Geotectônica do Brasil: uma síntese

Reinhardt A. Fuck
Benjamim Bley de Brito Neves
América do Sul: Principais traços geológicos
Effects of the Brasiliano orogeny are absent.

- Amazonian Craton
- Paraguay Belt
- Faixa Brasília
- Araçuaí Belt
- Ribeira Belt
- Dom Feliciano Belt

Strong Brasiliano/Pan-African imprint.
Amazonian Craton
- Central Amazonian Province
- Maroni-tacaunaas Province
- Vertua-Tapajós Province
- Rio Negro-Juruena Province
- Rondonian-San Ignacio Province
- Sungsas Province

Smaller cratonic masses
- São Luís Craton
- São Francisco Craton
- Luiz Alves Craton
- Rio de La Plata Craton

Sedimentary covers
- Phanerozoic
- Precambrian
- Andean belt, with Precambrian outcrops
- Neoproterozoic tectonic provinces
Bacia do Parnaíba

Cráton do São Francisco

Domínio N

Domínio Central (Zona Transversal)

Domínio S

Província Borborema
Northern Domain: continuous Paleoproterozoic basement

T.J.S. dos Santos et al, 2009
Província Borborema
Terrenos tectono-estratigráficos (Santos e Medeiros 1999; Santos 2000)

From: Oliveira (2008)
A Província Tocantins

Figura V.12 – Domínios tectônicos e principais estruturas da Província Tocantins. XG-Sistema Xambioá-Gurupí; 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-Gurupí Province; LT- Transbrasiliano Lineament; IP- Pirineus Inflexion; MB-Lineamento Morporá-Novinho Brasil; NM-“Nappe” Maratá; SP-Sistema Paraná; NA-“Nappe” de Araxá
Fig. 1 – Tectonic setting of the continent, with regional geology.
Aerogeofísica
- 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

## Archean in South America

<table>
<thead>
<tr>
<th>Brasiliano Cratonic Provinces</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Large Para-autochthonous Blocks</strong></td>
<td>Surrounding Paleoproterozoic fold belts</td>
</tr>
<tr>
<td><strong>Allochthonous Blocks / Plates</strong></td>
<td>Agglutinated during Rhyacian-Orosirian orogeneses</td>
</tr>
<tr>
<td><strong>Archean Remnants in the Interior of Paleoproterozoic Belts</strong></td>
<td>Slivers, terranes, gneiss domes, thrust sheets etc</td>
</tr>
<tr>
<td><strong>Local Records of Archean Protoliths</strong></td>
<td>Regional Geology &quot;&lt;&quot; isotopic data (Sm-Nd, U-Pb)</td>
</tr>
<tr>
<td><strong>Presumed Archean Domains Hidden by Proterozoic and Phanerozoic Covers</strong></td>
<td>Very large Paleo, Meso and Neoproterozoic basins and rifts; major Phanerozoic synclines</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Brasiliano Structural Provinces</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Central Goiás &quot;Massif&quot; / Microplate</strong></td>
<td>Well preserved Archean Rock Units = LGT and HGT</td>
</tr>
<tr>
<td><strong>Archean Basement Inliers</strong></td>
<td>Structural windows, transpressional blocks</td>
</tr>
<tr>
<td><strong>Archean Remnants in the Interior of Paleoproterozoic Fold Belts</strong></td>
<td>Like last item above. The Paleoproterozoic basement is by far predominant</td>
</tr>
<tr>
<td><strong>Local Archean Crustal Sources</strong></td>
<td>T&lt;sub&gt;DM&lt;/sub&gt; values (basement, cover sequences, some granitic rocks), U-Pb in zircons</td>
</tr>
<tr>
<td><strong>OROGENIC PROCESSES / EVENTS</strong></td>
<td><strong>ANOROGENIC MAGM./PROC.</strong></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Some few occurrences</td>
<td>Very important - widespread STATHERIAN TAPHROGENESIS</td>
</tr>
<tr>
<td>Rio Negro Juruena belt (Transcontinental belt)</td>
<td>CAM</td>
</tr>
<tr>
<td>Rio Apa Block</td>
<td>CAM</td>
</tr>
<tr>
<td>Alto Jauru greenst. belt</td>
<td>CAM</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Important</td>
<td>Important - widespread</td>
</tr>
<tr>
<td>Ventuari-Tapajós belt (volcanic arc suites)</td>
<td>CAM</td>
</tr>
<tr>
<td>Jacobina-Areião belt</td>
<td>SF</td>
</tr>
<tr>
<td>Lagoa Real pluton.</td>
<td>SF</td>
</tr>
<tr>
<td>Cabo Frio block</td>
<td>Mant.</td>
</tr>
<tr>
<td>Arequipa block</td>
<td>And</td>
</tr>
</tbody>
</table>

