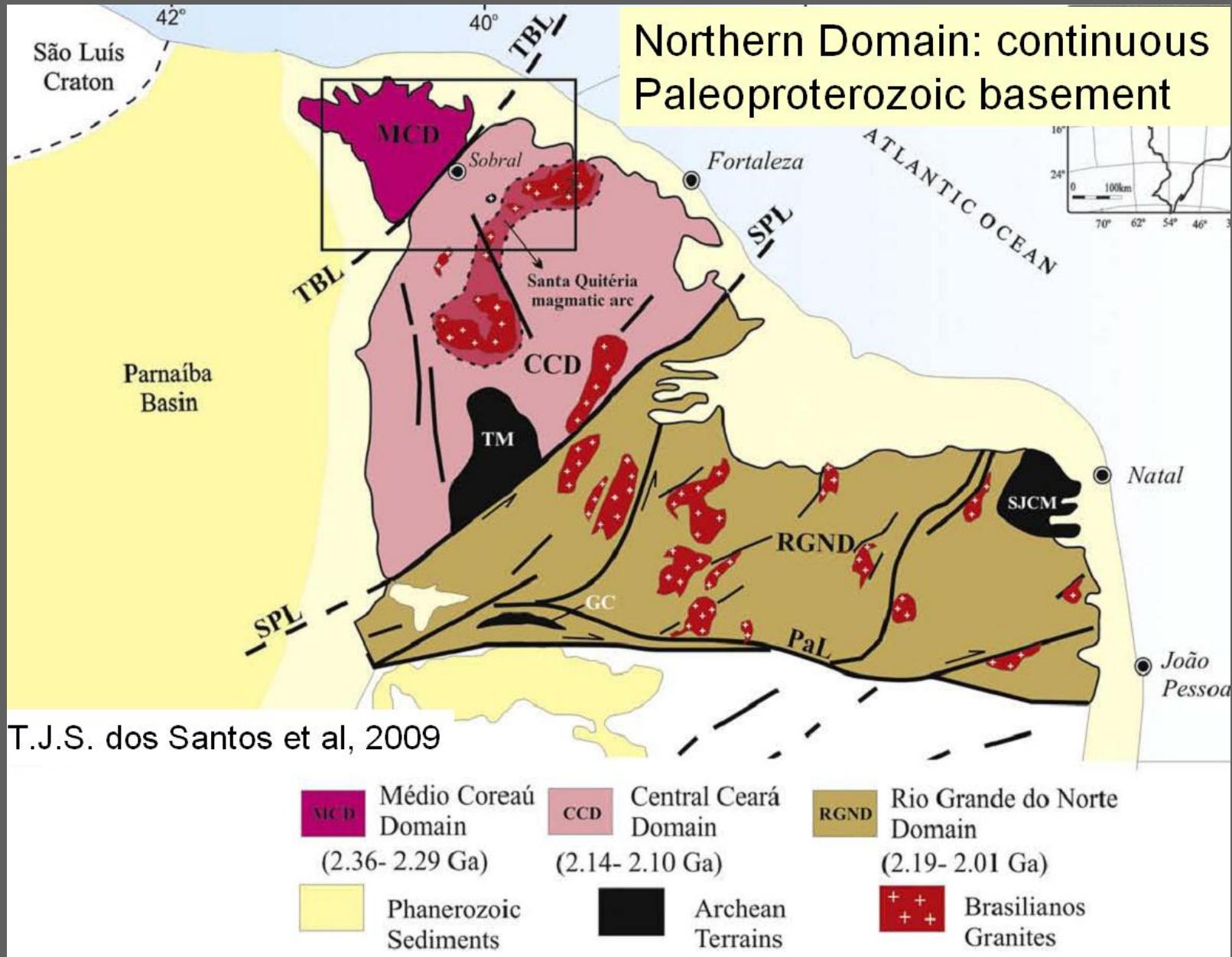


Cráton do São Francisco

Domínio N

Domínio Central  
(Zona Transversal)

Domínio S



# Província Borborema

## Terrenos tectono-estratigráficos (Santos e Medeiros 1999; Santos 2000)

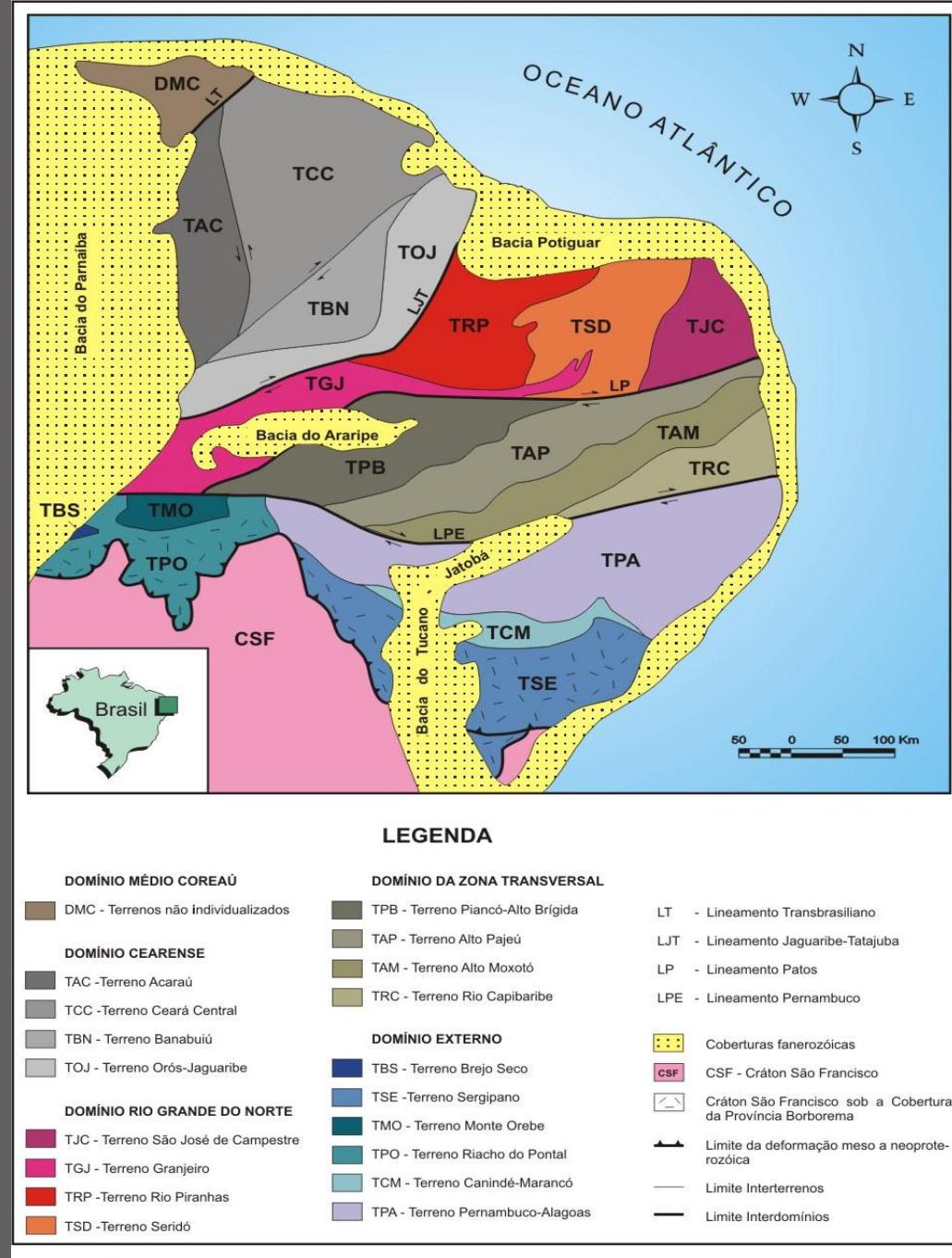


Figura 2.9 - Compartimentação da Província Borborema em domínios e terrenos tectono-estratigráficos, segundo Santos & Medeiros (1999) e Santos (2000).

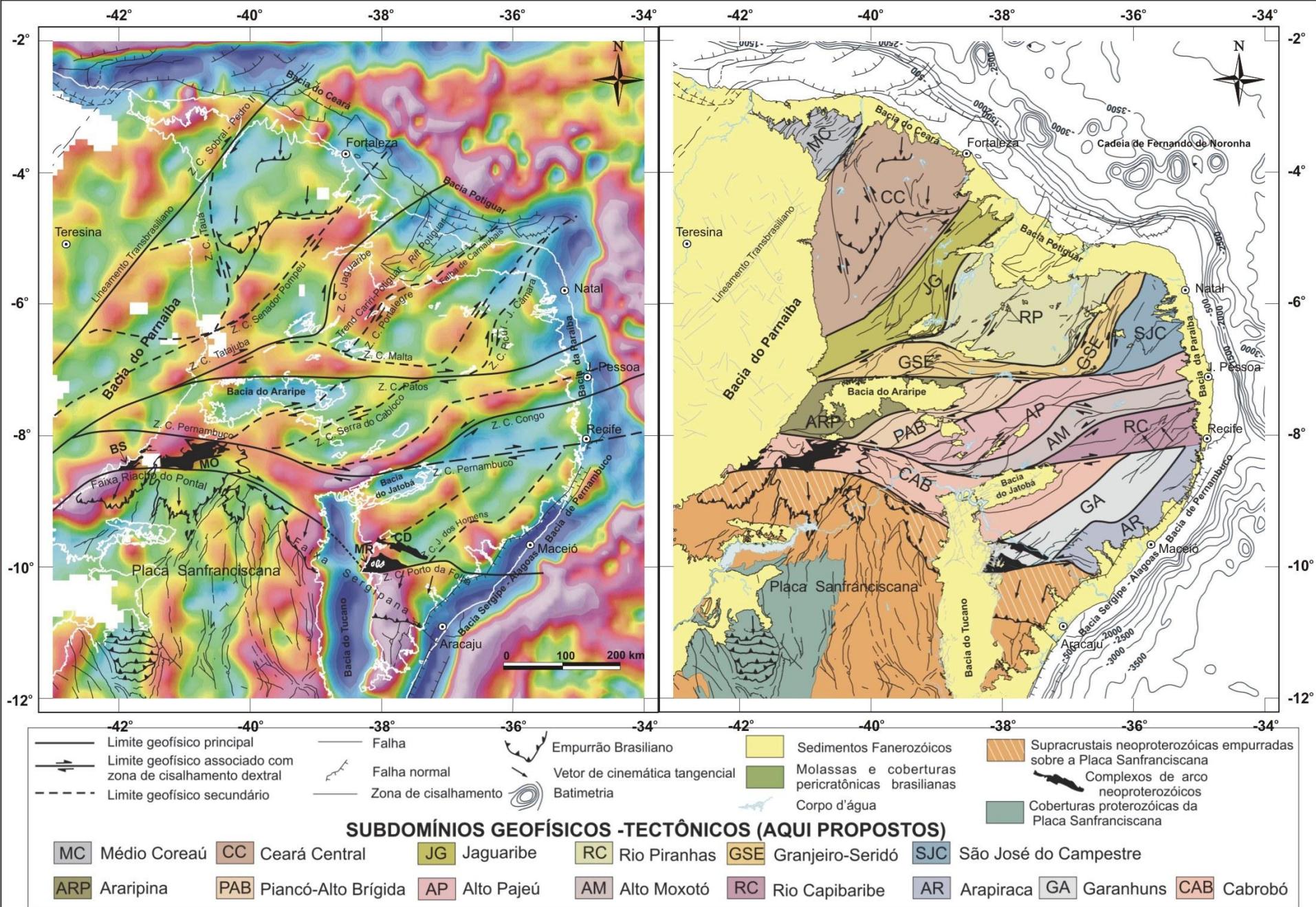
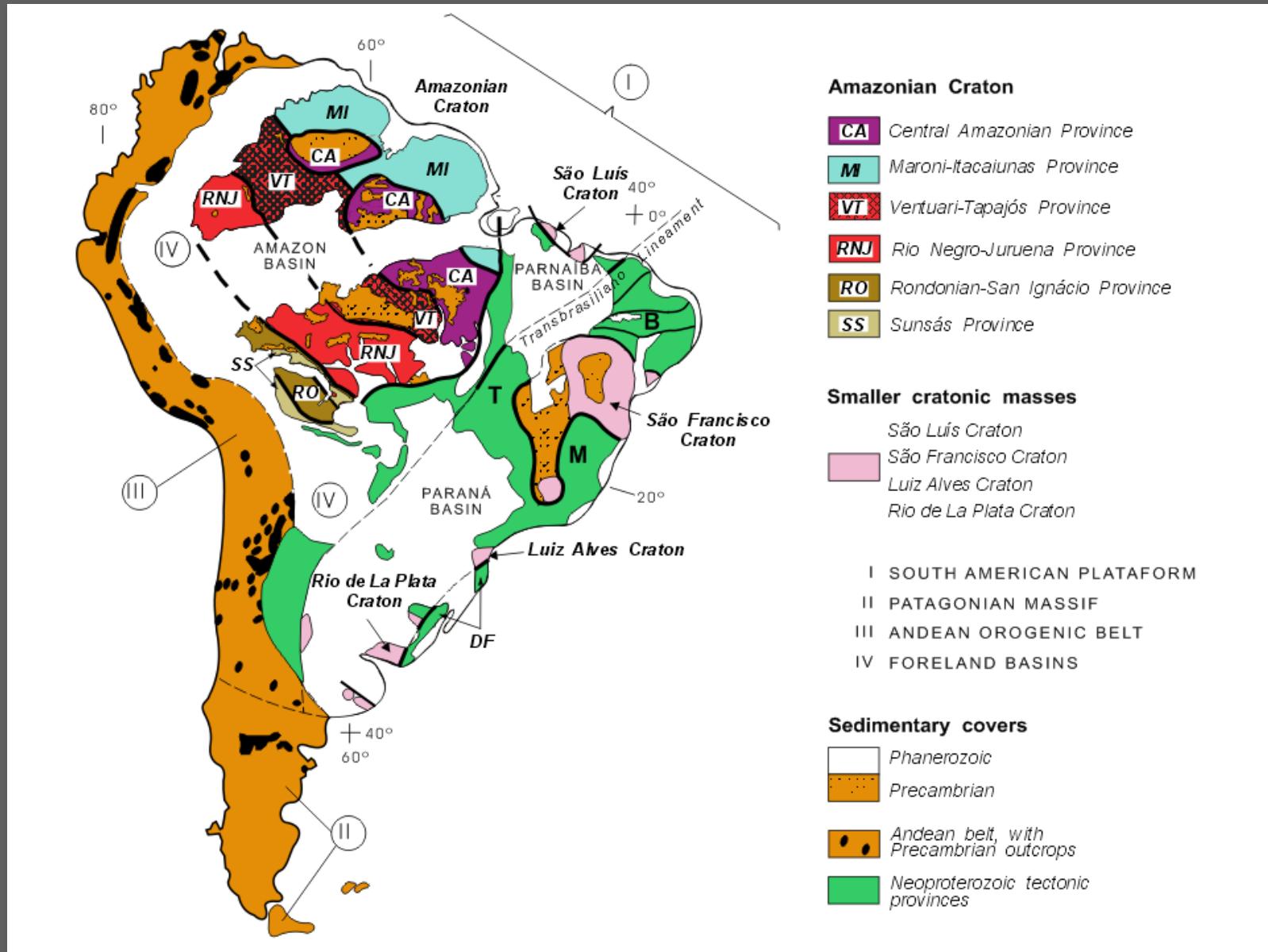


Figura 5.12: Comparação da interpretação dos subdomínios geofísicos-tectônicos com o mapa de anomalias Bouguer residuais. Explicações no texto.

