

Vendian-Cambrian of Western Gondwana: Introduction

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Gondwana (Suess, 1875) formed as a result of the Pan African-Brasiliano orogenies, and survived until the opening of the Atlantic in late Mesozoic times. For researchers dealing with the genesis of this remarkable supercontinent, the time period represented by the Vendian to Cambrian (ca. 600–500 Ma) is crucial. The Vendian to Early Cambrian was a period of outstanding events in Earth history, namely:

(1) Occurrence of the latest (near) global glaciation on Earth (Varangerian/Marinoan);

(2) Termination of a ca. 200 Ma-long period of global or near-global glaciations (Cryogenian);

(3) Climax of one of the most intense orogenic periods (Pan African-Brasiliano), leading to the amalgamation of the Gondwana supercontinent (Unrug, 1996, Fig. 1);

(4) Important changes in the chemistry of oceans and atmosphere;

(5) Advent and demise of the Vendobionta (Seilacher, 1992);

(6) Occurrence of the oldest known mass extinctions, which might have been caused by a bolide impact (Grey et al., 2003);

(7) The advent and diversification of metazoans and skeletons (“Cambrian explosion”);

(8) Biological innovations related to sediment recycling and biomat grazing by metazoans, leading to the “agronomic revolution” *sensu* Seilacher (1996);

Intense debate is currently taking place around these issues, as demonstrated by the innumerable publications, which are specifically based on W-Gondwana. The reason is that a very complete and fossiliferous sedimentary record spanning the Vendian and lowermost Cambrian occurs there (Fig. 1), which includes glacial deposits both at the African and South American side of Gondwana. Furthermore, the remnants of the Pan African-Brasiliano orogens are extensively exposed at different crustal levels (Fig. 1). The region has the potential to significantly

contribute towards unravelling the complex amalgamation history of Gondwana, explaining the causes of global Cryogenian glaciations and their impact on the biosphere, establishing a bio- and chemostratigraphic scheme valid for W-Gondwana and understanding the causes of the Cambrian evolutionary radiation of metazoans.

These questions were addressed at the “II International Colloquium Vendian-Cambrian of W-Gondwana”, held in

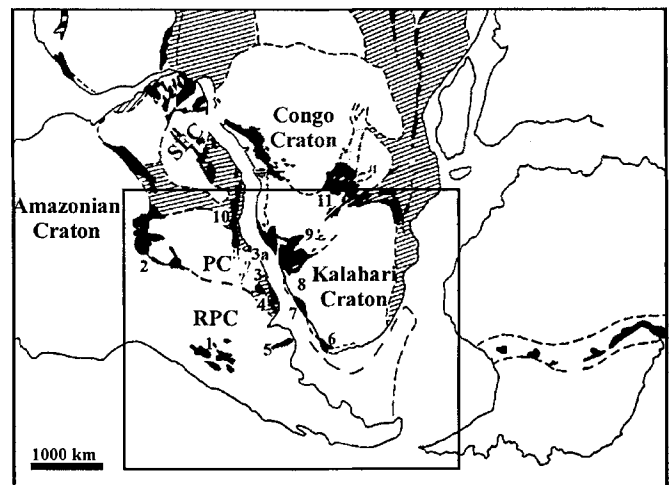


Fig. 1. Outcrop area of Neoproterozoic to Early Palaeozoic belts (black areas) and sedimentary successions, indicated on a pre-drift reassembly of Gondwana (modified after Porada, 1989). Hatching represents areas of Neoproterozoic-Cambrian basement rejuvenation. PC–Paraná Craton, RPC–Río de la Plata Craton; SFC–São Francisco Craton. The Vendian is recorded in the following sedimentary units of SW-Gondwana (rectangle): 1–Puncoviscana Formation and correlative units, 2–Corumbá, Araras, Itapucumí and Tucavaca Groups and Puga Formation, 3–Camaquã Group, 3a–Itajaí Group, 4–Arroyo del Soldado Group, 5–Sierras Bayas Group and Cerro Negro Formation, 6–Cango Caves, Gamtoos and Malmesbury Groups, 7–Port Nolloth Group, 8–Witvlei, Nama and Vanrhynsdorp Groups, 9–Otavi and Mulden Groups, 10–Eleutério, Pouso Alegre and Pico de Itapeva Basins, and 11–Katanga Supergroup.

Montevideo in March 2002. Thirty researchers from six countries gathered to discuss the palaeogeography, palaeoclimatology and palaeobiology of western Gondwana during the Vendian-Cambrian. The importance of the region, especially of SW-Gondwana, for the elucidation of the fundamental questions described above became obvious during the meeting, leading to the presentation of a project proposal to the International Geological Correlation Programme (IGCP). The project, named "Neoproterozoic to Early Paleozoic palaeogeographic, palaeoclimatic, palaeobiologic and tectonomagmatic events within the framework SW-Gondwana", was approved by UNESCO-IUGS early in 2003 and became IGCP 478. More than sixty researchers from eleven countries currently participate in the different activities of the project. One of its main goals is to contribute towards understanding of the complex relationships that exist between global tectonics, climate change and organismic evolution. SW-Gondwana is a key region for the study of these interactions in the Vendian-Cambrian. The tectonic events leading to the amalgamation of Gondwana had a profound impact on the distribution of oceanic basins and currents, number and extension of continental shelves, global biogeochemical cycles and climate in the latest Proterozoic-Cambrian (Brasier and Lindsay, 2001). Climate amelioration and changes in ocean geochemistry, in turn, may have enabled the opportunistic expansion of metazoans (Knoll, 1994), known as the "Cambrian explosion". On the other hand, it becomes increasingly clear that also organisms exerted a major control on climate, either by altering the carbon cycle (Gaucher et al., 2003) or developing new strategies of sediment recycling (i.e., the "agronomic revolution": Seilacher, 1996). Furthermore, the advent of biomineralization in the Vendian and its expansion in the Early Cambrian determined significant changes in composition of sediments and in the geological cycles of a number of elements. Important inferences on long-term trends in climate and organismic evolution are expected as a major outcome of IGCP 478.

The present thematic issue comprises a number of contributions on different subjects, focussing on the Vendian-Cambrian evolution of western Gondwana. Palaeogeography, chemostratigraphy, palaeontology, palaeoclimatology and the genesis of ore deposits are dealt

with, providing at the same time an important basis for future research. We hope that the volume provides answers to some of the fundamental questions about the edge of the abyss of time represented by the Precambrian.

Acknowledgments

We wish to thank UNESCO for financial support during the "II Colloquium Vendian-Cambrian of W-Gondwana", and especially Jorge Ellis at UNESCO regional office in Montevideo. Our sincere appreciation goes to all reviewers (including five anonymous): F.G. Aceñolaza, J. Bossi, C. Cingolani, G.J.B. Germs, P.F. Hoffman, A.J. Kaufman, R.J. Pankhurst, C. Riccomini, A.N. Sial and W. Volkheimer. Last but not least, we thank continuous and professional support and advice by M. Santosh.

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