

Antarctica

A Keystone in a Changing World

Proceedings of the 10th International Symposium on
Antarctic Earth Sciences
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Front cover: Depicting change from greenhouse to icehouse times in Antarctica. *Upper:* Snowstorm on Seymour Island, Antarctic Peninsula. Image provided by Jane Francis. *Lower:* Middle Cretaceous forest on Antarctica; painting by Robert Nicholls, with permission for use by the artist and by the British Antarctic Survey who commissioned the painting and have it on display there.

Back cover: *Upper:* Estimates skin-depth temperatures derived from the thermal IR channel of historical AVHRR data. Image is from NASA website: <http://svs.gsfc.nasa.gov/vis/a000000/a003100/a003188/index.html>. *Lower:* Predictions of ice-sheet volume changes and the effect of these changes on global sea levels. Models are from the paper by Miller et al. in this book, and are in turn based on work of Deconto and Pollard (*Nature* 421:245-249, 2003).

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Preface

Gondwana geologists have a timely metaphor: “Antarctica—the heart of it all” or from the geologic perspective: Antarctica—the center from which all surrounding continental bodies separated millions of years ago. The title of our book “*Antarctica: A Keystone in a Changing World*” reinforces the importance of continual changes in Antarctica’s multifaceted history and the impact of these changes on global systems. In 2007, the Scientific Committee on Antarctic Research (SCAR) sponsored the 10th International Symposium on Antarctic Earth Sciences (10th ISAES) in Santa Barbara, California, to give researchers from 34 countries an opportunity to share and discuss recent discoveries in the Antarctic region. Such discoveries help decipher the prior and current roles of Antarctica in manifesting the global climatic changes, now seemingly accelerating.

The 10th ISAES coincides with the International Polar Year (IPY) that falls on the 50th anniversary of the International Geophysical Year (IGY). In recognition of these events, the symposium format and topics of keynote papers in the book envelop a broad spectrum with six themes covering key topics on evolution and interactions of the geosphere, cryosphere, and biosphere and their cross-linkages with past and historic paleoclimates. Emphasis is on deciphering the climate records in ice cores, geologic cores, rock outcrops, and those inferred from climate models. New technologies for the coming decades of geoscience data collection are also highlighted.

The 10th ISAES also marks the 44th year of such symposia, and denotes the first significant change in presentation and publication formats. Prior ISAES have a valued history of impressive printed symposia volumes, with a total of nearly one thousand printed papers (Table 1) that were solicited and printed after the symposia. In recognition of IPY and the desire to quickly document and disseminate

Antarctic research results to the science community, the 10th ISAES changed to a new format of online and book publication. Presenters, other than keynote speakers, were asked to submit either a short research paper for peer review or an extended abstract without peer review before the symposium. Over 950 co-authors from 34 countries submitted 326 manuscripts. Prior to the symposium, 34 co-editors, over 200 peer reviewers and authors processed manuscripts into final publication format so that 92 percent were published in the Online Proceedings (<http://pubs.usgs.gov/of/2007/1047/>) before the symposium commenced and the remaining 8 percent were made available online to meeting participants and authors; these were then published in the Online Proceedings within the month following the symposium.

Ten keynote speakers were invited to contribute overview talks at the symposium and contribute a full-length paper. The keynote papers are printed in this book along with a paper that summarizes highlights of the 10th ISAES. Several reports from meetings and workshops held in conjunction with the symposium were also submitted. The DVD in the back of the book contains the keynote and summary papers and a complete copy of the 10th ISAES Online Proceedings (see also <http://pubs.usgs.gov/of/2007/1047/>), all in PDF format for access, search, and printing. The DVD can be accessed and used on either a MAC or PC.

This special IPY volume for the 10th ISAES is a 100-year milestone for Antarctic publications, and a first for any symposium publication. One hundred years ago, Ernest Shackleton’s expedition members created and printed the first book ever published in Antarctica “on the ice in cryospace,” with their scientific discoveries and personal vignettes—they titled the book *Aurora Australis*. One hundred years later, the 10th ISAES authors and editors created the first Antarctic pre-symposium proceedings “online in cyberspace,” with