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
<table>
<thead>
<tr>
<th>OROGENIC PROCESSES / EVENTS</th>
<th>ANOROGENIC MAGM./PROC.</th>
<th>SEDIMENTARY STAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RHYACIAN</strong></td>
<td>Common occurrences</td>
<td>Upper sedimentary groups of many greenstone belts</td>
</tr>
<tr>
<td>Maroni-Itacaiunas belt</td>
<td>Granitic and syenitic plutonism</td>
<td>Cam-SF</td>
</tr>
<tr>
<td>Tromai-Aurizona (TTG)</td>
<td></td>
<td>(Late-Rhyacian/ Early Orosiran)</td>
</tr>
<tr>
<td>Mineiro belt</td>
<td>Potassic and ultrapostassive syenitic magmatism (2.1-2.05 Ga)</td>
<td>SF</td>
</tr>
<tr>
<td>Itabuna-Salvador belt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Bahia belt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piedra Alta-Tandilia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most of the basement of all Brasillian Structural Provinces (microcontinents, microplates etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SIDERIAN</strong></td>
<td>Local, scattered occurrences</td>
<td>Intra-cratic and continental margin rock assemblages</td>
</tr>
<tr>
<td>Many local and scattered occurrences</td>
<td>Rift-related processes</td>
<td></td>
</tr>
<tr>
<td>High Grade rocks (TTG) + greenstone belts (TBG)</td>
<td>(Siderian taphrogenesis)</td>
<td></td>
</tr>
<tr>
<td>Bacajás domain</td>
<td>Dike swarms</td>
<td></td>
</tr>
<tr>
<td>Amapá block</td>
<td>Mafic-ultramafic compl.</td>
<td></td>
</tr>
<tr>
<td>Lavras</td>
<td>Alkaline complexes</td>
<td></td>
</tr>
<tr>
<td>Contendas-Jacob. basem.</td>
<td>Basin-forming tectonics</td>
<td></td>
</tr>
<tr>
<td>Sta. Catarina complex</td>
<td>Probable oceanic openings</td>
<td></td>
</tr>
<tr>
<td>Granja/R.Piranhas/TAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Almas – Conceição domain.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta. Maria Chico</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quirino</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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
<table>
<thead>
<tr>
<th>STATHERIAN</th>
<th>A single and complex accretionary belt (Rio Negro-Jurena + Widespread Taphrogenesis)</th>
</tr>
</thead>
</table>
| OROSIAN           | Different accretionary and collisional orogenies at different lithospheric blocks: 1.95-1.8 Ga  
|                   | A local LIP (Uatumá)                                                                 |
| RHYACIAN          | At least three different orogenic cycles in different lithospheric blocks (diachronous)  
|                   | >2.2 Ga; 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

<table>
<thead>
<tr>
<th>Period</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STATHERIAN</strong> (1.8-1.6 Ga)</td>
<td>A single and complex accretionary belt: Rio Negro Juruena-Transcontinental-Gothian Widespread Taphrogenesis All Paleoproterozoic blocks — From Amazônia to La Plata</td>
</tr>
<tr>
<td><strong>OROSIRIAN</strong></td>
<td>Different accretionary and collisional belts in some lithospheric blocks (1.95-1.8 Ga) Extraordinary (anorogenic) granitic plutonism A local LIP (Uatumã) Cooling Events of previous cycles</td>
</tr>
<tr>
<td><strong>RHYACIAN</strong></td>
<td>Different accretionary and collisional belts in most of the lithospheric paleoproterozoic blocks (&gt;2.2 Ga; ca. 2.15 Ga; 2.1-2.06 Ga) Important granitic (and syenitic) plutonism</td>
</tr>
<tr>
<td><strong>SIDERIAN</strong></td>
<td>Local formation of HGT and LGT In different blocks Local evidences for basin-forming tectonics (&quot;greenstone&quot; and marginal basins)</td>
</tr>
</tbody>
</table>
MESOPROTEROZÓICO
(1,6 - 1,0 Ga)

