

Annex 2: Book description

DEVELOPMENTS IN PRECAMBRIAN GEOLOGY

“Neoproterozoic-Cambrian tectonics, global change and evolution: a focus on southwestern Gondwana”

Editors: C. Gaucher, A.N. Sial, G.P. Halverson, H.E. Frimmel

Estimated number of printed pages: 500

Summary

Chapter	Title	Chapter conveners(**)/authors
<i>Section I: Neoproterozoic-Cambrian Events: state of the art</i>		
1	The Neoproterozoic and Cambrian: a time of revolutions and innovations	Gaucher, Halverson, Frimmel & Sial
2	Palaeogeography and global tectonics in the Neoproterozoic-Cambrian	Evans
3	The global record of Neoproterozoic palaeoclimatic events	Chumakov & Halverson
4	Global C, Sr and S isotope curves and biogeochemical events	Kaufman
5	The Neoproterozoic biota and the Cambrian evolutionary radiation	Xiao
6	Enduring controversies	Gaucher, Halverson, Frimmel & Sial
<i>Section II: Neoproterozoic-Early Palaeozoic Events in SW-Gondwana</i>		
7	Amazonian Palaeocontinent	Alvarenga & Boggiani**
8	São Francisco Palaeocontinent	Dardenne & Sial**
9	Río de la Plata Palaeocontinent	Gaucher & Poiré**
10	Neoproterozoic to Cambrian evolution of southwestern Africa	Frimmel & Germs**
11	Pampia Terrane	Aceñolaza & Tosselli
12	Other microcontinents and suspect terranes	Gaucher & Schmitt**
<i>Section III: Synthesis and global implications</i>		
13	Tectonic events and palaeogeographic evolution of SW-Gondwana in the Neoproterozoic and Cambrian	Gaucher, Germs, Frimmel
14	Neoproterozoic evolutionary radiation and extinction events	Gaucher, Fedonkin, Germs, Aceñolaza, Brain
15	The Cambrian Revolution	Fedonkin, Aceñolaza
16	Biogeochemical events	Halverson, Hurtgen, Sial, Bartley
17	Palaeoclimatic events	Sial, Kaufman, Frimmel
18	Relative timing and interplay of tectonic, palaeoclimatic, biogeochemical and biotic events	Corsetti, Gaucher, Kaufman

19	A perspective on mineral resources	Frimmel, Dardenne, Bossi
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Deadlines

- Submission of manuscripts: 15th February 2008
- Submission of final manuscripts (reviewed and corrected): 15th July 2008
- Submission to Elsevier of all reviewed manuscripts: 15th August 2008

Concept

The book deals with the record of important Neoproterozoic to Early Palaeozoic events in southwestern Gondwana, that heralded the Cambrian explosion and the dawn of modern ecosystems. It contains a detailed account of the Neoproterozoic to Cambrian geological record in a poorly-known part of the world, which is at the same time key to understand fundamental processes at the Proterozoic-Cambrian transition. The emphasis is placed on litho-, bio-, chemostratigraphy and magmatism. The palaeoclimatic, tectonic, evolutionary radiation and extinction events and associated mineralizations will be identified and discussed. A synthesis of all data will be provided at the end of the book, integrating the data from all cratons and fold belts in southwestern Gondwana. The events will be individualized, their impact discussed and correlations between different successions both within and outside Gondwana proposed.

The book is organized in three sections. Section one is intended to provide a state of the art account of Neoproterozoic-Early Palaeozoic events. Section two comprises six chapters dealing with the geological record and the events recorded in the different palaeocontinents that were amalgamated to form southwestern Gondwana. Section three will provide a synthesis on every major topic, and a critical assessment of the global implications of the presented data. In order to reach a wide consensus, these final chapters (13 to 19) will be discussed during the 2007 IGCP 478 annual meeting, to be held at the University of Stellenbosch (South Africa). This meeting provides the necessary platform for discussion of the existing data (chapters 1-12), that should be already written by the time of the conference (September 2007).

Detailed description

Section I: Neoproterozoic-Cambrian Events: state of the art (100 pages)

Chapter 1: The Neoproterozoic and Cambrian: a time of revolutions and innovations

Authors: C. Gaucher, A.N. Sial, G.P. Halverson, H.E. Frimmel

Chapter 2: Palaeogeography and global tectonics in the Neoproterozoic-Cambrian

Author: David Evans

Chapter 3: The global record of Neoproterozoic palaeoclimatic events

Authors: N. Chumakov, G.P. Halverson

Chapter 4: Global C, Sr and S isotope curves and biogeochemical events

Authors: Alan J. Kaufman

Chapter 5: The Neoproterozoic biota and the Cambrian evolutionary radiation

Author: Shuhai Xiao

Chapter 6: Enduring controversies

Authors: C. Gaucher, A.N. Sial, G.P. Halverson, H.E. Frimmel

Section II: Neoproterozoic-Early Palaeozoic Events in SW-Gondwana

Chapter 7: The Amazonian Palaeocontinent (40 pages)

7.1. Lithostratigraphy (C. Alvarenga, P. Boggiani, M. Figueiredo & M. Dardenne)
Synthesis of the stratigraphic units including the integration of the data from the northern and southern Paraguay Belt and Tucava Belt in Bolivia.

