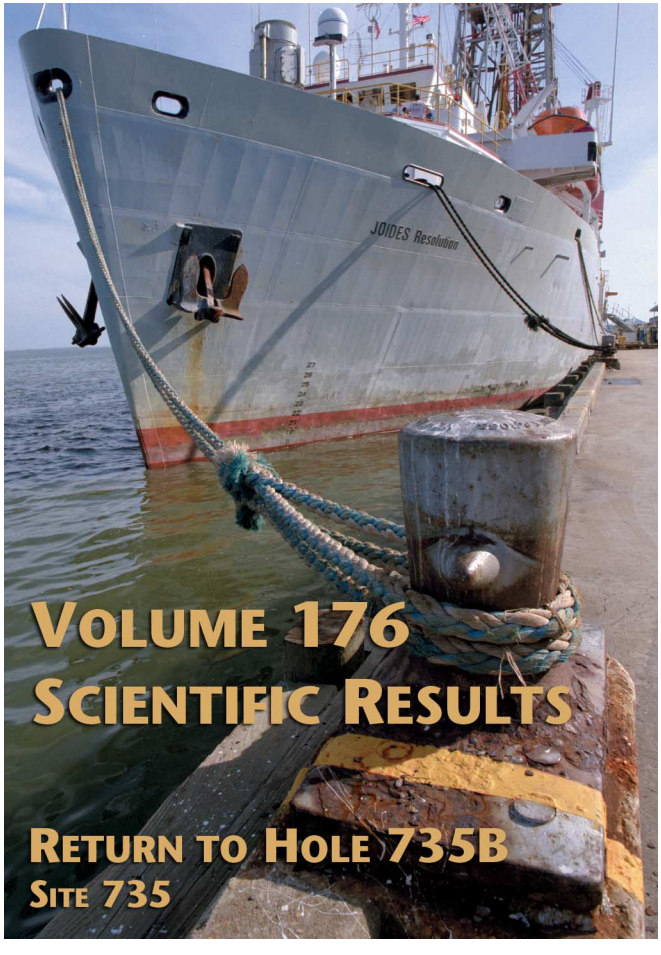

PROCEEDINGS OF THE OCEAN DRILLING PROGRAM

Prepared by the
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Volume 176
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Return to Hole 735B

Covering Leg 176 of the cruises of the Drilling Vessel *JOIDES Resolution*
Cape Town, South Africa, to Cape Town, South Africa
Site 735
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Institut Français de Recherche pour l'Exploitation de la Mer (France)

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Natural Environment Research Council (United Kingdom)

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Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation, the participating agencies, Joint Oceanographic Institutions, Inc., Texas A&M University, or Texas A&M Research Foundation.

Current policy requires that all figures published in *Scientific Results* volumes of the *Proceedings of the Ocean Drilling Program* be provided by the authors.

Abbreviations for names of organizations and publications in ODP reference lists follow the style given in *Chemical Abstracts Service Source Index* (published by American Chemical Society).

Supplemental data on the volume CD-ROM were provided by the authors and may not conform to ODP publication formats.

The map at the front of this volume was produced using Generic Mapping Tools (GMT) of Paul Wessel and Walter H.R. Smith (**gmt.soest.hawaii.edu**). A site map showing the drilling locations for this leg and maps showing the drilling locations of all Ocean Drilling Program (ODP) and Deep Sea Drilling Project (DSDP) drilling sites are available on the volume CD-ROM in PDF format.

Cover photograph of the *JOIDES Resolution* by ODP Photographer John Beck.

Foreword

By Joint Oceanographic Institutions, Inc.

This volume presents scientific and engineering results from the Ocean Drilling Program (ODP). These results address the scientific and technical goals of the program, which are focused on the study of the dynamics of Earth's interior and environment, the evolution of oceanic crust, and the fluctuations of climate. In addition, study of the Earth's deep biosphere is an emergent research objective.

ODP, an international partnership of scientists and research institutions from 22 countries, operates the drillship *JOIDES Resolution*. This state-of-the-art research vessel contains eight levels of laboratories and other scientific facilities required for carrying out the program's objectives.

The management of ODP involves a partnership of scientists and governments. International oversight and coordination are provided by the ODP Council, which is made up of representatives from the member countries. Overall scientific and management guidance is provided by representatives from the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES).