- Rocha metassedimentar de grau muito baixo a baixo
- Rocha metassedimentar de grau baixo a médio (incluindo metavulcânica)
- Seqüência metavulcanossedimentar de grau baixo a médio
- Rocha para- e/ou ortoderivada de grau médio a alto
- Plutônica alcalina
- Plutônica felsica a intermediária
- Plutônica/vulcânica máfica a ultramáfica

4,1%
Tabela 4 – Evolução crustal mesoproterozóica no Bloco Amazônico

<table>
<thead>
<tr>
<th>PERÍODOS</th>
<th>PROCESSOS ACRESIONAIS</th>
<th>PICOS METAMÓRFICOS / COLISÃO</th>
<th>MAGMATISMO ANOROGÉNICO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estateriano</td>
<td></td>
<td></td>
<td>Rincon Del Tigre</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>“Younger Granites”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0,99 - 0,92 Ga</td>
</tr>
<tr>
<td>Toniano</td>
<td>1,8 - 1,55 Ga</td>
<td>0,95 Ga</td>
<td>Rincon Del Tigre</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aguapeí</td>
<td>“Younger Granites”</td>
</tr>
<tr>
<td>Esteniano</td>
<td></td>
<td>1,1 - 1,05 Ga</td>
<td>Taperas - 1,07 Ga</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sunús - N. Brasilândia</td>
<td>Sta Clara - 1,08 - 1,07 Ga</td>
</tr>
<tr>
<td>Ectasiano</td>
<td>1,34 - 1,32 Ga</td>
<td>1,32 - 1,30 Ga</td>
<td>Oriente Novo - 1,08 Ga</td>
</tr>
<tr>
<td>Caliminiano</td>
<td>Sta Helena - 1,48 - 1,42 Ga</td>
<td>Rondoniano / S. Ignácio</td>
<td>Extensão Aguapeí</td>
</tr>
<tr>
<td></td>
<td>Rio Alegre - 1,51 - 1,38 Ga</td>
<td>Xistos Colorado / Tunui</td>
<td>Sunús / Vibosi</td>
</tr>
<tr>
<td></td>
<td>Rio Crespo - 1,49 Ga</td>
<td></td>
<td>Nova Brasilândia</td>
</tr>
<tr>
<td></td>
<td>Cachoeirinha - 1,52 - 1,50 Ga</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estateriano</td>
<td>Rio Negro - Jurena</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1,8 - 1,55 Ga</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MESOPROTEROZOÍCO
(1,6 - 1,0 Ga)

- Rocha metassedimentar de grau muito baixo a baixo
- Rocha metassedimentar de grau baixo a médio (incluindo metavulcânica)
- Seqüência metavulcanossedimentar de grau baixo a médio
- Rocha para- e/ou ortoderivada de grau médio a alto
- Plutônica alcalina
- Plutônica felsica a intermediária
- Plutônica/vulcânica máfica a ultramáfica

4,1%
Fig. 2 – A paleogeographic overview for the Neoproterozoic of Western Gondwana.
## CRATONIC SEDIMENTARY COVER DEVELOPED FROM THE EARLY ORDOVICIAN UP TO THE NEogene: 5 “SLOSSIAN” SEQUENCES

### A
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

### 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?

### C
Some local and fair records of accretionary orogenies, in the Mantiqueira Province (S. Gabriel, Rio Negro, still of contradictory interpretation).

### C’
Some local records of high grade metamorphism (precocious collisional events?), preceding the climax of the Brasiliano development.

### D
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.

### E
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.

### F
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.

### G
Late to post tectonic events of foreland + Extrusion + local Impactogène + Diversified Magmatism * (*alkaline granites, rapakivi granites, pegmatites, mafic dikes)