From: Oliveira (2008)



# A Província Tocantins

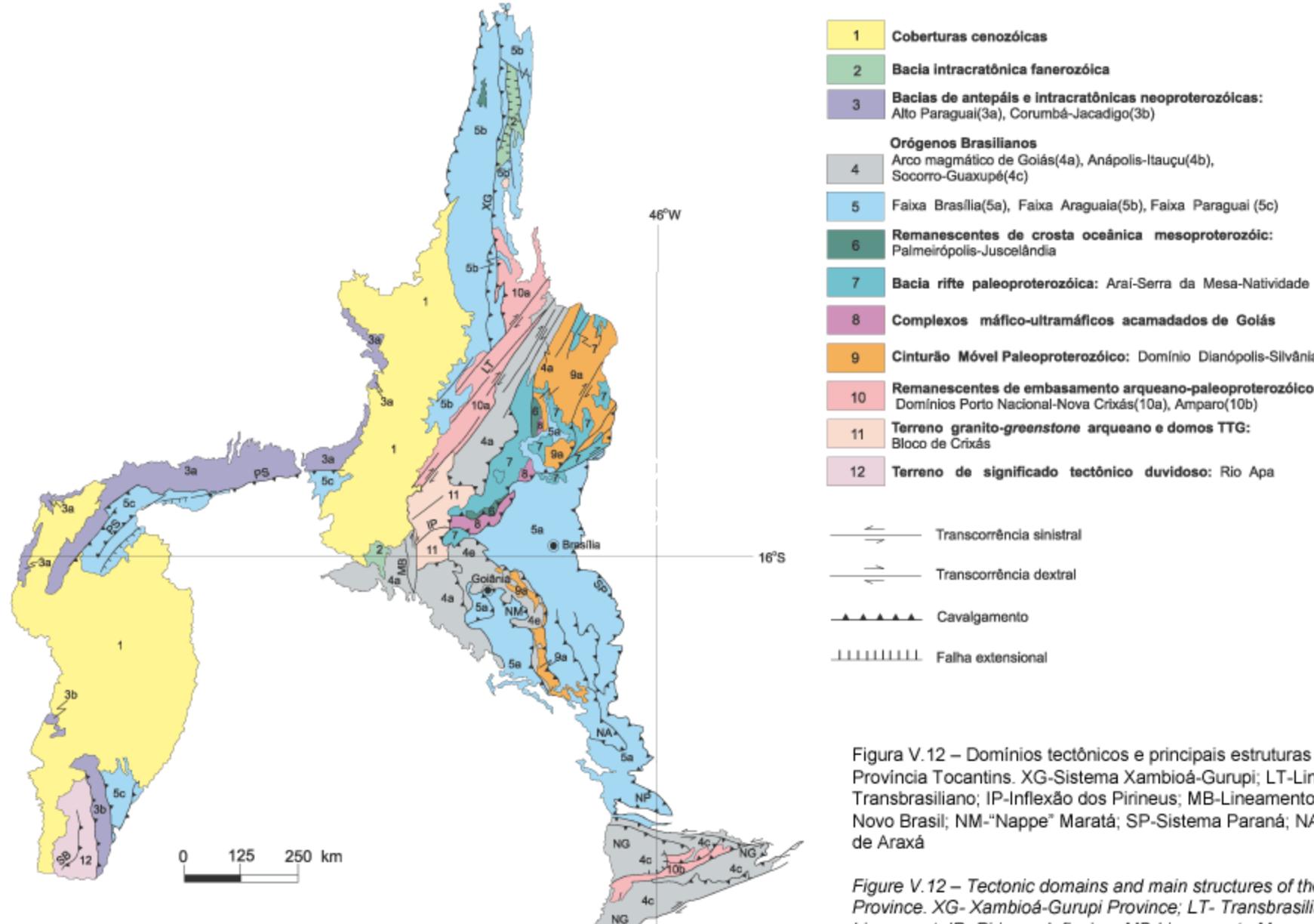


Figura V.12 – Domínios tectônicos e principais estruturas da Província Tocantins. XG-Sistema Xambioá-Gurupi; LT-Lineamento Transbrasiliano; IP-Inflexão dos Pirineus; MB-Lineamento Morporá-Novo Brasil; NM-“Nappe” Maratá; SP-Sistema Paraná; NA-“Nappe” de Araxá

Figure V.12 – Tectonic domains and main structures of the Tocantins Province. XG- Xambioá-Gurupi Province; LT- Transbrasiliano Lineament; IP- Pirineus Inflexion; MB- Lineamento Morporá-Novo Brasil; NM-“Nappe” Maratá; SP- Sistema Paraná; NA-“Nappe” de Araxá

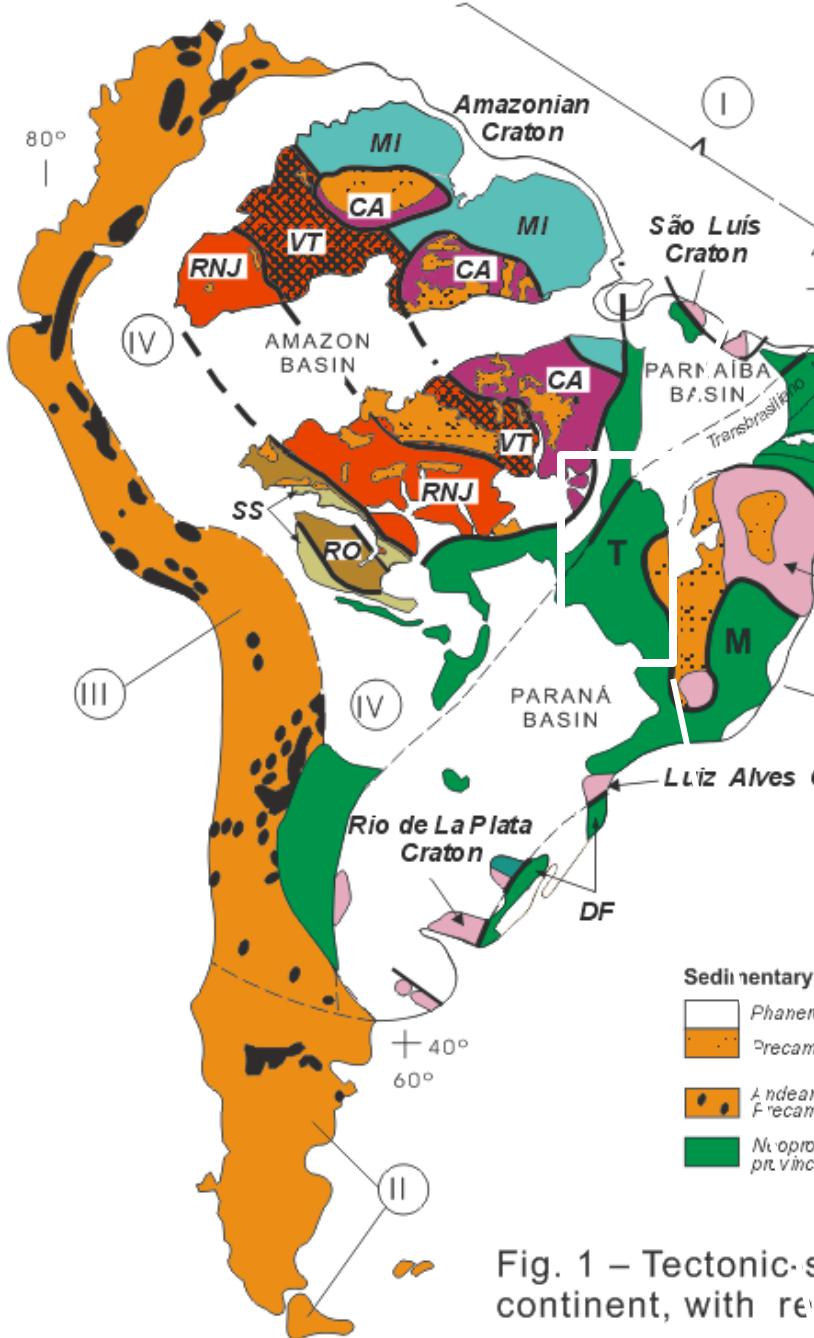
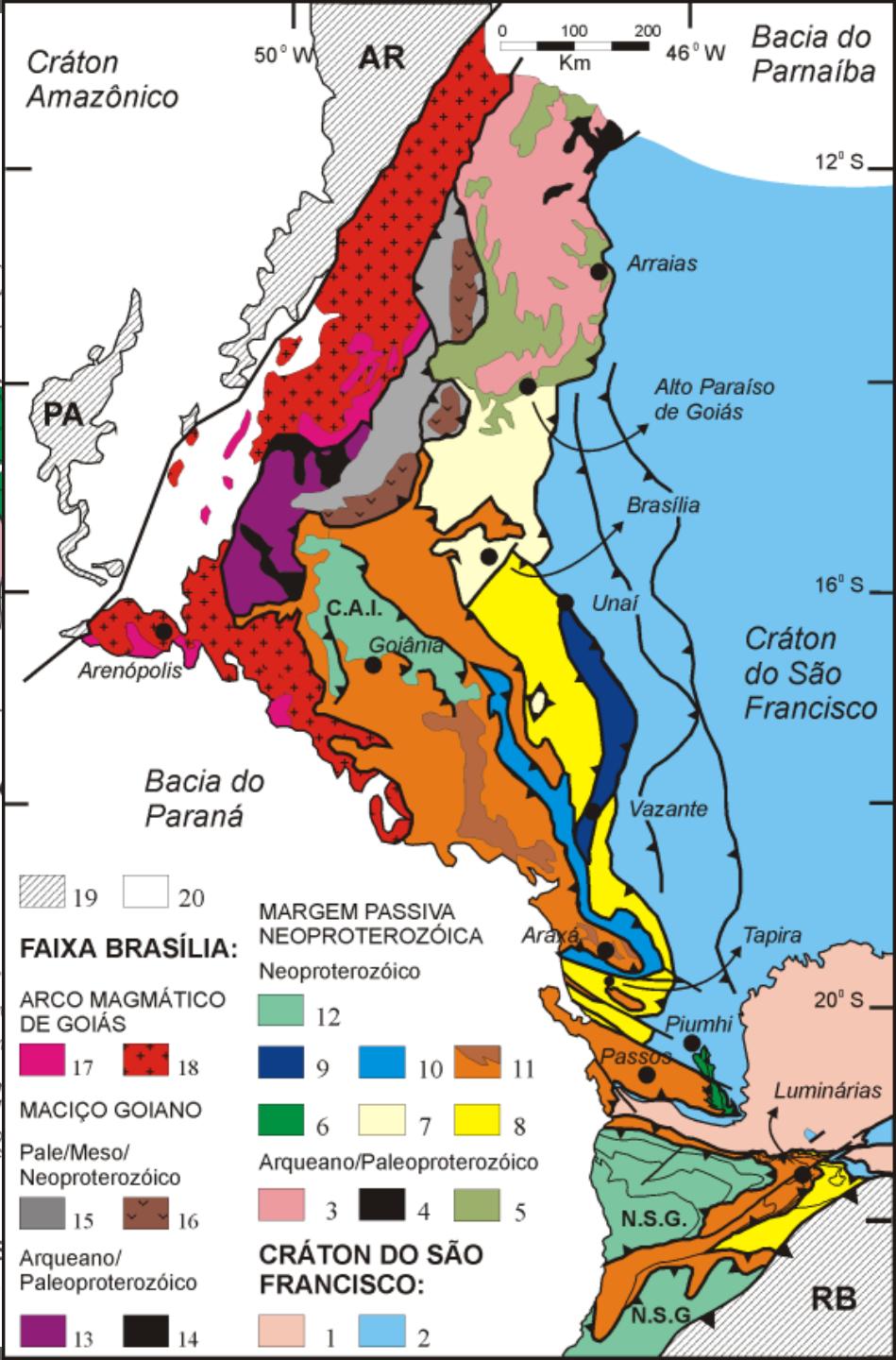
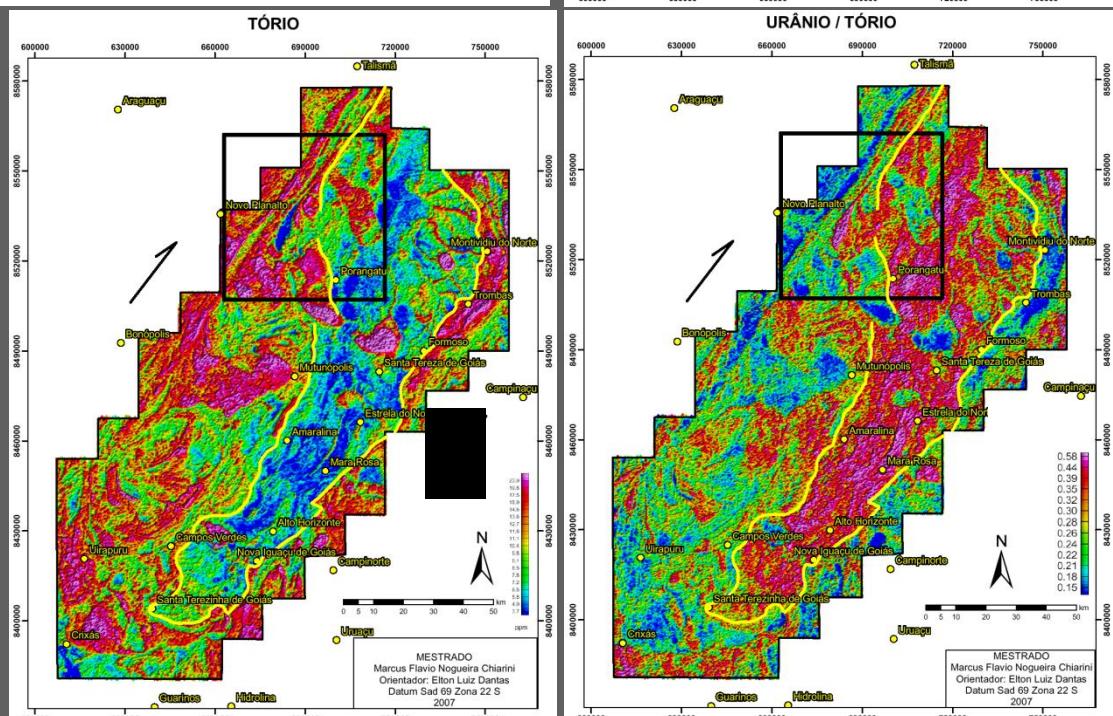
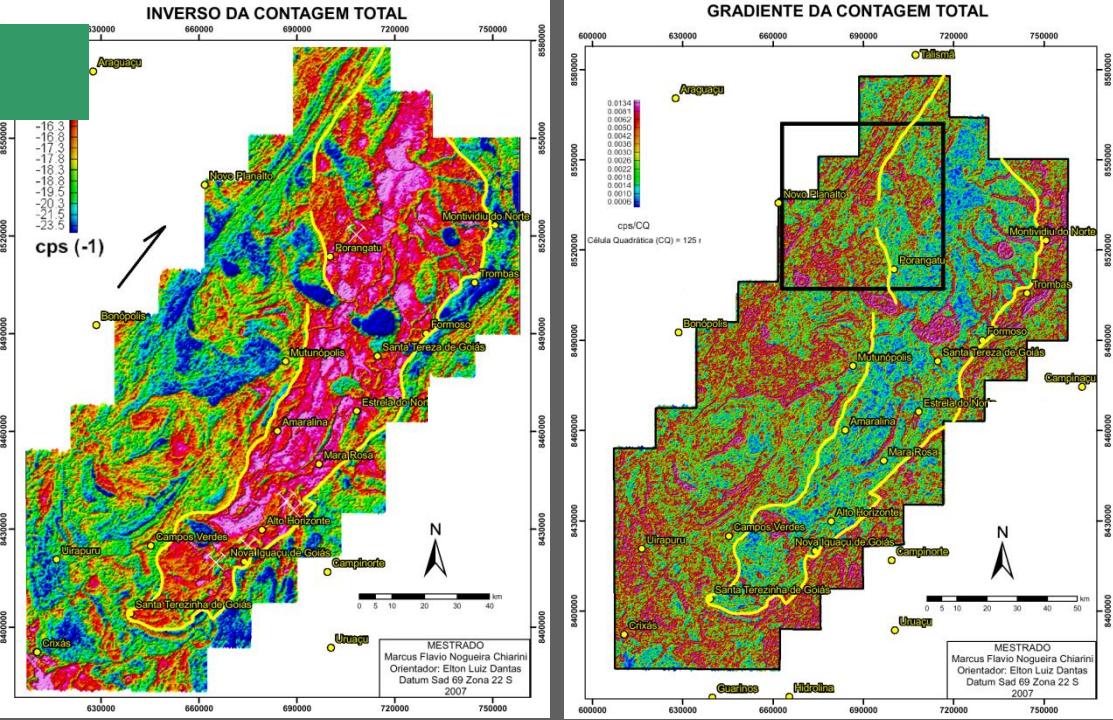
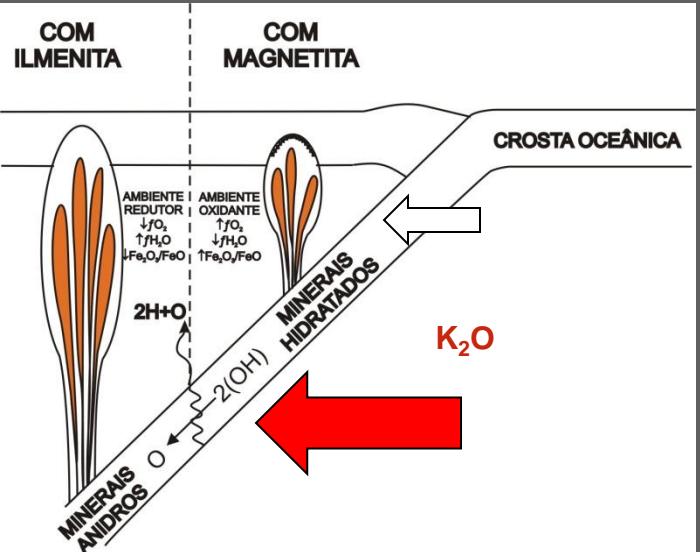


