The South Atlantic in the Late Quaternary: Reconstruction of Material Budgets and Current Systems. Editors: G. Wefer, S. Mulitza, & V. Ratmeyer. Springer Verlag, 2004. A Review.

Reviewed by: Dr. Joachim Ribbe, University of Southern Queensland, Department of Biological & Physical Sciences, Toowoomba. E-mail: Joachim.Ribbe@usq.edu.au

In order to understand current and future patterns of climate variability and change, we need to know how climate varied in the past and which physical forcing mechanisms led to these climatic changes. Direct observations of climate indicators such as temperature and rainfall reach back about 150 years. To extend this observational record, we rely on information from environmental paleoclimatic proxy records that have been extracted from natural archives of past climate variability.

One of these important natural archives of past climatic variability is the global ocean and its deep sea sediments. The ocean itself is often referred to as the flywheel of the climate system due to its enormous heat capacity. The entire atmospheric heat content is stored within the top two to three metres of the ocean, and on seasonal, annual and decadal time scales atmospheric temperature variations are buffered by oceanic control of the atmospheric heat content.

On much longer time scales ranging from centuries to many millions of years, the signature of past climate variability is stored within the structure and composition of the deep sea sediments. Varying environmental conditions within the upper layer of the ocean lead to changes in the organisation of marine ecosystems and their productivity. These changes can be caused by a range of natural internal and external processes of climate variability which include changes in the general circulation of the global ocean and changes in available solar insulation.

The South Atlantic Ocean plays an important role within our current climate system. Many of the physical processes that operate here link this southern ocean with the equatorial and northern hemisphere ocean. It is a pathway for the global scale water masses that are produced in the Southern Ocean and are redistributed via the South Atlantic throughout the Southern Hemisphere. There is significant evidence that much of the upper world's ocean marine productivity depends upon the supply of nutrients derived from sources in the southern ocean which is directly linked to climate.

In order to gain a better understand how the South Atlantic operated in the past, the German Research Foundation funded a multidisciplinary research program from 1989 to 2001. Its given task was to investigate and reconstruct past material budgets and oceanic current systems focusing upon the period of the late Quaternary.

The results from this multi-year research program are summarised in this book and presented in thirty articles divided into seven chapters. The topics of theses chapters are: (1) Particle Flux in the South Atlantic; (2) Documentation of the Marine Environment in Microfossil Assemblages and Stable Isotopes; (3) Physical Sedimentary Records of Paleoenvironmental and Depositional Conditions; (4) Source and Transport Signatures of the Terrigenous Sediment Fraction; (5) Early Diagnostic Processes and Preservation of Primary Signals; (6) History of Upper Ocean Circulation; and (7) History of Bottom and Deep Water Circulation.

There is no doubt that this publication is an important one, providing much needed insight into the most recent climate history of an important component of the global climate system. The book presents an enormous resource for climate system scientists, established researchers, educators and for advanced research students embarking on a career in the climate sciences.

The book missed an opportunity to be more than just a collection of articles documenting multidisciplinary research projects and serving as an important reference and recourse tool. In content and structure it is not much different from a voluminous special edition of a scientific peer-reviewed journal.

What is missing is a comprehensive introductory summary article that synthesises the knowledge gained over eleven years from multidisciplinary research into the South Atlantic; an introductory article that introduces the reader to the key questions and how eleven years of research advanced our knowledge and filled those important gaps in our knowledge. What are the key outcomes in the various areas of multidisciplinary research? What is the exact status quo of our knowledge of past circulations in the South Atlantic Ocean having completed this program? To extract this from the book is left to the interested and dedicated reader.

Another point relates to the data assembled through this project. The lack of South Atlantic data was obviously one of the motivating factors that let to this project, and the reader would have gained significantly from being provided with the actual data that are presented, described and analysed in this project. Only ten to fifteen years ago it would have not been possible to do so, but the world of publishing has moved on from just producing printed material. Many books now include CD-ROMs providing additional material and access to the actual data that help the reader, educator, researcher and student to study the climate system and follow the presented work in much more detail.

These two points of criticism should not distract from the important contribution this collection of research articles makes in advancing our knowledge of the South Atlantic's changing role within the climate system. While not necessarily a book destined for an individual reader's bookshelf, the book would certainly be an important addition to institutional libraries.

I also hope that this book will be viewed as an impetus to start complementing this important work in one of the southern oceans with similar books providing detailed insights into the workings of the other southern oceans, i.e. the South Indian and more importantly, the South Pacific Ocean which is partly addressed through the international Climate Variability and Predictability Programme.