### 560 ⇒ 480 Ma
550 ⇒ 500 Ma
585 ⇒ 560 Ma
660 ⇒ 600 Ma
780-750Ma
790 Ma; 710 Ma
810⇒750Ma
<table>
<thead>
<tr>
<th>Sistemas/Períodos</th>
<th>Frequência estimada</th>
<th>Notas</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAMBRO – ORDOVICIANO</td>
<td>540-480 Ma</td>
<td>+++</td>
</tr>
<tr>
<td>EDIACARANO</td>
<td>580-560 Ma</td>
<td>+++ + + + +</td>
</tr>
<tr>
<td>CRIOGENIANO / EDIACARANO</td>
<td>650-610 Ma</td>
<td>+++ + + +</td>
</tr>
<tr>
<td>EOTONIANO</td>
<td>1000-930 Ma</td>
<td>+++</td>
</tr>
<tr>
<td>ESTENIANO</td>
<td>+ + +</td>
<td>COLAGEM &quot;GREENVILLIANA&quot;</td>
</tr>
<tr>
<td>ECTASIANO</td>
<td>+ ? +</td>
<td></td>
</tr>
<tr>
<td>CALIMINIANO</td>
<td>+ ? +</td>
<td></td>
</tr>
<tr>
<td>ESTATERIANO</td>
<td>+ + +</td>
<td>TAFROGÊNESE ESTATERIANA</td>
</tr>
<tr>
<td>OROSIRIANO</td>
<td>+ + ?</td>
<td></td>
</tr>
<tr>
<td>RHIACIANO</td>
<td>2200-2050 Ma</td>
<td>+++ + + +</td>
</tr>
<tr>
<td>SIDERIANO</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>NEOARQUEANO</td>
<td>2800-2500 Ma</td>
<td>+++</td>
</tr>
<tr>
<td>MEOARQUEANO</td>
<td>3200–3100 Ma</td>
<td>+ +</td>
</tr>
<tr>
<td>PALEOARQUEANO</td>
<td>3400–3500 Ma</td>
<td>+ ?</td>
</tr>
</tbody>
</table>
### COBERTURA SEDIMENTAR CRATÔNICA DO EO-ORDOVICIANO AO NEÓGENO: 5 SEQUÊNCIAS

<table>
<thead>
<tr>
<th></th>
<th>Sequência</th>
<th>Descrição</th>
</tr>
</thead>
</table>
|  | **G** | 560 ⇒ 480 Ma  
Eventos (tardi a pós) tectônicos de antepais + Extrusão + Impactogênese local + Diversificado Magmatismo*  
(* granitos alcalinos, granitos rapakivi, pegmatitos, diques máficos) |
|  | **F** | 550 ⇒ 500 Ma  
Processos locais e residuais de orogenias acrescionários do Cambriano sobretudo, no norte da Província Mantiqueira (550-540 Ma) e na Prov. Pampeana (550-525 Ma), com eventos tardios no eo-ordoviciano |
|  | **E** | 585 ⇒ 560 Ma  
Vários ciclos de orogenias acrescionárias (e colisão local) na maioria das províncias estruturais, localmente com separação difícil do ciclo de orogêneses anteriores |
|  | **D** | 660 ⇒ 600 Ma  
O mais importante conjunto ciclos de interações orogênicas acrescionárias (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** | 780-750 Ma  
Registros de eventos locais de metamorfismo de alto grau, precedendo o auge do desenvolvimento Brasiliano |
|  | **C** | 790 Ma; 710 Ma  
Registros locais de eventos precoces de orogenia acrescionária, na Província Mantiqueira, de interpretação ainda controversa (Rio Negro e São Gabriel) |
|  | **B** | 810⇒750 Ma  
Processos Tafrogenéticos Diacrônicos, com registro praticamente em todas as províncias diversificadas ocorrências com magmatismo felsico (vulcanismo e plutonismo), máfico e ultramáfico. (Ligado à fissão do Supercontinente Rodinia?) |
|  | **A** | Ciclos de orogenia Cedotonianas (1.000- 930 Ma) e Tardtotonianos (960-820 Ma) na Borborema (C. Velhos), na Tocantins (Mara Rosa) e na Mantiqueira (Itiacoca) + vários e dispersos eventos tafrogenéticos associados com plutonismo granítico e vulcanismo basáltico. (de >1.000 Ma a 910 Ma) |

### EMBASAMENTO PALEOPROTEROZÓICO POLICÔCLICO (núcleos meso e neoarqueanos)  
E MESOPROTEROZÓICO (faixas e blocos).

### QUADRO 6: EVOLUÇÃO DOS PROCESSOS / EVENTOS  
OROGÊNICOS DO NEOPROTEROZÓICOS NA PLATформA SUL-AMERICANA