Fig. 1 – Tectonic-sedimentary provinces of the continent, with regions I-VI.

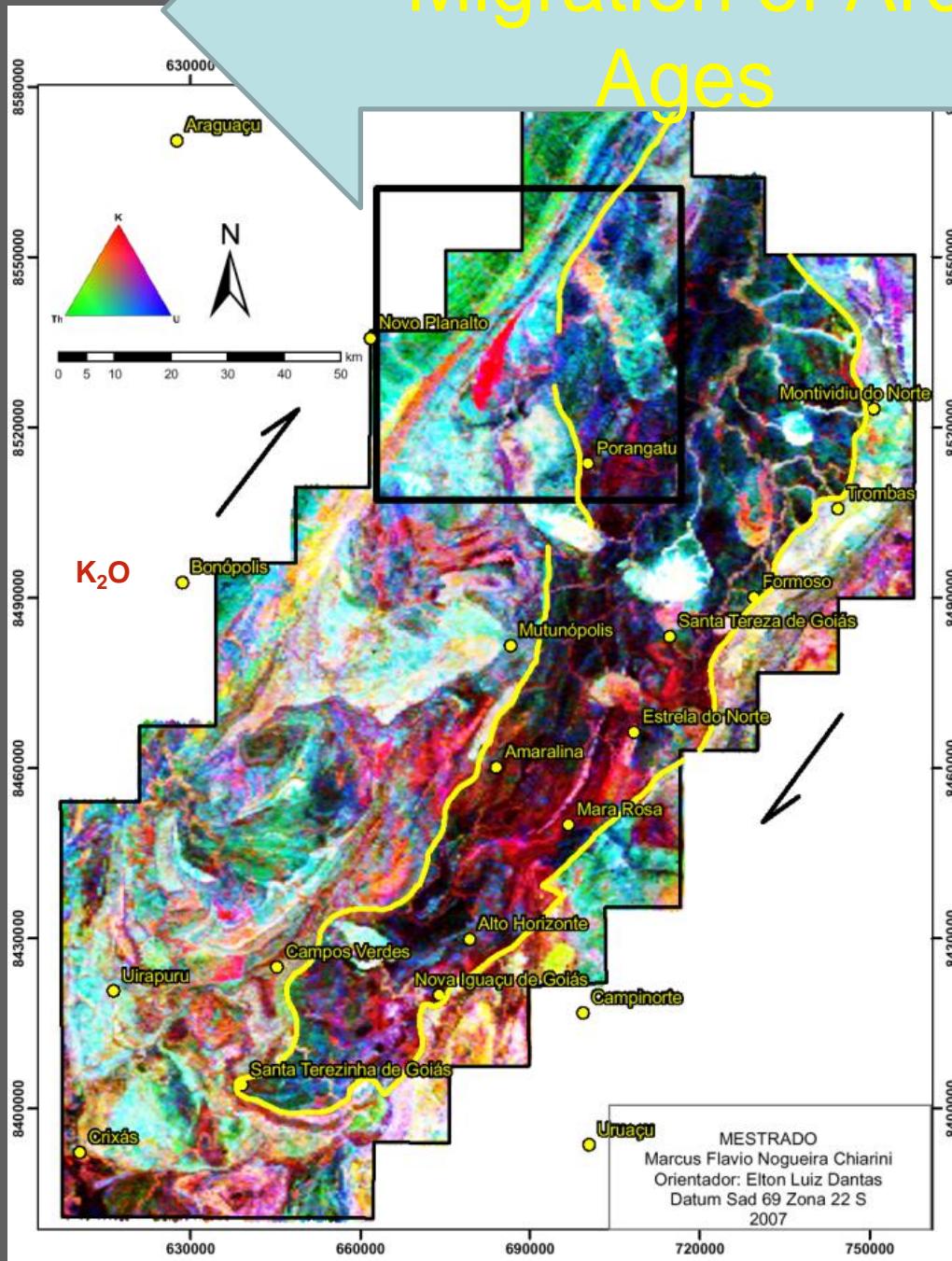


# Aerogeofísica



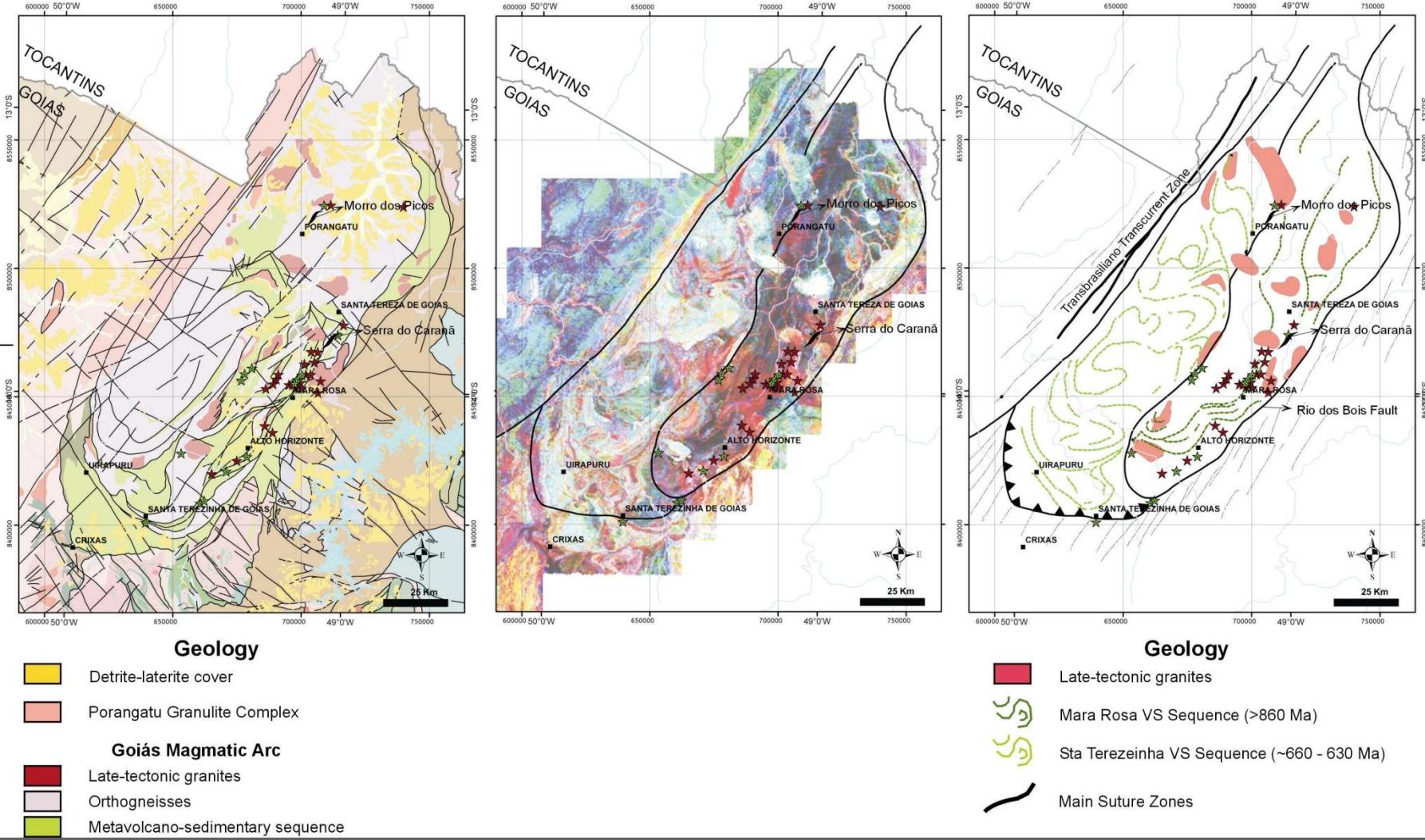
# Migration of Arc Ages

- 630 Ma
- Continental arc signature
  - e Nd
  - High Th,U, K
- Magnetic

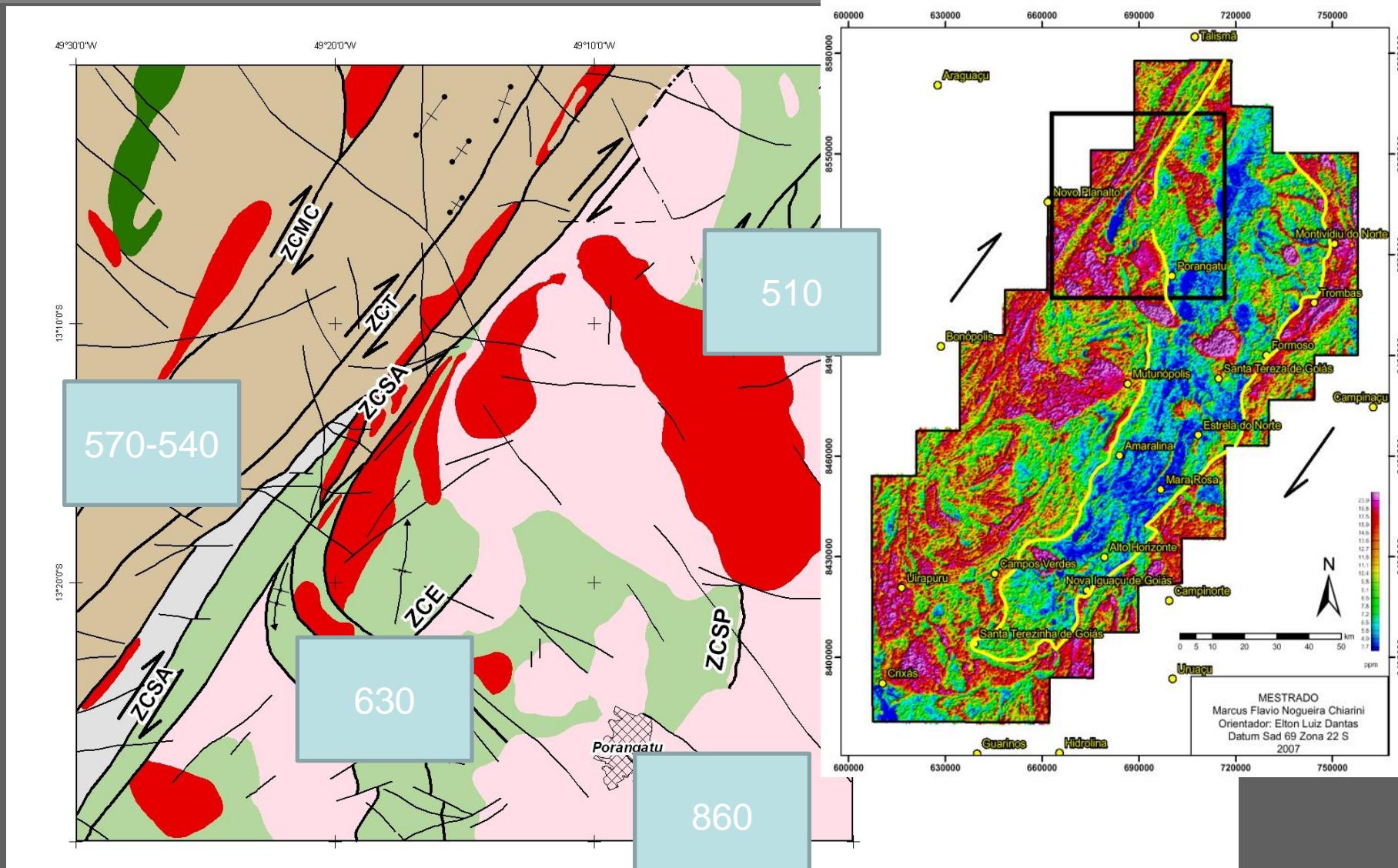


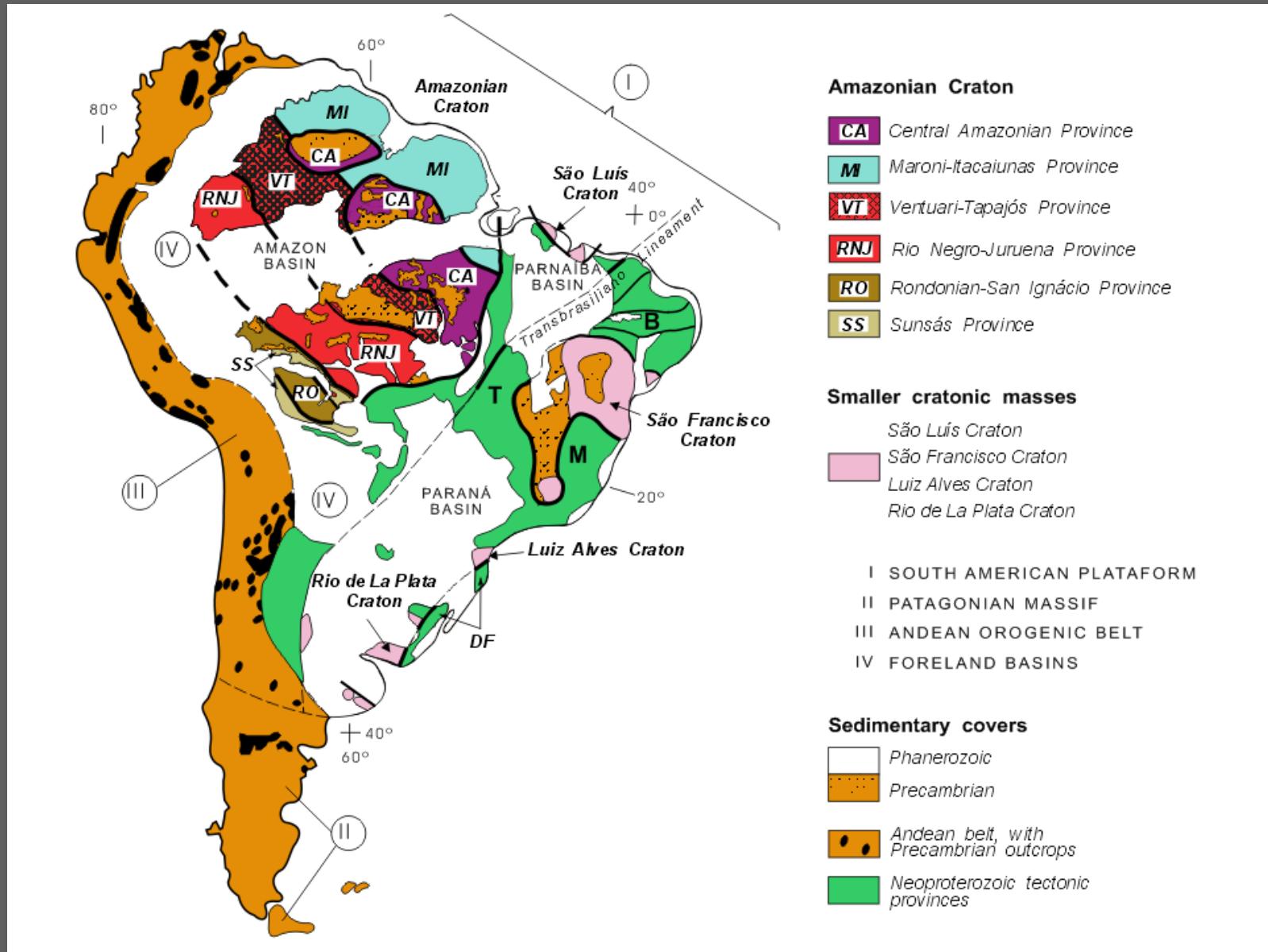
- 860 Ma
- Island arc signature + e Nd
- Low Th,U, K
- High Magnetic

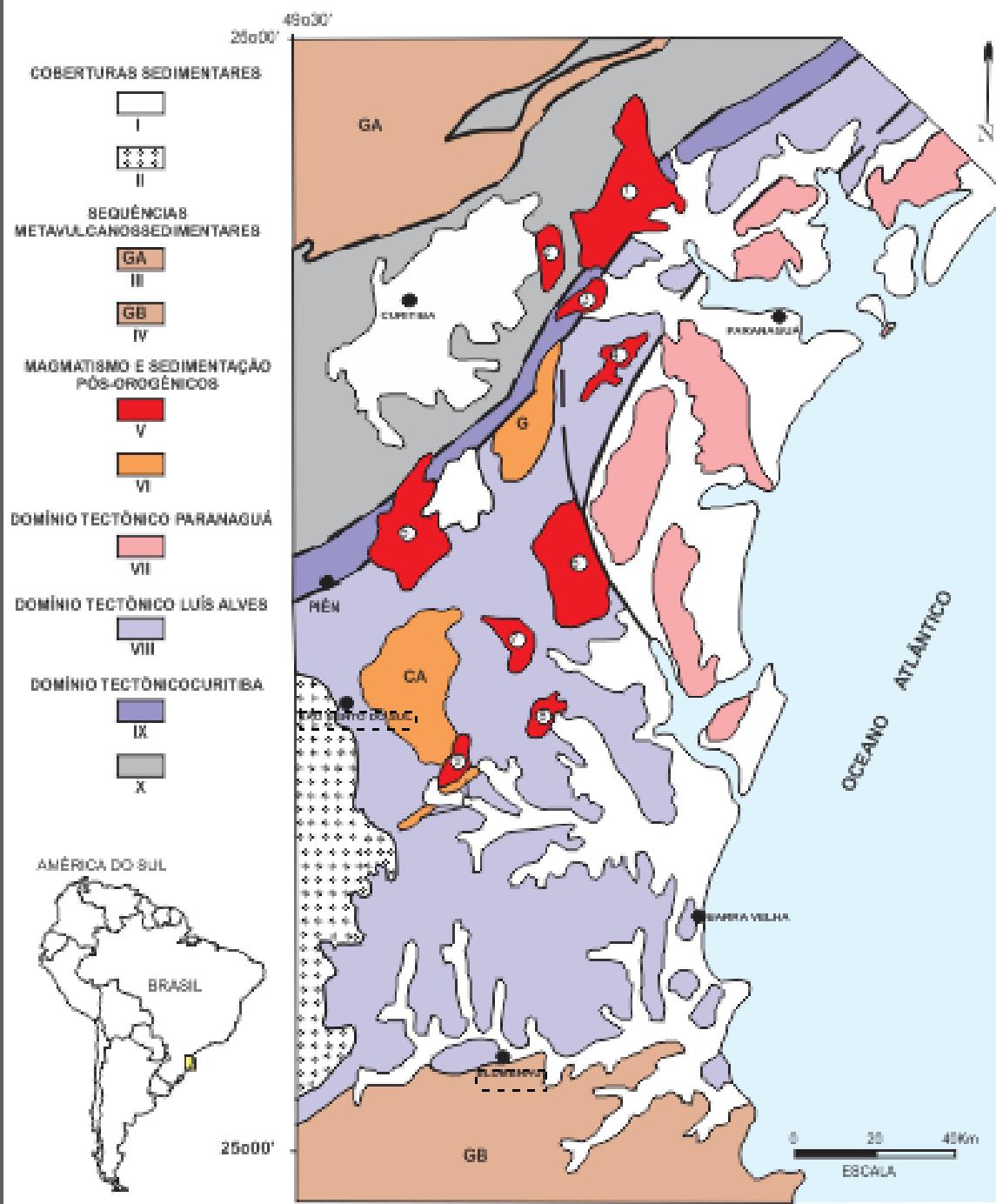
# Mineralizações de ouro no Arco de Goiás

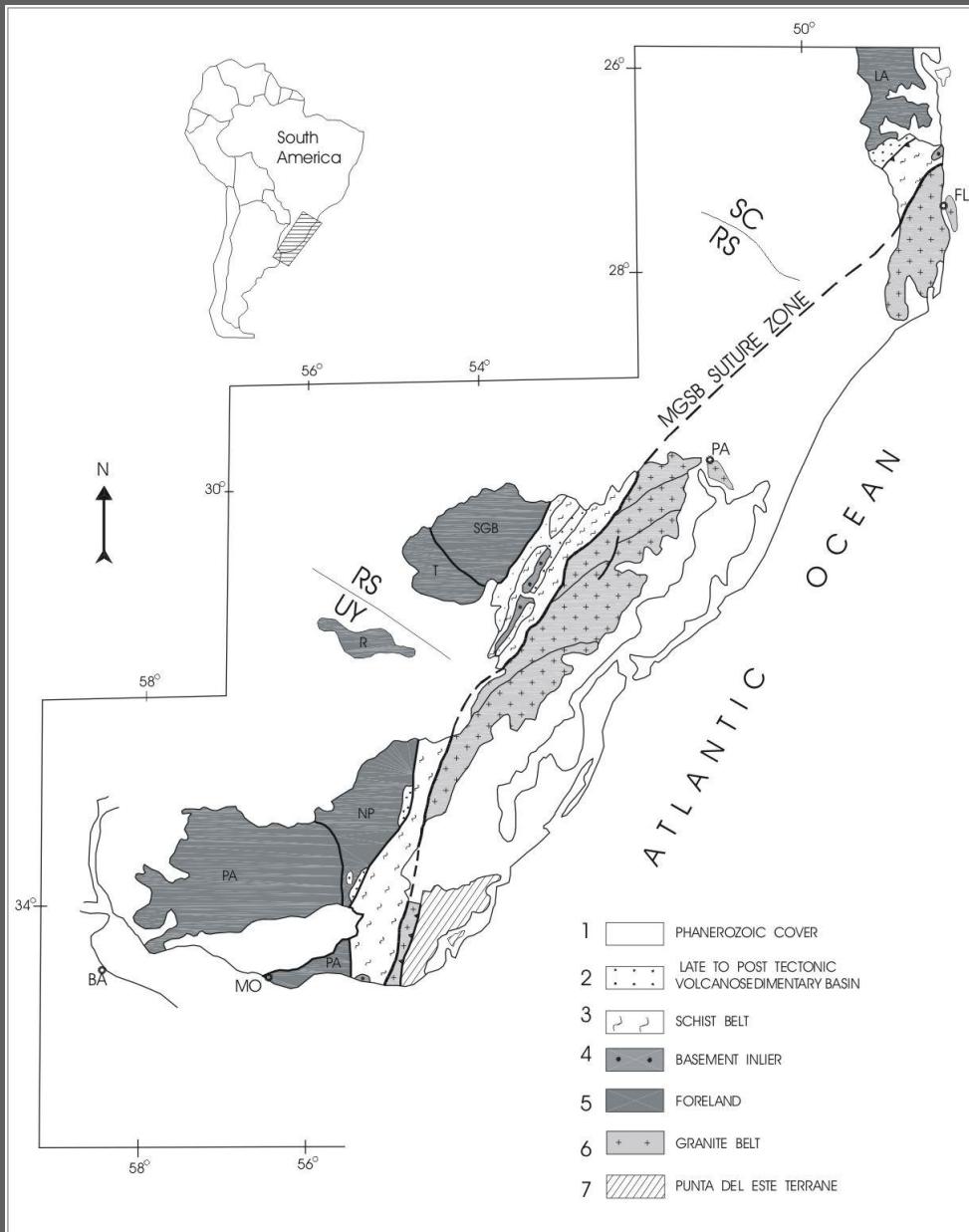


# Event at 590-540 Ma

















## ARCHEAN IN SOUTH AMERICA: EXTENT AND TECTONIC DIVERSITY

**BRASILIANO CRATONIC PROVINCES**  
pre – 1.0 Ga

**LARGE PARA-AUTOCHTHONOUS BLOCKS**  
surrounded by Paleoproterozoic fold belts

Rio Maria - Serra Carajás, Xingú