Joint Oceanographic Institutions, Inc. (JOI), a nonprofit consortium of 18 U.S. oceanographic institutions, serves as the National Science Foundation's prime contractor for ODP. JOI implements scientific objectives, plans, and recommendations of the JOIDES committees through major subcontracts to Texas A&M University (TAMU) for science operations and to Lamont-Doherty Earth Observatory (LDEO) of Columbia University for geochemical and geophysical well-logging services.

JOI, TAMU, and LDEO have worked together successfully for many years to manage the Ocean Drilling Program. We look forward to many exciting discoveries and continued international collaboration as we further our scientific mission, especially the planning for the future of ocean drilling beyond 2003.

Steven R. Bohlen
President of the Joint Oceanographic Institutions and Executive Director of the Ocean Drilling Programs
Washington, D.C.

Preface

The Voyages of Discovery

The *Scientific Results* volumes of the *Proceedings of the Ocean Drilling Program* are about Earth and her oceans.

These volumes contain contributions to a better understanding of the history of our planet through time. This exploration of Earth's past is based on scientific analyses of layers of strata sampled by the *JOIDES Resolution* at key locations throughout the global ocean. These volumes are a tribute to the scientific exploration carried out by the men and women who contributed to these voyages of discovery. Like the pioneering exploration and research of Captain Cook aboard the first *Resolution*, these volumes are a credit to the human spirit, which sees no boundaries.

The papers in this volume are published in a new online format that will be archived on CD-ROM. The *Proceedings* contents are available to students, scientists, and the public throughout the world. Volumes, once housed in the libraries of the member nations of ODP, are now published on the Internet for a worldwide audience and are also available in CD-ROM format. This electronic publication enables future investigators to gain easier access to the results of ocean drilling research. I acknowledge and thank the authors for their contributions and willingness to participate in this new venture.

Each *Scientific Results* volume has an Editorial Review Board that is responsible for obtaining peer reviews of papers submitted to the volume. This board usually is made up of the two co-chief scientists for the cruise, the ODP staff scientist for the cruise, and one external specialist who is familiar with the geology of the investigated area. ODP staff coordinate the peer-review process and also edit and produce each paper.

Each *Scientific Results* volume contains one leg synthesis paper and other peer-reviewed papers that present the results of extensive research in various aspects of scientific ocean drilling related to each leg. Each paper submitted to a *Scientific Results* volume undergoes rigorous peer review by at least two specialists in the author's research field. Volumes may also contain short reports of useful data. These Data Reports do not include interpretation of results and are peer-reviewed by at least one specialist. We seek to maintain a peer-review system comparable to those of the most highly regarded journals in the geological sciences.

To acknowledge the contributions made by this volume's Editorial Review Board, the Board members are designated Editors of the volume. Reviewers of manuscripts for this volume, whose efforts are so essential to the success of the publication, are listed without attribution to any particular manuscript.

On behalf of the Ocean Drilling Program, I extend sincere appreciation to the members of the Editorial Review Board and to the reviewers for generously contributing their time and effort. This process ensures that only papers of high scientific quality are published in the *Scientific Results* volumes.

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Synthesis

Chapters

CD-ROM Contents: ASCII Tables

The *Scientific Results* CD-ROM contains ASCII versions of selected geochemistry and mineralogy data tables.

Synthesis chapter
Appendix B. Compositions of gabbro and diabase.

Chapter 6
Table T10. Geochemical database for shipboard and shore-based analysis of samples, Hole 735B.

Chapter 10
Table T1. Plagioclase analyses.
Table T2. Clinopyroxene analyses.
Table T3. Olivine analyses.
Table T4. Orthopyroxene analyses.
Table T5. Brown hornblende analyses.

CD-ROM Contents: Oversized Material

These oversized tables are available in PDF format.

Chapter 3
Table T1. Major and trace element analysis.

CD-ROM Contents: Supplementary Material

The following tables are available in Microsoft Excel 97/98 format. Supplementary material files are located in the SUPP_MAT directory.

MIN_COMP
SR176SYN
SYN_TAB.XLS

SR176_10
10_T01.XLS
10_T02.XLS
10_T03.XLS
10_T04.XLS
10_T05.XLS

CD-ROM Contents: Drilling Location Maps

A site map showing the drilling locations for this leg and maps showing the drilling locations of all Ocean Drilling Program (ODP) and Deep Sea Drilling Project (DSDP) drilling sites are available in PDF format.

ODP Leg 176 Site Map

ODP Map (Legs 100–176)

DSDP Map (Legs 1–96)

CD-ROM Contents: Index to Leg 176 *Initial Reports* and *Scientific Results* Volumes

The index covers both the *Initial Reports* and *Scientific Results* portions of Volume 176 of the *Proceedings of the Ocean Drilling Program.* The index contains a subject and taxonomic index.