7.2. Biostratigraphy (T. Fairchild & C. Gaucher)
Brief description and stratigraphic range of stromatolites, organic-walled microfossils, vendotaenids, skeletal fossils and soft-bodied metazoans occurring in or around the Amazonian Craton.

7.3. Chemostratigraphy (C. Alvarenga, M. Babinski, P. Boggiani, R. Ventura, A. Sial.)
Synthesis of all chemostratigraphic sections, with the aim of showing the pattern and recorded events in the region.

7.4. Palaeomagnetic events (R. Trindade)
Synthesis of existing palaeomagnetic data for the Amazonian Craton.

7.5. Geochronology and provenance ages (M. Babinski, E. Dantas, C. Alvarenga)
U-Pb ages of ash beds and detrital zircons, and Sm-Nd data of Neoproterozoic sedimentary rocks.

7.6. Mineralizations (C. Alvarenga, P. Boggiani, M. Dardenne, F. Pinho, J. C. Möller)
Synthesis of Neoproterozoic mineralizations: (i) Fe and Mn of Jacadigo, (ii) Sedimentary phosphate, (iii) Gold mineralizations

7.7. Conclusions and regional analysis (C. Alvarenga & P. Boggiani)

Chapter 8: The São Francisco Palaeocontinent (45 pages)

8.1. Lithostratigraphy

Synthesis of the lithostratigraphic units including the integration of the data from: cratonic Bambuí Group (Marcel Auguste Dardenne & Carlos Alvarenga); Una Group and Salitre Formation (Aroldo Misi); Brasilia Belt (Marcel Auguste Dardenne & Carlos Alvarenga); Rio Pardo Group (A. Pedreira); Rio Preto e Riacho do Pontal belts (Marcos Egydio Silva; Sergipano Belt (A.N. Sial, Valderez Pinto Ferreira, Marinho Alves da Silva Filho); Araçuaí Belt (Alexandre Uhlein & Antonio Carlos Pedrosa-Soares)

8.2. Biostratigraphy (T. Fairchild & M. A. Dardenne)

Synthesis of available data about microfossils, trace fossils and stromatolites

8.3. Chemostratigraphy (R. Ventura, A. N. Sial, C. Alvarenga, A. Misi)

Synthesis of the available chemostratigraphic data for sections of representative Neoproterozoic sequences

8.4. Geochronology and provenance (M. Babinski, E. Dantas, M. M. Pimentel & M. A. Dardenne)

Synthesis including U-Pb and Sm-Nd data

8.5. Mineralizations (M.A. Dardenne & A. Misi)

Synthesis of Neoproterozoic mineralizations: lead, zinc, fluorine, barium and phosphates.

8.6. Conclusions and Regional Analysis (Marcel Auguste Dardenne, Carlos Alvarenga and Alcides Nobrega Sial)

Chapter 9: Río de la Plata Palaeocontinent (35 pages)

9.1. Lithostratigraphy (D.G Poiré & C. Gaucher)

Sierras Bayas Group, Cerro Negro Formation, Mina Verdún Group, Las Ventanas Formation, Arroyo del Soldado Group, Piedras de Afilar Formation. Discussion of Fuente del Puma Group (ex-Lavalleja Group).

9.2. Biostratigraphy (C. Gaucher & D.G. Poiré)

Acritarchs, skeletal fossils, trace fossils and stromatolites

9.3. Chemostratigraphy (C. Gaucher, A.N. Sial, D.G. Poiré, L. Gómez Peral & V.P. Ferreira).

Chemostratigraphic sections of all units dealt with in 4.1 except Las Ventanas Formation.

9.4. Palaeoclimatic events (C. Gaucher & D.G. Poiré)

Indications of tropical climate. Units with suspect glacial diamictites: Sierras Bayas Group, lower Las Ventanas Formation, Playa Hermosa Formation. Eustatic sea-level oscillations. Unconformity on top of Loma Negra and Polanco formations. Problems with the “snowball Earth” hypothesis ?

9.5. Tectonomagmatic events (J. Bossi, C. Cingolani & Pablo González)

Neoproterozoic and Cambrian intrusive and volcanic units in the Río de la Plata Craton. Geotectonic setting and age.