**ALLOCHTHOCTONOUS BLOCKS / PLATES**  
agglutinated during Rhyacian-Orosirian orogeneses

Gavião, Jequié, Serrinha, C. Belo

**ARCHEAN REMNANTS IN THE INTERIOR OF PALEOPROTEROZOIC BELTS**  
Slivers, terranes, gneiss domes, thrust sheets etc

Imataca, Cupixi, Amapá, Bação etc

**LOCAL RECORDS OF ARCHEAN PROTOLITHS**  
Regional Geology << isotopic data (Sm-Nd, U-Pb)

Luis Alves, Rio La Plata

**PRESUMED ARCHEAN DOMAINS HIDDEN BY PROTEROZOIC AND PHANEROZOIC COVERS**  
Very large Paleo, Meso and Neoproterozoic basins and rifts; major Phanerozoic synecclises

**CENTRAL GOIÁS “MASSIF”/ MICROPLATE**  
Well preserved Archean Rock Units = LGT and HGT

Between Brasilia and Paraguay belts

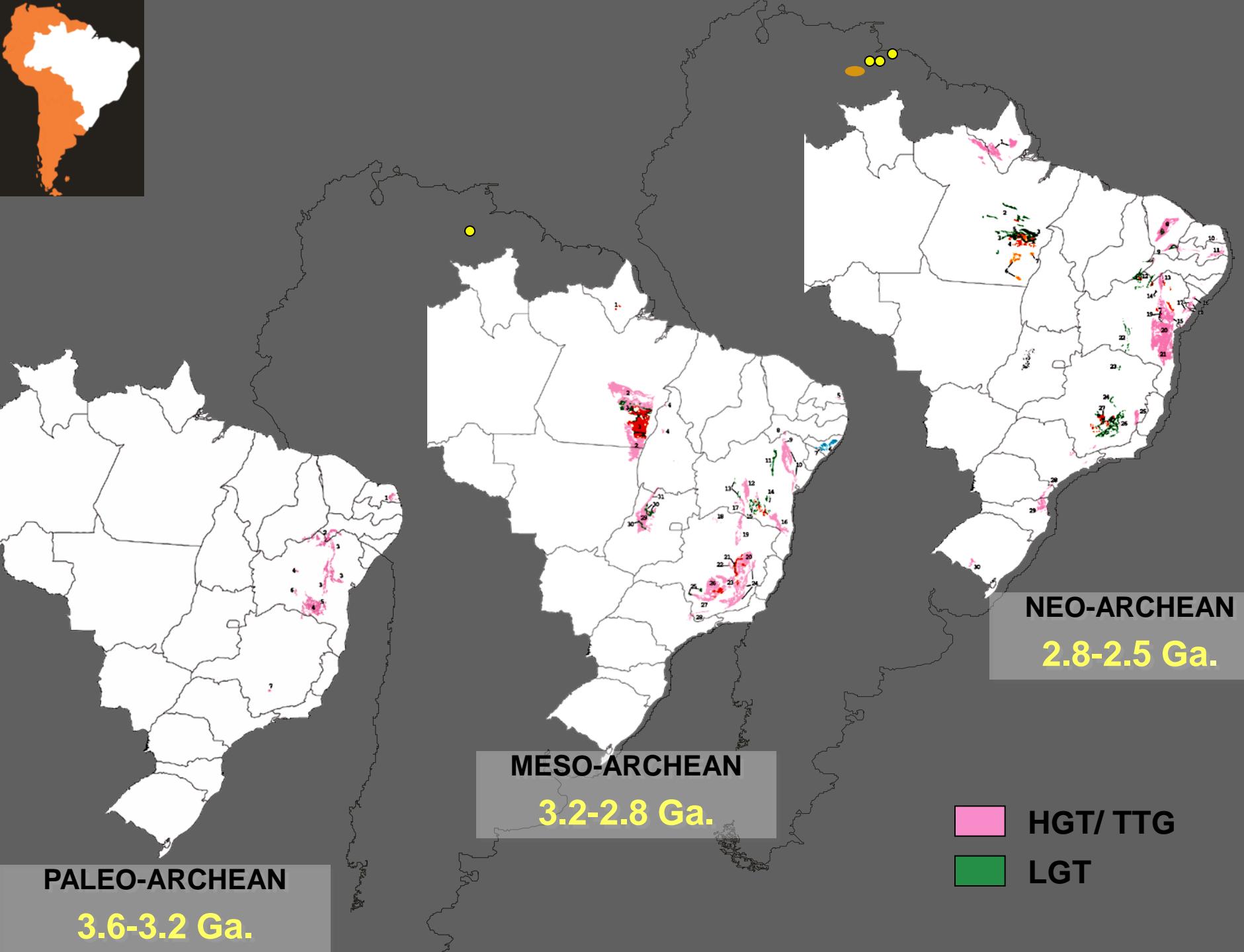
**ARCHEAN BASEMENT INLIERS**  
Structural windows, transpressional blocks