Index to Leg 176

CD-ROM Contents: Compiled Electronic Index

The Compiled Electronic Index of the *Proceedings of the Ocean Drilling Program* contains the indexes of Volumes 101–173, 174B–176, 178, and 180. The indexes are contained in the directory titled ODPINDEX and are named ###NDX.PDF (### = the leg number). These indexes can be searched individually or collectively. For information on using the Acrobat search function, see **"Searching a PDF Document"** in README.PDF.

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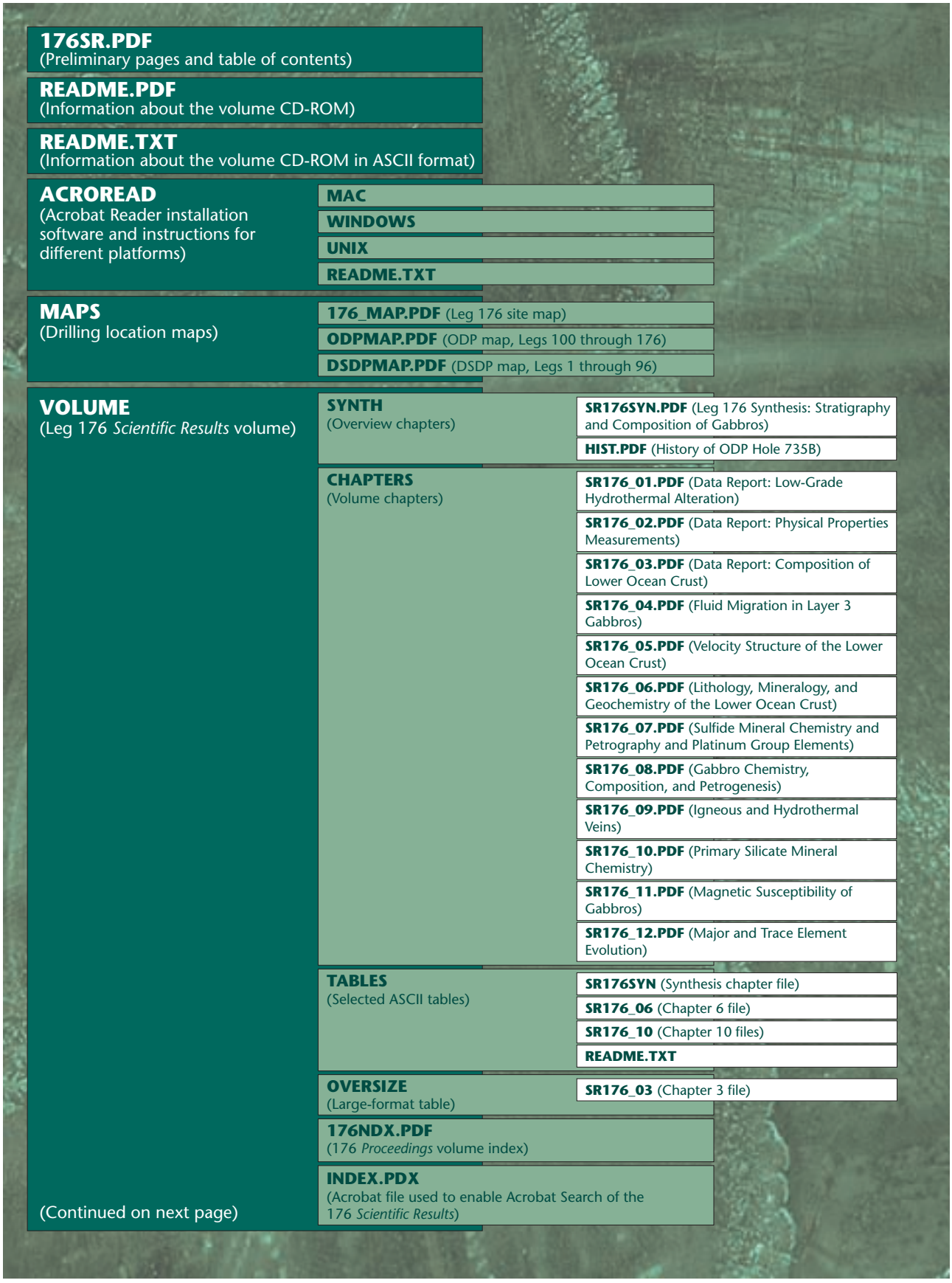

(Continued on next page)

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