TABLE 1 The History of ISAES Symposia and Their Publication Volumes

No.	Location	Year	Symposium volume
I	Cape Town, South Africa	1963	Adie, R. J., ed. (1964), <i>Antarctic Geology</i> —Proceedings of the First (SCAR) International Symposium on Antarctic Geology, North Holland Publishing Co, Amsterdam, 758 pp.
II	Oslo, Norway	1970	Adie, R. J., ed. (1972), <i>Antarctic Geology and Geophysics</i> —Proceedings of the Second (SCAR) Symposium on Antarctic Geology and Solid Earth Geophysics, International Union of Geological Sciences, B1, Universitetsforlaget, Oslo, 876 pp.
III	Madison, Wisconsin, USA	1977	Craddock, C., ed. (1982), <i>Antarctic Geoscience</i> —Proceedings of the Third (SCAR) Symposium on Antarctic Geology and Geophysics, International Union of Geological Sciences, B4, University of Wisconsin Press, Madison, 1172 pp.
IV	Adelaide, Australia	1982	Oliver, R. L., P. R. James and J. B. Jago, eds. (1983), <i>Antarctic Earth Science</i> —Proceedings of the Fourth (SCAR) International Symposium on Antarctic Earth Sciences, Australian Academy of Science, Canberra, 697 pp.
V	Cambridge, UK	1987	Thompson, M. R. A., J. A. Crame and J. W. Thompson, eds. (1991), <i>Geological Evolution of Antarctica</i> —Proceedings of the Fifth (SCAR) International Symposium on Antarctic Earth Sciences, Cambridge University Press, Cambridge, 722 pp.
VI	Tokyo, Japan	1991	Yoshida, Y., K. Kaminuma and K. Shiraishi, eds. (1992), <i>Recent Progress in Antarctic Earth Science</i> —Proceedings of the Sixth (SCAR) International Symposium on Antarctic Earth Sciences, Terra Scientific Publishing, Tokyo, 796 pp.
VII	Siena, Italy	1995	Ricci, C. A., ed. (1997), <i>The Antarctic Region: Geological Evolution and Processes</i> —Proceedings of the Seventh (SCAR) International Symposium on Antarctic Earth Sciences, Terra Antarctica Publication, Siena, 1206 pp.
VIII	Wellington, New Zealand	1999	Gamble, J. A., D. N. B. Skinner, and S. Henrys, eds. (2002), <i>Antarctica at the Close of the Millennium</i> —Proceedings of the Eighth (SCAR) International Symposium on Antarctic Earth Sciences, The Royal Society of New Zealand Bulletin No. 35, Wellington, Terra Scientific Publishing, Tokyo, 652 pp.
IX	Potsdam, Germany	2003	Futterer, D. K., D. Damaske, G. Kleinschmidt, H. Miller, and F. Tessensohn, eds. (2006), <i>Antarctica: Contributions to Global Earth Sciences</i> —Proceedings of the Ninth (SCAR) International Symposium on Antarctic Earth Sciences, Springer-Verlag, Berlin-Heidelberg, 477 pp.
X	Santa Barbara, California, USA	2007	Cooper, A. K., P. J. Barrett, H. Stagg, B. Storey, E. Stump, W. Wise, and the Tenth ISAES editorial team, eds. (2008), <i>Antarctica: A Keystone in a Changing World</i> —Proceedings of the 10th (SCAR) International Symposium on Antarctic Earth Sciences, The National Academies Press, Washington, D.C. 162 pp. with DVD containing website http://pubs.usgs.gov/of/2007/1047/ . The 10th ISAES Proceedings Volume is the first in the ISAES series to include both book and electronic publication formats.

new research findings and interpretations. The book and online proceedings are yet another way in which Antarctica and its scientists are effecting changes in the dissemination of geoscience and other information globally.

The 10th ISAES Proceedings volumes showcase the great breadth of Antarctic geoscience research at the time of IPY, and the importance of Antarctica in deciphering

changes in global systems. The volumes illustrate the positive impact of this research in successfully preserving the spirit of collaboration, data-sharing, and use of Antarctica as a “continent for science” as intended by the Antarctic Treaty that was implemented in 1959 at the close of IGY.

Alan Cooper
Lead editor

Acknowledgments

The 10th ISAES was held under the auspices of the Scientific Committee on Antarctic Research (SCAR) and we thank SCAR for their ongoing support of these Antarctic geoscience symposia.

Creating the special International Polar Year volumes for the 10th ISAES, with book and DVD (and Online Proceedings) over the last three years has involved over 1200 people, most on a volunteer basis, in more than 34 countries, including over 950 authors, 34 editors and editorial staff, more than 200 peer reviewers, 23 members of the International and Local Organizing Committees and their staff, and many managers and staff from the Scientific Committee on Antarctic Research, The National Academies Polar Research Board, U.S. Geological Survey, National Science Foundation, The National Academies Press, Conference Exchange, Stanford University, and University of California Santa Barbara. These people and institutions are warmly thanked for their varied contributions to this successful undertaking. There is not adequate space here to list all names, but see the DVD (Online Proceedings) for expanded lists of those who have assisted. We especially thank Stephen Mautner, Executive Editor, and Rachel Marcus, Managing Editor, of the National Academies Press for their dedicated efforts to make this book possible and in producing it on schedule.

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