Tróia, Granjeiro, S. J. Campestre etc

**ARCHEAN REMNANTS IN THE INTERIOR OF PALEOPROTEROZOIC FOLD BELTS**  
Like last item above. The Paleoproterozoic basement is by far predominant

**LOCAL ARCHEAN CURSTAL SOURCES**  
 $T_{DM}$  values (basement, cover sequences, some granitic rocks), U-Pb in zircons

**BRASILIANO STRUCTURAL PROVINCES**  
post 0.9 Ga



OROGENIC PROCESSES / EVENTS		ANOROGENIC MAGM./PROC.		SEDIMENTARY STAGES
<b>S T A T H E R I A N</b>	Some few occurrences		<b>Very important - widespread STATHERIAN TAPHROGENESIS</b>	<b>Very important</b>
	Rio Negro Juruena belt (Transcontinental belt)	CAm	Mafic dike swarms AMCGr rock associations Intraplate granitic plutonism*	Orós-Jaguaribe-Parnaiba
	Rio Apa Block	CAm	Intraplate granitic plutonism* Felsic volcanic traps	Arai – Serra da Mesa Espinhaço-Chapada Diamantina
	Alto Jauru greenst. belt	CAm	Rifts and System of rifts	São Roque Group
<b>O R O S I R I A N</b>	Important		<b>Important - widespread</b>	
	Ventuari-Tapajós belt (volcanic arc suites)	CAm	L.I.P. UATUMÃ	RORAIMA plateau
	Jacobina-Areião belt Lagoa Real pluton.	SF	Intrusive plutonic suites: <i>Carajás, Estrela, Breves, Musa-Jamon etc.</i>	CAm→ Cam
	Cabo Frio block	Mant.	Layered mafic-ultramafic Complex.	CAM-SF
	Arequipa block	And	1st. Carbonatitic complexes	SF

Cam = Amazonian Craton; SF = S. Francisco Craton; SL = S. Luis Craton; La = Luis Alves Craton; RP = Rio de La Plata Craton; Bo = Borborema; To = Tocantins; Ma = Mantiqueira; And = Andean Structural Provinces

	OROGENIC PROCESSES / EVENTS	ANOROGENIC MAGM./PROC.			SEDIMENTARY STAGES
R H Y A C I A N	<b>Very important, widespread</b> <i>Common Arching inliers and protoliths</i>	<b>Common occurrences</b>			
	Maroni-Itacaiunas belt Tromai-Aurizona (TTG) Mineiro belt Itabuna-Salvador belt Western Bahia belt Piedra Alta-Tandilia	<b>CAm</b> <b>SL</b> <b>SF</b> <b>SF</b> <b>SF</b> <b>RP</b>	Granitic and syenitic plutonism Potassic and ultrapotassic syenitic magmatism (2.1-2.05 Ga)	<b>CAm-SF</b> <b>SF</b>	Upper sedimentary groups of many greenstone belts
	Most of the basement of all Brasiliano Structural Provinces (microcontinents, microplates etc.)		(Late-Rhyacian/ Early Orosirian)		
S I D E R I A N	<b>Many local and scattered occurrences</b> <b>High Grade rocks (TTG) + greenstone belts (TBG)</b>	<b>Local, scattered occurrences</b>			
	Bacajás domain Amapá block Lavras Contendas-Jacob. basem. Sta. Catarina complex	<b>CAm</b> <b>CAm</b> <b>SF</b> <b>SF</b> <b>LA</b>	Rift-related processes (Siderian taphrogenesis) Dike swarms Mafic-ultramafic compl. Alkaline complexes		
	Granja/R.Piranhas/TAM Almas – Conceição domain. Sta. Maria Chico Quirino	<b>Bo</b> <b>To</b> <b>Ma</b> <b>Ma</b>	Basin-forming tectonics Probable oceanic openings		Intra-cratonic and continental margin rock assemblages

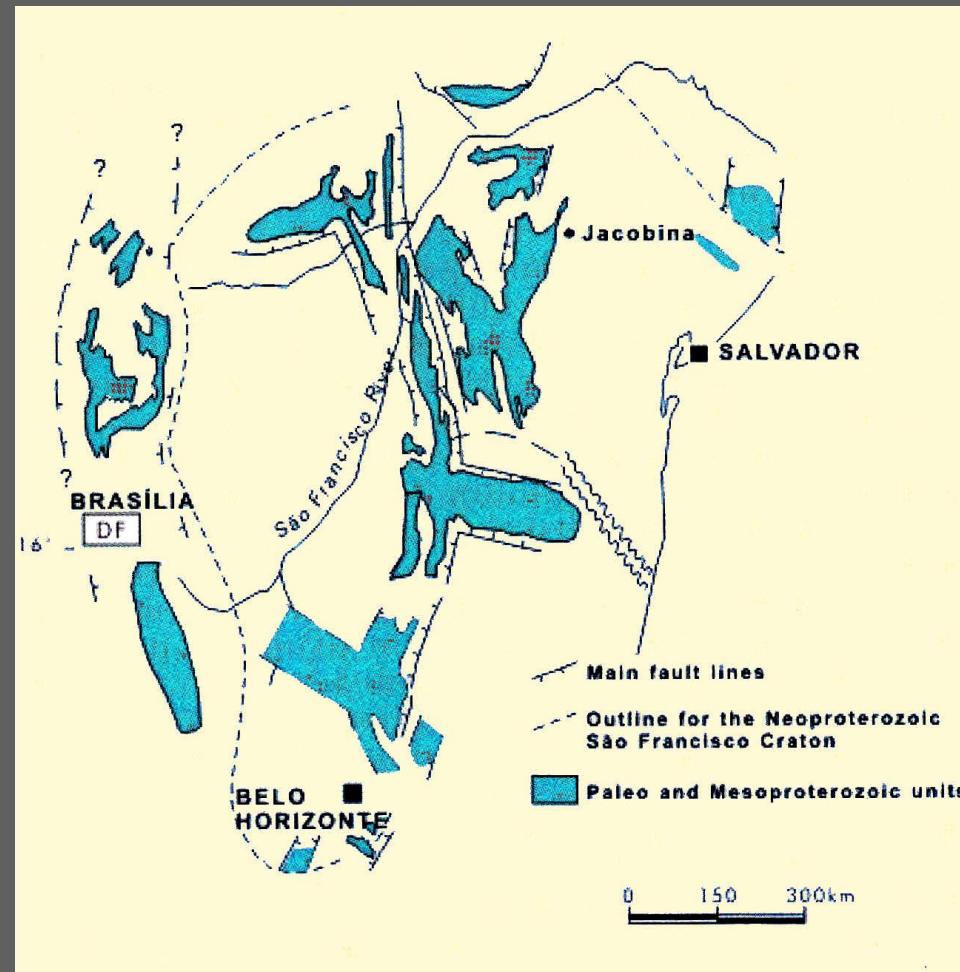
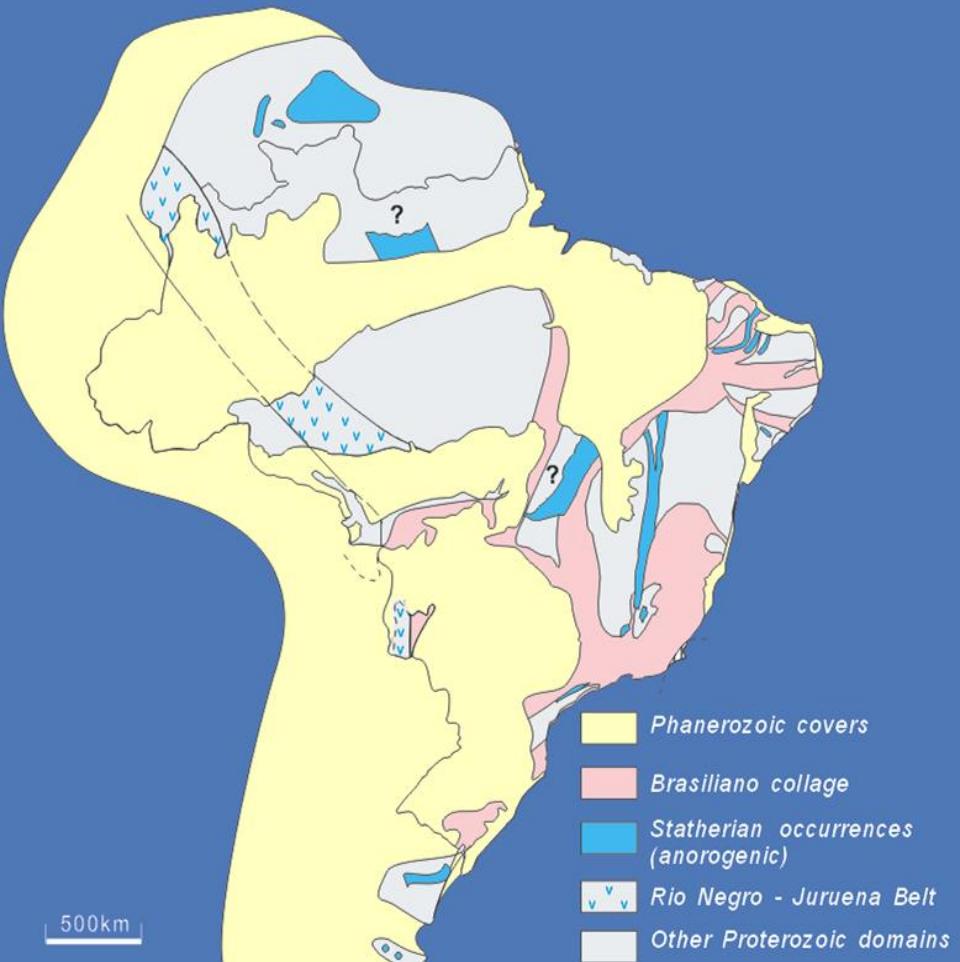
Cam = Amazonian Craton; SF = S. Francisco Craton; SL = S. Luis Craton; La = Luis Alves Craton; RP = Rio de La Plata Craton; Bo = Borborema; To = Tocantins; Ma = Mantiqueira; And = Andean Structural Provinces

## PALEOPROTEROZOIC IN SOUTH AMERICA: TECTONIC DIVERSITY IN TIME

STATHERIAN	A single and complex accretionary belt (Rio Negro~Jurena + Widespread Taphrogenesis)
OROSIRIAN	Different accretionary and collisional orogenies at different lithospheric blocks : 1.95-1.8 Ga A local LIP (Uatumã)
RHYACIAN	At least three different orogenetic cycles in different lithospheric blocks (diachronous) >2.2Ga ; ca. 2.15 Ga; 2.1-2.05 Ga
SIDERIAN	HGT and LGT orogenic formations, in different blocks ca. 2.35 Ga

# PALEOPROTEROZOIC SYSTEMS OF THE SOUTH AMERICAN CONTINENT

STATHERIAN (1.8-1.6 Ga)	<p><b>A single and complex accretionary belt:</b> Rio Negro Juruena- Transcontinental- Gothian</p> <p><b>Widespread Taphrogenesis</b> All Paleoporterozoic blocks – From Amazônia to La Plata</p>
OROSIRIAN	<p><b>Different accretionary and collisional belts</b> in some lithospheric blocks (1.95-1.8 Ga)</p> <p><b>Extraordinary (anorogenic) granitic plutonism</b></p> <p><b>A local LIP (Uatumã)</b></p> <p><b>Cooling Events of previous cycles</b></p>
RHYACIAN	<p><b>Different accretionary and collisional belts</b> in most of the lithospheric paleoproterozoic blocks (&gt;2.2 Ga; ca. 2.15 Ga; 2.1-2.06 Ga)</p> <p><b>Important granitic (and syenitic) plutonism</b></p>
SIDERIAN	<p><b>Local formation of HGT and LGT</b> In different blocks</p> <p><b>Local evidences for basin-forming tectonics</b> ("greenstone" and marginal basins)</p>