9.6. Palaeogeography (C. Gaucher & J. Bossi)
Palaeogeographic evolution in the Neoproterozoic to Cambrian.

9.7. Mineralizations (J. Bossi, D.G. Poiré & C. Gaucher)
Limestone and dolomite, clays, iron, base metals.

Chapter 10: Neoproterozoic to Cambrian evolution of southwestern Africa
(60 pages)

10.1. Configuration of Pan-African orogenic belts in southwestern Africa (H.E. Frimmel)

Kaoko, Damara, Gariiep, Saldania Belts, relationship with Dom Feliciano Belt.

10.2. Continental Rifting (H.E. Frimmel)

Pre-rift magmatism, sedimentation and syn-rift magmatism

10.3. Passive continental margin evolution (Frimmel, Halverson)

Basin development, litho- and chemostratigraphy. Relics of oceanic crust.

10.4. Syn- to late orogenic deposits (Germes, Frimmel, Gaucher)

Syn-to late orogenic deposits. Ediacaran chemo- and biostratigraphy. Basin evolution and tectonics.

10.5. Orogenic tectono-thermal evolution (Will, Rozendaal, Frimmel, McMiller)

-Kaoko Belt

- Damara Belt

- Gariiep Belt

- Saldania Belt

10.6. Syn- to post-orogenic magmatism (Frimmel, Rozendaal, Will)

Syn-tectonic granites. Post-tectonic alkaline magmatism.

10.7. Styles of Mineralization (H.E. Frimmel)

Syn-sedimentary (s.l.) rift deposits. Oceanic VMS deposits. Syn-orogenic deposits.

Chapter 11: Pampia Terrane F.G. Aceñolaza & A.J. Toselli (25 pages)

11.1. Introduction

The Pampia Terrane, or Pampean Orogen, involves a large region of central and Northwest Argentina, and integrates a series of sedimentary and magmatic episodes during the Ediacaran- Lower Cambrian. These episodes were the result of the amalgamation to Gondwana of an important sedimentary succession. The Pampean Orogen evolved from an aulacogenic structure that began at the “Bolivian Triple Point”, displaying a general transversal disposition to the margin of Western Gondwana. The early referred structure was developed between the Rio de La Plata, Guaporé and Arequipa cratons, and allowed the deposition of thick siliciclastic and carbonate sequences that were affected as well, by the volcanic and plutonic events that characterise this type of basins.

Recent discussions proposed an alternative interpretation of the whole area as a part of a different continental block placed close to South America and accreted to Gondwana. The present contribution discuss the authochtonous character of the Pampean Orogen.

- 11.2. Lithostratigraphy
- 11.3. Chemostratigraphy
- 11.4. Biostratigraphy
- 11.5. Paleoclimatic events
- 11.6. Mineralizations.
- 11.7. Tectonomagmatic events and palaeogeography.

Chapter 12: *Other microcontinents and suspect terranes (40 pages)*

- 12.1. Cuchilla Dionisio-Pelotas Terrane (J. Bossi, M.A.S. Basei, H. Frimmel, R. Schmitt & C. Gaucher)
- 12.2. Luis Alves Craton (M.A.S. Basei)
- 12.3. Cuyania Terrane/Argentine Precordillera (S. Finney)
- 12.4. Paraná-Parapanema Block (M. Mantovani, B.B. Brito Neves)

Section III: Synthesis and global implications

Chapter 13: *Tectonic events and palaeogeographic evolution of south-western Gondwana in the Neoproterozoic and Cambrian*

Suggested authors: C. Gaucher, G.J.B. Germs, H.E. Frimmel (20 pages)

Chapter 14: *Neoproterozoic evolutionary radiation and extinction events*

Suggested authors: C. Gaucher, M. Fedonkin, G.J.B. Germs, G. Aceñolaza, B. Brain (20 pages)

Chapter 15: *The Cambrian Revolution*

Suggested authors: M. Fedonkin, G. Aceñolaza (20 pages)

Chapter 16: *Biogeochemical events*

Suggested authors: G.P. Halverson, M. Hurtgen, A.N. Sial, J. Bartley (20 pages)

Chapter 17: *Palaeoclimatic events*

Suggested authors: A.N. Sial, A.J. Kaufman, H.E. Frimmel (20 pages)

Chapter 18: *Relative timing and interplay of tectonic, palaeoclimatic, biogeochemical and biotic events*

Suggested authors: F. Corsetti, C. Gaucher, A.J. Kaufman (20 pages)

Chapter 19: *A perspective on mineral resources*

Suggested authors: H.E. Frimmel, M.A. Dardenne, J. Bossi (*20 pages*)