## MESOPROTEROZÓICO (1,6 - 1,0 Ga)

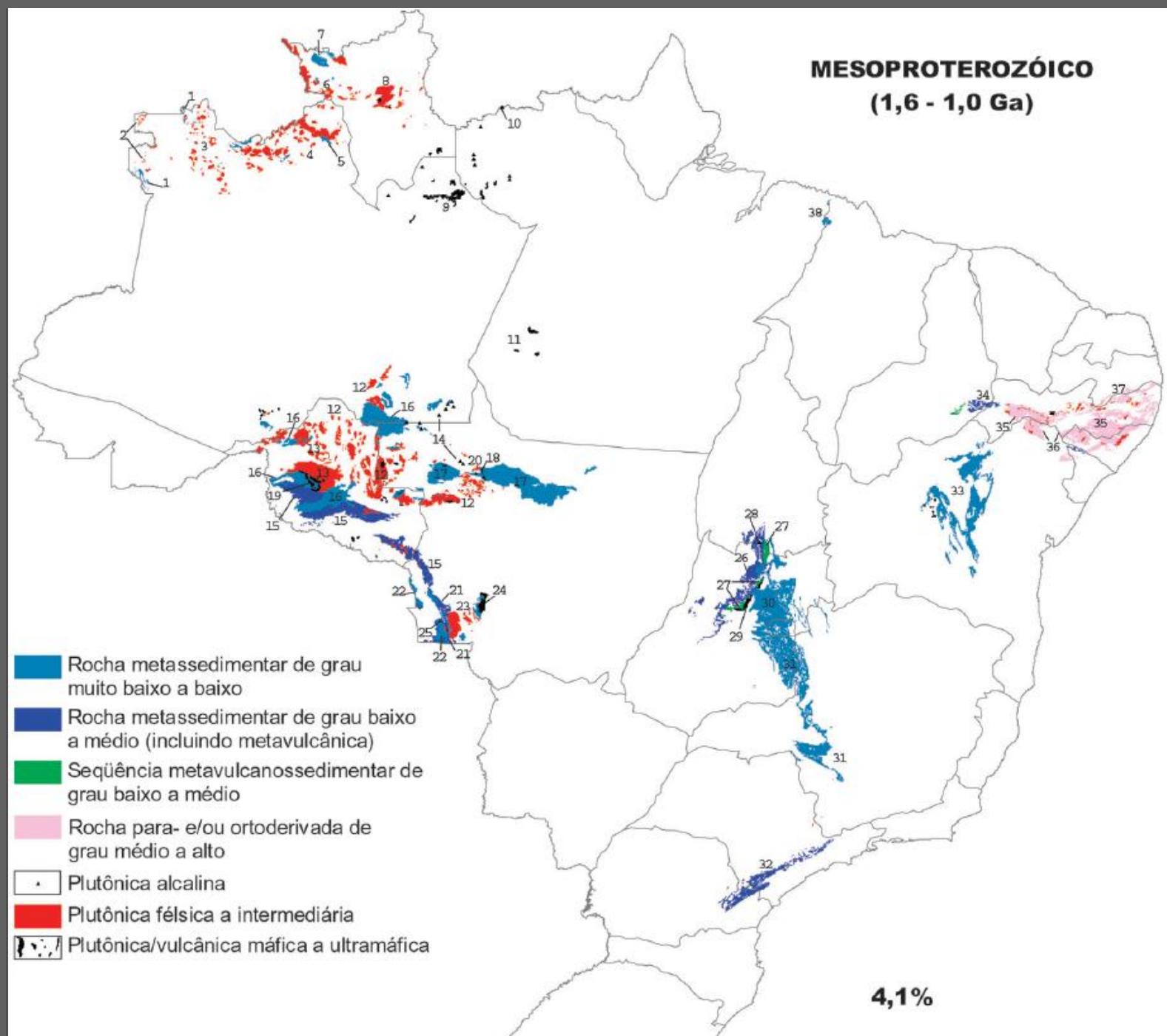
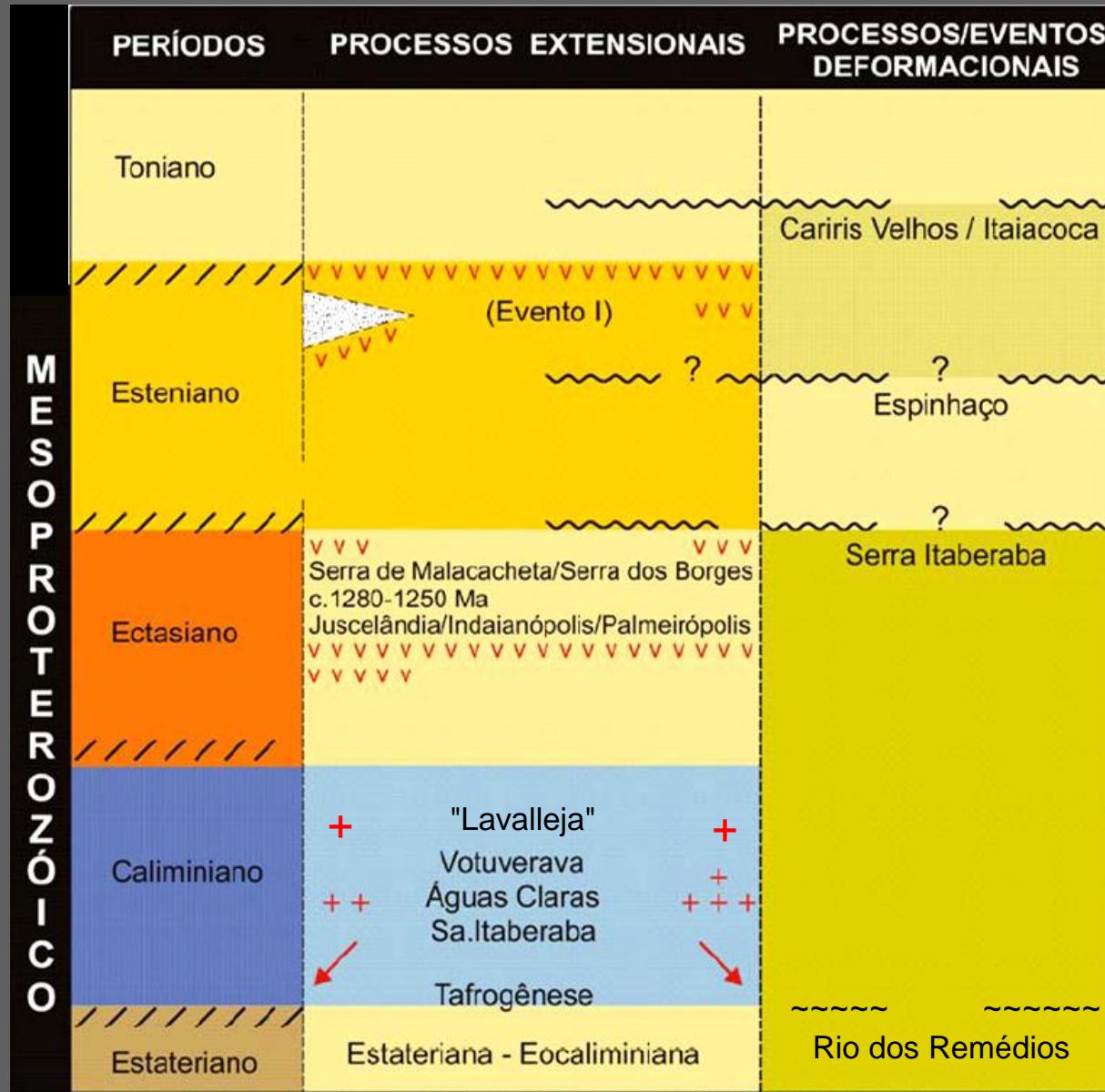
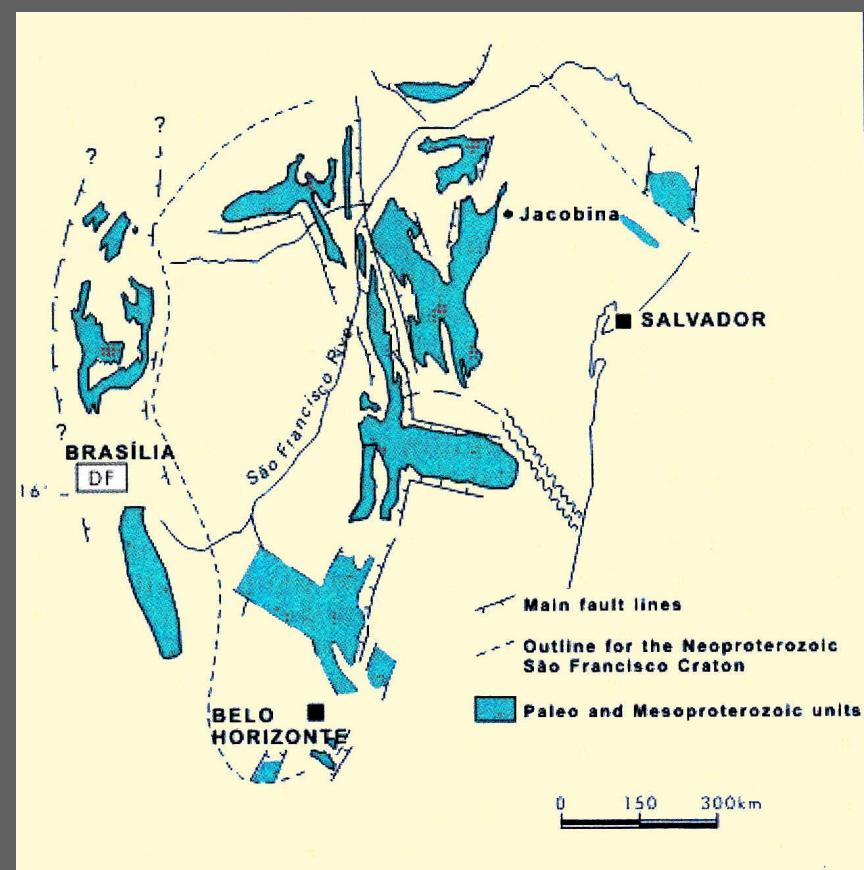
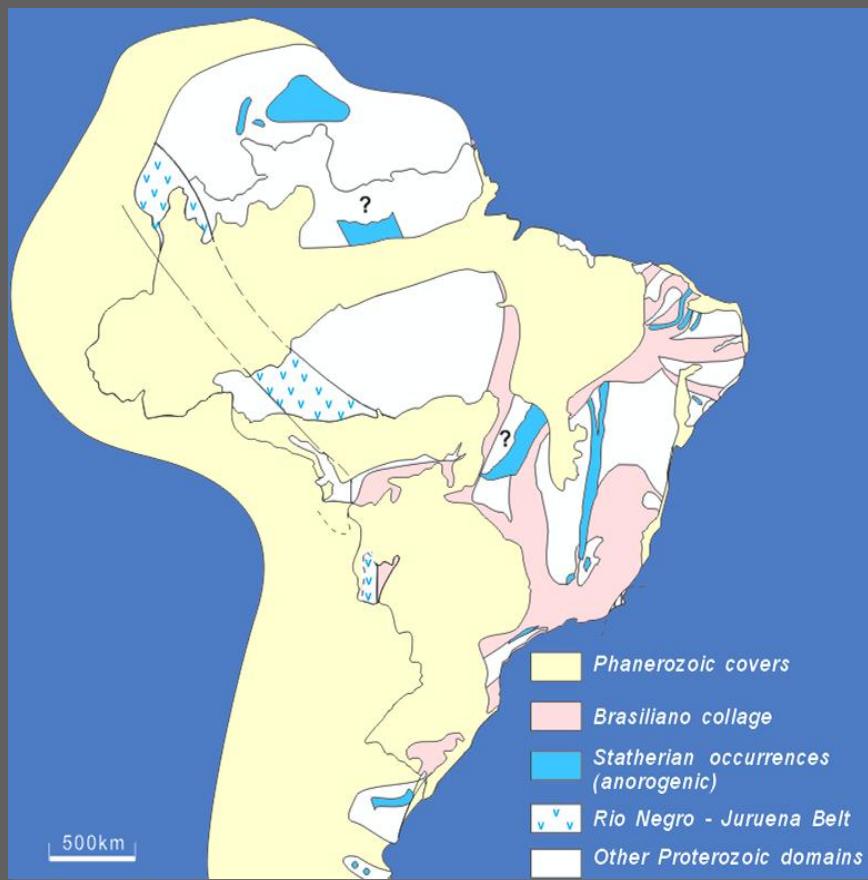


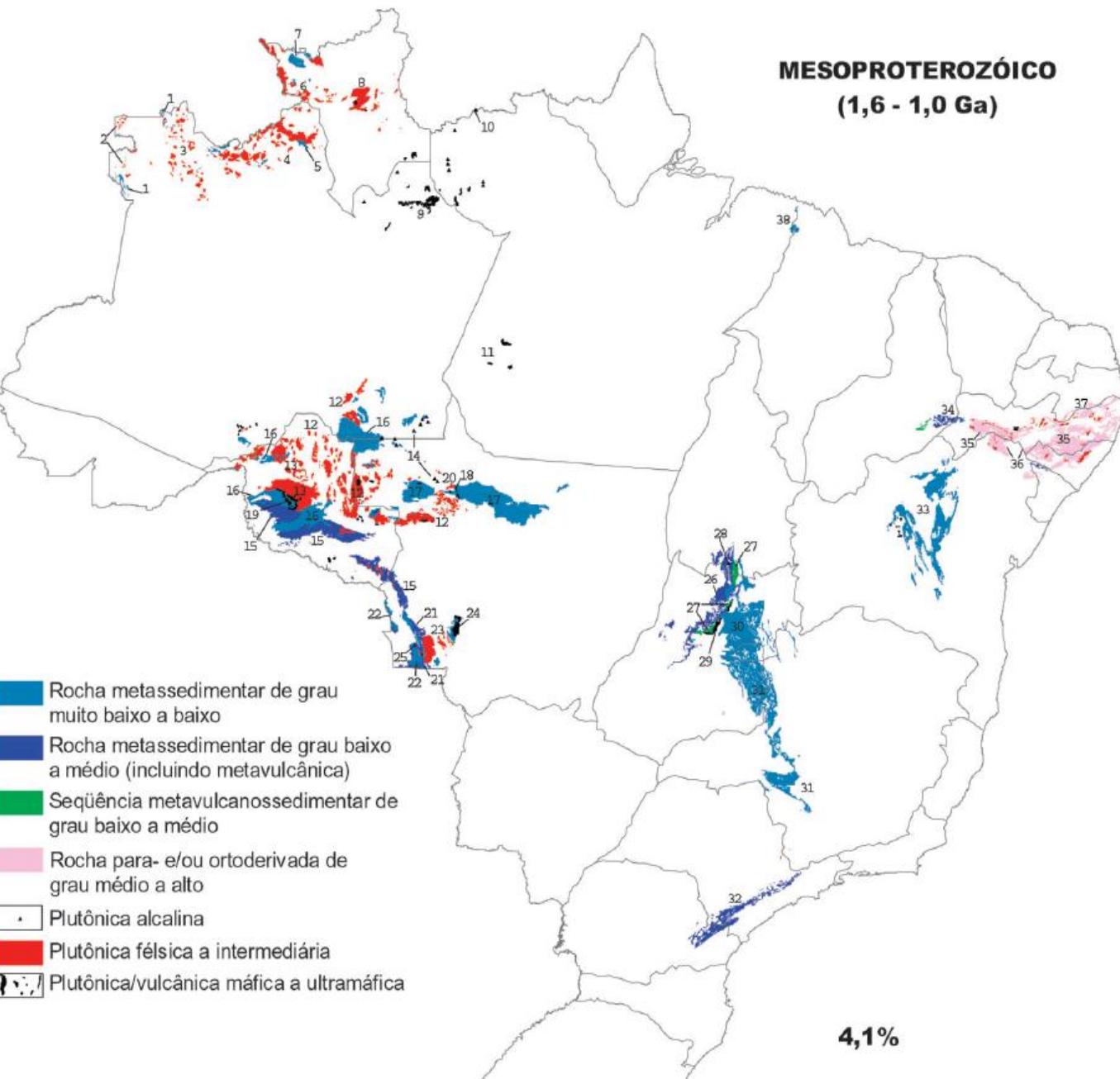
Tabela 4 – Evolução crustal mesoproterozóica no Bloco Amazônico

PERÍODOS	PROCESSOS ACRESCIONAIS	PICOS METAMÓRFICOS / COLISÃO	MAGMATISMO ANOROGÊNICO
<b>Toniano</b>		~~~~~ 0,95 Ga ~~~~~ Aguapeí	Rincon Del Tigre "Younger Granites" - 0,99 - 0,92 Ga
<b>Esteniano</b>		~~~~~ 1,1 - 1,05 Ga ~~~~~ Sunsás - N. Brasilândia	Taperas - 1,07 Ga Sta Clara - 1,08 - 1,07 Ga Oriente Novo - 1,08 Ga
<b>Ectasiano</b>		~~~~~ 1,32 - 1,30 Ga ~~~~~ Rondoniano / S. Ignácio Xistos Colorado / Tunui	1,22 - 1,12 Ga Extensão Aguapeí Sunsás / Vibosi Nova Brasilândia
<b>Caliminiano</b>	Pensamiento - 1,34 - 1,32 Ga  Sta Helena - 1,48 - 1,42 Ga Rio Alegre - 1,51 - 1,38 Ga Rio Crespo - 1,49 Ga Cachoeirinha - 1,52 - 1,50 Ga		S. Lourenço/Caripunas (1,31 Ga) Alto Candeias (1,34 Ga) Sto. Antonio (1,41 Ga)  Rio Branco (1,47 - 1,46 Ga) Igana Waupés (1,54 - 1,51 Ga) Sa. Providência (1,6 - 1,56 Ga)
<b>Estateriano</b>	Rio Negro - Jurena 1,8 - 1,55 Ga	///	

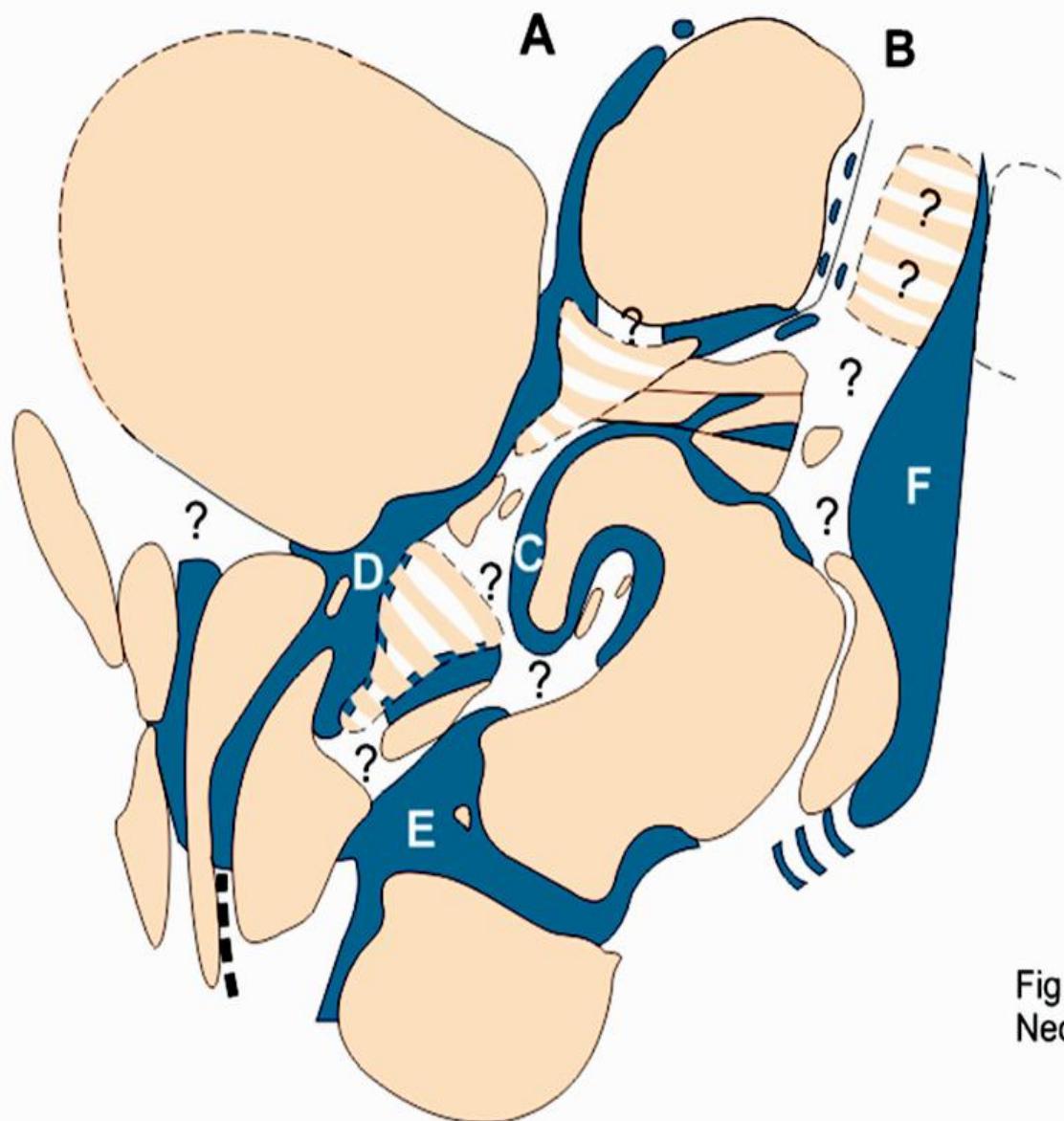




## MESOPROTEROZÓICO (1,6 - 1,0 Ga)







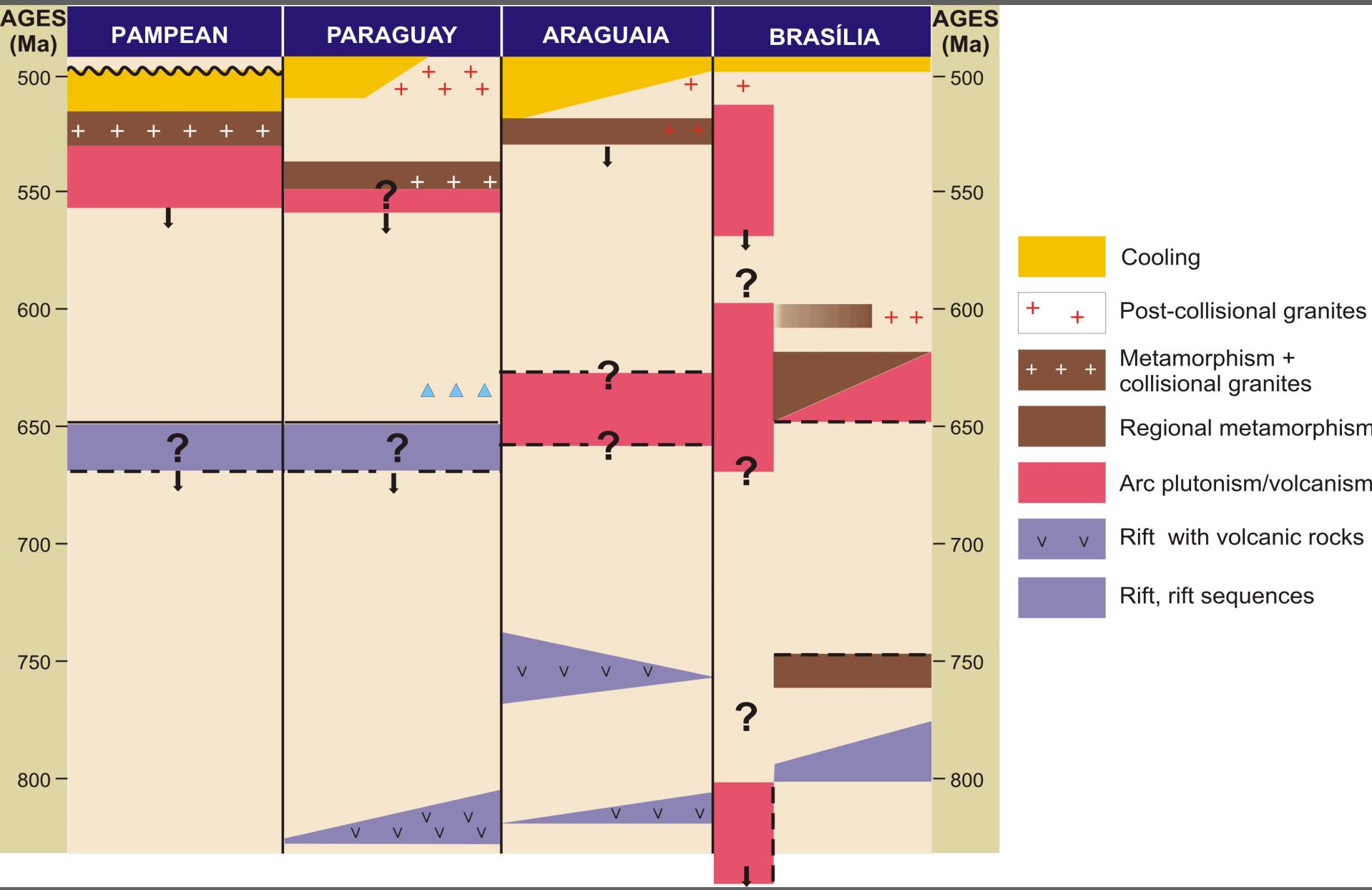
?

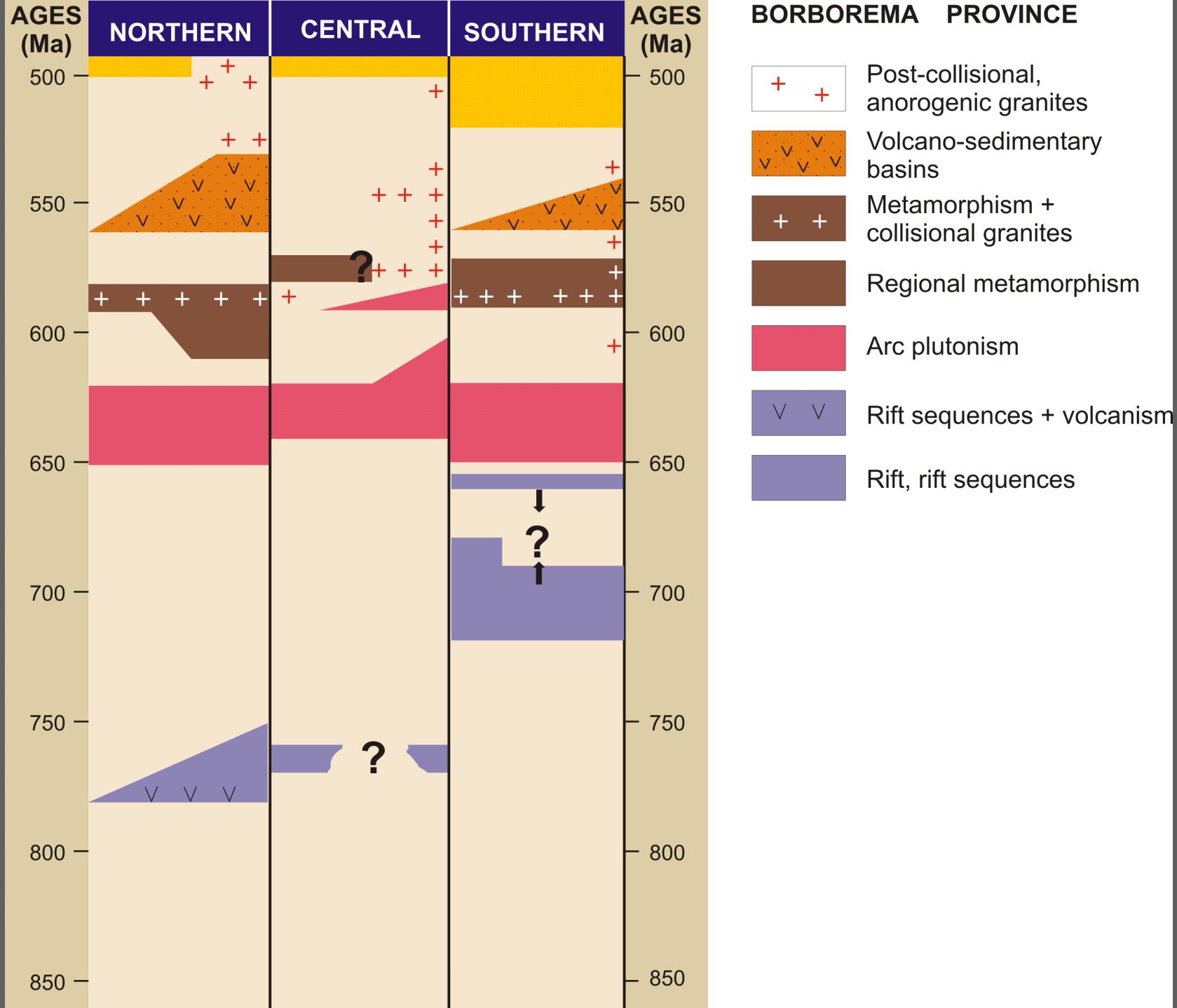
Areas with Phanerozoic cover and/or deep crustal reworking

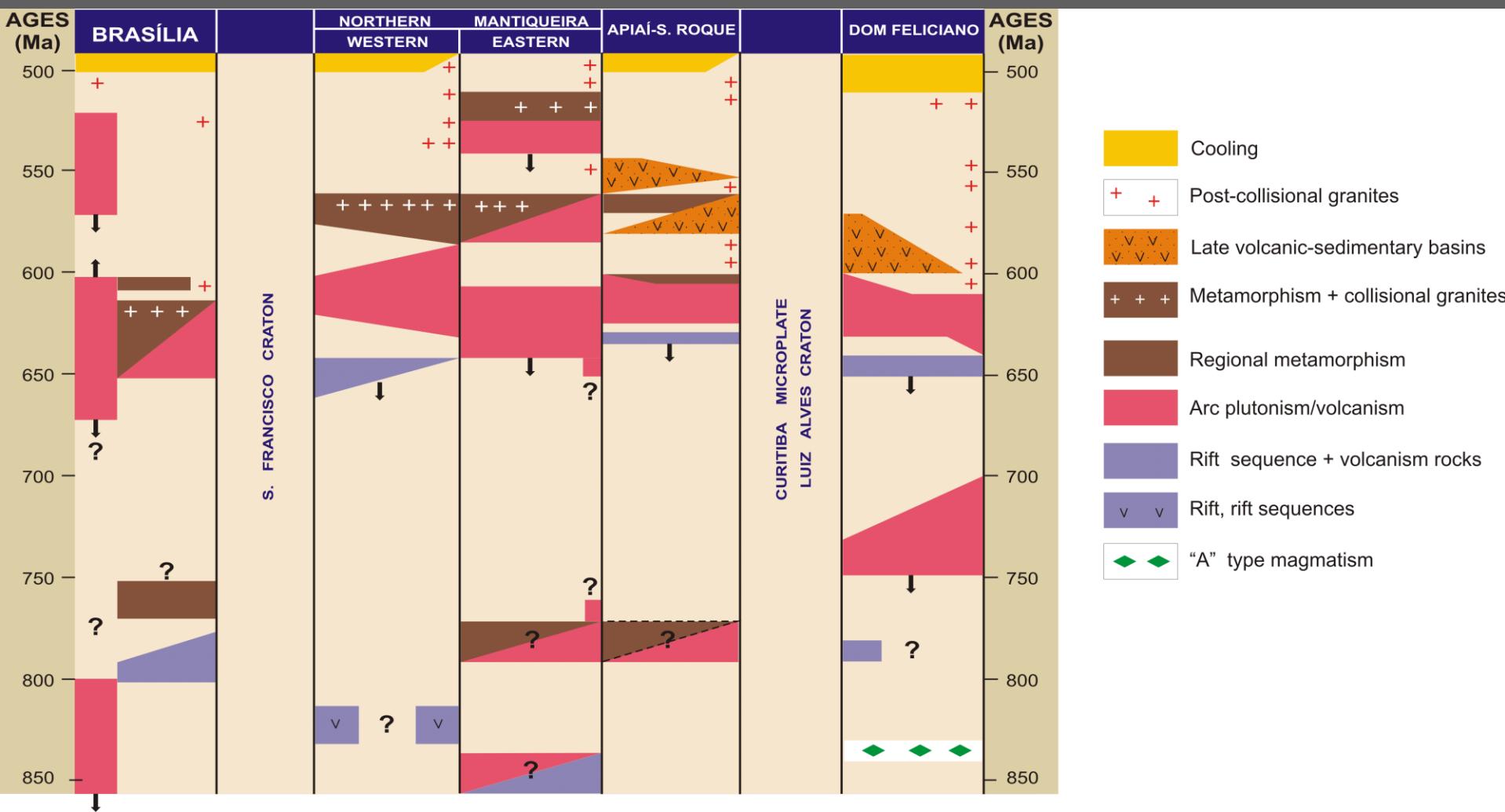
■ Neoproterozoic oceanic domains and related environments  
A/D= Rokelide/Goianides/ Cordoba;  
B=Pharusian/ Inhamuns;  
C=Peri-Franciscan  
E= Adamastor  
F=ANEKT

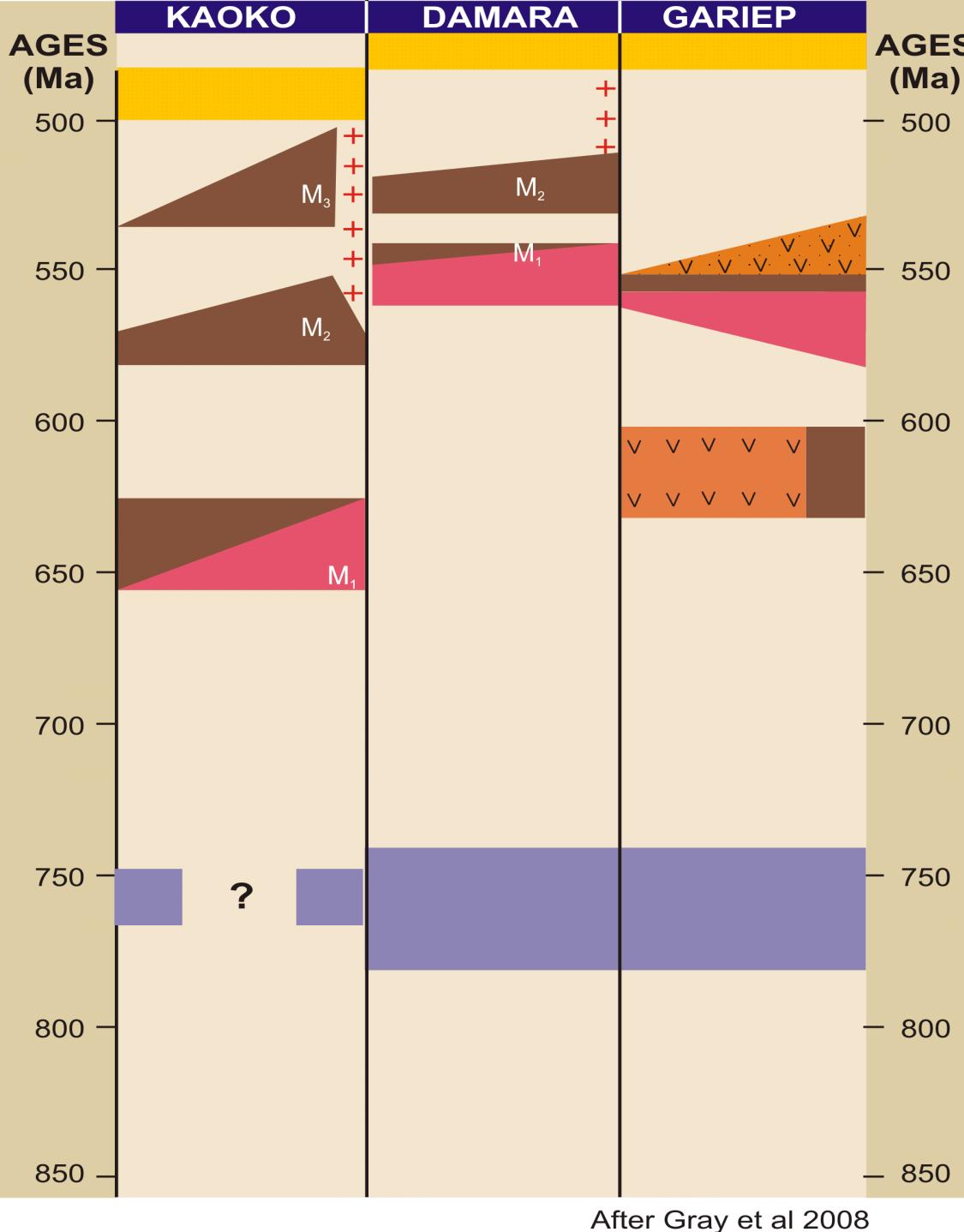
■ Pre-Neoproterozoic continental lithospheric segments (Rodinia's descendants)

Fig. 2 – A paleogeographic overview for the Neoproterozoic of Western Gondwana).









After Gray et al 2008

## CRATONIC SEDIMENTARY COVER DEVELOPED FROM THE EARLY ORDOVIOCIAN UP TO THE NEOGENE: 5 "SLOSSIAN" SEQUENCES

<b>G</b>	<b>560 ⇒ 480 Ma</b> Late to post tectonic events of foreland + Extrusion + local Impactogenesis + Diversified Magmatism * (*alkaline granites, rapakivi granites, pegmatites, mafic dikes)
<b>F</b>	<b>550 ⇒ 500 Ma</b> Local processes of late accretionary orogenies, Cambrian in age, specially in the northern part of the Mantiqueira Province (550-540Ma) and in the Pampean Province (550-525 Ma), with late events going up to the Early Ordovician.
<b>E</b>	<b>585 ⇒ 560 Ma</b> Many cycles of accretionary orogenies (with some local collisions) in most of the Structural Provinces. Usually it is difficult to discriminate these processes from the previous ones of 660-600Ma.
<b>D</b>	<b>660 ⇒ 600 Ma</b> The most important group of interaction of plates: accretionary orogenies followed by collisions of the Brasiliano Collage. Wide and rich range of records, from different fold belts, from a province to another, along a time interval of about 60Ma.
<b>C'</b>	<b>780-750Ma</b> Some local records of high grade metamorphism (precocious collisional events?), preceding the clímax of the Brasiliano development.
<b>C</b>	<b>790 Ma; 710 Ma</b> Some local and fair records of accretionary orogenies, in the Mantiqueira Province (S. Gabriel, Rio Negro, still of contradictory interpretation).
<b>B</b>	<b>810⇒750Ma</b> Diachronous taphrogenic processes, with records practically in all the provinces, associated to diversified occurrences of magmatism, felsic (volcanism and plutonism), mafic and ultramafic (large bodies). Events related to the fission of Rodinia?
<b>A</b>	Cycles of Early Tonian orogenies (1.000- 930 Ma) and Late Tonian (960-820 Ma), in the Borborema (C. Velhos), in the Tocantins (Mara Rosa) and in the Mantiqueira (Itaiacoca) provinces. Side by side with sparse events of taphrogenic associated to granitic plutonism and basaltic volcanism (from >1.000Ma a 910 Ma) Mostly Paleoproterozoic Basement (some Archem nuclei ); local mesoproterozoic basement

SISTEMAS / PERÍODOS		Frequência estimada	
CAMBRO-ORDOVICIANO	540-480 Ma	+++	
EDIACARANO	580-560 Ma	+++++	FUSÃO BRASILIANA
CRIOGENIANO / EDIACARANO	650-610 Ma	+++++	
EOTONIANO	1000-930 Ma	+++	
ESTENIANO		+++	COLAGEM "GREENVILLIANA"
ECTASIANO		+ ? +	
CALIMINIANO		+ ? +	
ESTATERIANO		+++	TAFROGÊNESE ESTATERIANA
OROSIRIANO		++ ?	
RHIACIANO	2200-2050 Ma	+++++	COLAGEM PALEOPROTEROZÓICA
SIDERIANO		++	
NEOARQUEANO	2800-2500 Ma	+++	
MESOARQUEANO	3200-3100 Ma	++	CÉLULAS MICROCONTINENTAIS ARQUEANAS
PALEOARQUEANO	3400-3500 Ma	+ ?	

## COBERTURA SEDIMENTAR CRATÔNICA DO EO-ORDOVICIANO AO NEÓGENO: 5 SEQUENCIAS

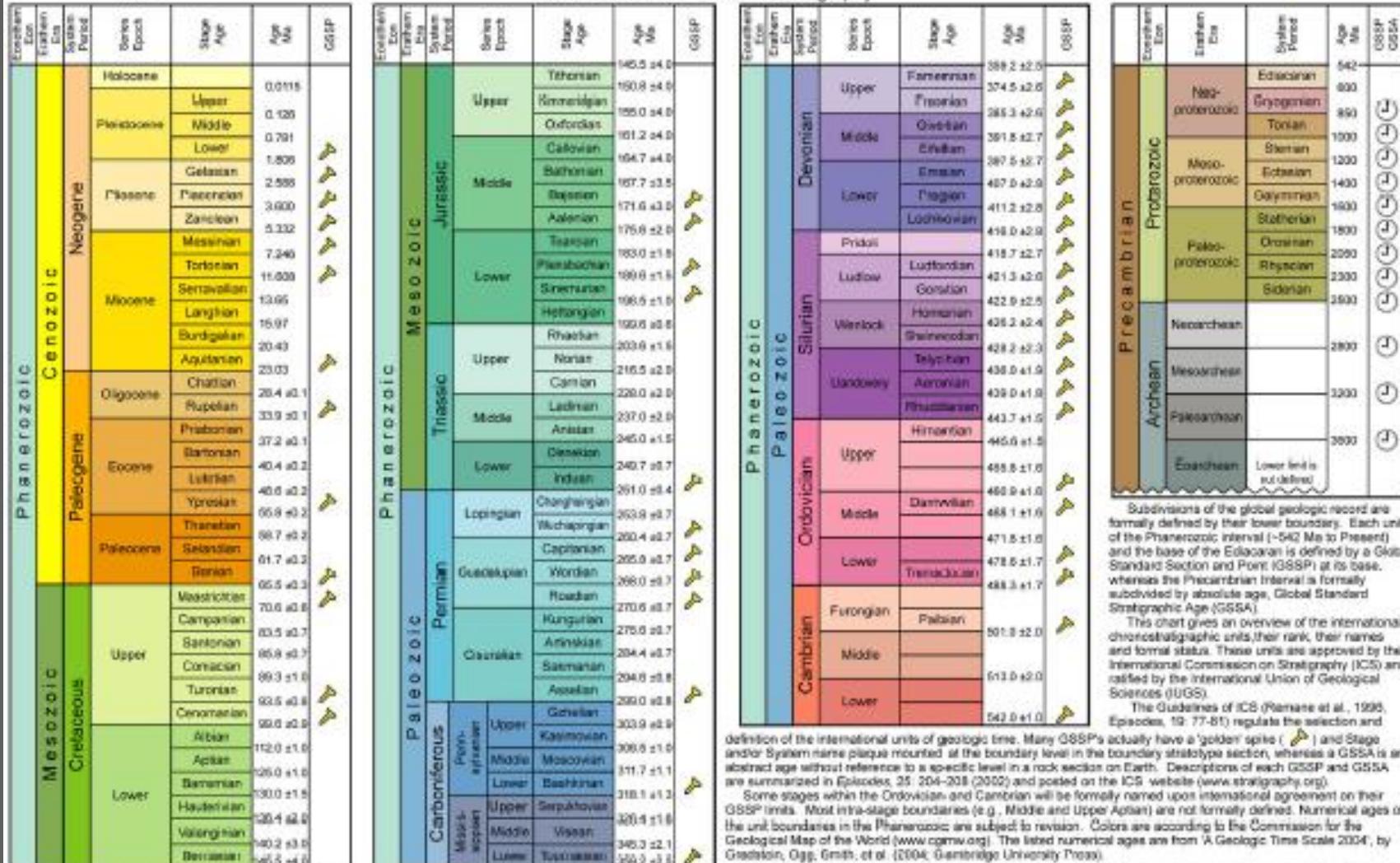
	<b>560 → 480 Ma</b>
G	Eventos (tardi a pós) tectônicos de antepaís + Extrusão + Impactogênese local + Diversificado Magmatismo* (* granitos alcalinos, granitos rapakivi, pegmatitos, diques maficos)
F	<b>550 → 500 Ma</b> Processos locais e residuais de orogenias acrecionárias do Cambriano sobretudo, no norte da Província Mantiqueira (550-540Ma) e na Prov. Pampeana (550-525 Ma), com eventos tardios no Eo-ordoviciano
E	<b>585 → 560 Ma</b> Vários ciclos de orogenias acrecionárias (e colisão local) na maioria das províncias estruturais, localmente com separação difícil do ciclo de orogêneses anteriores
D	<b>660 → 600 Ma</b> O mais importante conjunto ciclos de interações orogênicas acrecionárias (seguidos de colisão) da colagem Brasiliana. Registros ricos, de diferentes no tempo e no espaço, de uma província a outra , cobrindo intervalo delongado de ca. 60 Ma
C'	<b>780-750Ma</b> Registros de eventos locais de metamorfismo de alto grau , precedendo o auge do desenvolvimento Brasiliano
C	<b>790 Ma; 710 Ma</b> Registros locais de eventos precoces de orogenia acrecionária, na Província Mantiqueira, de interpretação ainda controversa (Rio Negro e São Gabriel)
B	<b>810→750Ma</b> Processos Tafrogenéticos Diacrônicos, com registro praticamente em todas as províncias diversificadas ocorrências com magmatismo felsico (vulcanismo e plutonismo), mafico e ultramafico. ( Ligado à fissão do Supercontinente Rodinia?)
A	<b>Ciclos de orogenia Cedotonianas (1.000- 930 Ma) e Tarditonianas (960-820 Ma)</b> na Borborema (C. Velhos), na Tocantins (Mara Rosa) e na Mantiqueira (Itaiacoca) + vários e dispersos eventos tafrogênicos associados com plutonismo granítico e vulcanismo basáltico. (de >1.000Ma a 910 Ma)

**EMBASAMENTO PALEOPROTEROZÓICO POLICÍCLICO (núcleos meso e neoarqueanos)  
E MESOPROTEROZÓICO (faixas e blocos).**

**QUADRO 6 : EVOLUÇÃO DOS PROCESSOS / EVENTOS  
OROGÊNICOS DO NEOPROTEROZÓICO NA PLATAFORMA SUL-  
AMERICANA**

# INTERNATIONAL STRATIGRAPHIC CHART

International Commission on Stratigraphy



Subdivisions of the global geological record are formally defined by their lower boundary. Each unit of the Phanerozoic interval (~542 Ma to Present) and the base of the Ediacaran is defined by a Global Standard Section and Point (GSSP) at its base, whereas the Precambrian Interval is formally subdivided by absolute age, Global Standard Stratigraphic Age (GSSA).

This chart gives an overview of the international chronostratigraphic units, their rank, their names and formal status. These units are approved by the International Commission on Stratigraphy (ICS) and ratified by the International Union of Geological Sciences (IUGS).

The Guidelines of ICS (Parsons et al., 1995; Episodes, 19: 77–81) regulate the selection and definition of the international units of geological time. Many GSSPs actually have a 'golden' spike ( ) and Stage and/or System name plaque mounted at the boundary level in the boundary stratotype section, whereas a GSSA is an abstract age without reference to a specific level in a rock section on Earth. Descriptions of each GSSP and GSSA are summarized in Episodes, 25: 204–208 (2002) and posted on the ICS website ([www.stratigraphy.org](http://www.stratigraphy.org)).

Some stages within the Ordovician and Cambrian will be formally named upon international agreement on their GSSP limits. Most intra-stage boundaries (e.g., Middle and Upper Atrypian) are not formally defined. Numerical ages of the unit boundaries in the Phanerozoic are subject to revision. Colors according to the Commission for the Geological Map of the World ([www.cpnm.org](http://cpnm.org)). The listed numerical ages are from 'A Geologic Time Scale 2004', by Grotzinger, Ogg, Smith, et al. (2004; Cambridge University Press).

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