

# Preface

## New to This Edition

The seventh edition of this popular textbook marks major changes in the coverage of weather and climate.

- ◆ Coverage on weather principles and tornadoes has been expanded and integrated in a new chapter 11. Sections have been rewritten, many figures have been revised.
- ◆ Climate has been integrated into one chapter (12, Climate Change) with expanded coverage of the 20th and 21st centuries including the IPCC (Intergovernmental Panel on Climate Change) reports. There is expanded coverage of recent and future climate with 12 new sections and numerous new figures.
- ◆ All chapters have been revised and updated.

## Why the Book Was Written

During years of teaching courses in physical geology and environmental geology at San Diego State University, it was obvious that natural disasters topics drew heightened levels of interest and questions from students. This led to creating a course called “Natural Disasters,” which was not advertised in any way. Yet almost instantly, students reading through the fine print of semester course offerings saw the “Natural Disasters” listing and enrollments skyrocketed. Over a few years, new teaching techniques were developed to reach large auditorium audiences, and enrollments rose to 5,000 students per academic year. Some of these experiences are described in a *Journal of Geoscience Education* article by Pat Abbott and Ernie Zebrowski [v. 46 (1998), pp. 471–75].

San Diego State University students do not have to take “Natural Disasters.” They can select from over 30 courses among 10 departments with offerings such as “Biology of Sex,” “Evolution,” “Origin of Life,” “The Oceans,” “Dinosaurs,” and “Confronting AIDS.” But more students opt for “Natural Disasters” than any other course. If your department could benefit from higher enrollments of nonmajor students, I strongly recommend offering a “Natural Disasters” course. Earthquakes, hurricanes, tornadoes, fires, floods, and other high-energy processes of our active Earth affect students’ lives. Stu-

dents want to understand why these natural disasters happen. The students’ high level of interest can be channeled by the instructor into some significant understanding about how the Earth works.

## About the Book

This book focuses on natural disasters: how the normal processes of the Earth concentrate their energies and deal heavy blows to humans and their structures. It largely ignores the numerous case histories describing human actions and resultant environmental responses; these topics are left to the excellent textbooks on environmental geology. Nor does this book address resource extraction, utilization, and disposal; these subjects are covered by fine textbooks on earth resources, minerals, energy, soils, and water. This book is concerned with how the natural world operates and, in so doing, kills and maims humans and destroys their works.

Throughout the book, certain themes are maintained:

- ◆ Energy sources underlying disasters
- ◆ Plate tectonics and climate change
- ◆ Earth processes operating in rock, water, and atmosphere
- ◆ Significance of geologic time
- ◆ Complexities of multiple variables operating simultaneously
- ◆ Detailed and readable case histories

The text aims to explain important principles about the Earth and then develop further understanding through numerous case histories. I hope that students will enjoy reading most of this book.

The primary organization of the book is based on an energy theme. Chapter 1 leads off with data describing natural disasters and the human population. Chapter 2 examines the energy sources underlying disasters: (1) Earth’s internal energy from its formative impacts and continuing decay of radioactive elements; (2) gravity; (3) external energy from the Sun; and (4) impacts with asteroids and comets.

Disasters fueled by Earth’s internal energy are addressed in chapters 3 through 9 and are organized on

a plate-tectonics theme. Chapter 3 provides the basic description of plate tectonics and its relationship to earthquakes. Chapter 4 covers the basic principles of earthquake geology and seismology. Chapter 5 discusses tsunami. Chapter 6 uses plate tectonics and historic and prehistoric records to explain earthquakes along western North America. Chapter 7 examines the history and potential for earthquakes throughout the rest of North America. The intent is to cover every geographic area and major historic earthquake. Chapters 8 and 9 discuss volcanoes; their characteristic magmas are organized around the three Vs—viscosity, volatiles, and volume. Eruptive behaviors are related to plate-tectonic setting. As throughout, case histories are employed to enliven the text.

Disasters powered primarily by gravity are covered in chapter 10 on mass movements. Many types are discussed and illustrated, from falls to flows and slides to subsidence.

Disasters fueled by the external energy of the Sun are examined in chapters 11 through 15. Chapter 11 begins with principles of atmosphere and ocean underlying weather and climate, and then moves on to severe weather phenomena, such as thunderstorms, lightning, and tornadoes. Chapter 12 on climate change begins with long-term climate change over timescales of millions, thousands, and hundreds of years. The time focus shrinks through the chapter, leading into a detailed examination of short-term climate change in the 20th and 21st centuries including the IPCC 4th Assessment Report. Chapter 13 examines hurricanes and the coastline. The emphasis on water continues in chapter 14 on floods and human activities. Chapter 15 on fire examines the liberation of ancient sunlight captured by photosynthesis and stored in organic material.

Before moving to the fourth energy source (impacts), chapter 16 examines the great dyings encased in the fossil record. The intent is to document the greatest of all natural disasters and to use multiple variables in analyzing their causes. Specific mass extinctions are examined using causative factors, such as continental unification and separation, climate change, flood-basalt volcanism, sea-level rise and fall, impacts, biologic processes, and the role of humans in the latest mass dying. Chapter 17 examines impact mechanisms in greater detail and includes plans to protect Earth from future impacts.

There is a lot of material in this book, probably too much to cover in one semester. But the broad range of natural disasters topics allows each instructor to select those chapters that cover their interests and local hazards. The

goal is to involve the students for a lifetime in understanding the Earth, atmosphere, oceans, and skies—to observe, think, explain, and discuss.

## Supplements For the Student

### Website at [www.mhhe.com/abbott7e](http://www.mhhe.com/abbott7e)

This site gives you the opportunity to further explore topics presented in the book using the Internet. The site contains interactive quizzing with immediate feedback, animations, web links, a career center, and more.

## For the Instructor

### Website at [www.mhhe.com/abbott7e](http://www.mhhe.com/abbott7e)

Take advantage of the Instructor's Manual Test Bank and PowerPoint lecture outlines.

## Presentation Center

Accessed through the Website, the Presentation Center is an online digital library containing assets such as art, photos, tables, and PowerPoints that can be used to create customized lectures, visually enhanced tests and quizzes, compelling course websites, or attractive printed support materials.

## Electronic Textbook

CourseSmart is a new way for faculty to find and review eTextbooks. It's also a great option for students who are interested in accessing their course materials digitally and saving money. CourseSmart offers thousands of the most commonly adopted textbooks across hundreds of courses from a wide variety of higher education publishers. It is the only place for faculty to review and compare the full text of a textbook online, providing immediate access without the environmental impact of requesting a print exam copy. At CourseSmart, students can save up to 50% off the cost of a print book, reduce their impact on the environment, and gain access to powerful web tools for learning including full text search, notes and highlighting, and email tools for sharing notes between classmates. [www.CourseSmart.com](http://www.CourseSmart.com)

## Acknowledgments

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I am indebted to other geologists who provided photographs: Alan Mayo of GeoPhoto Publishing Company on the Winter Park sinkhole and Tucson flooding; Michael W. Hart of San Diego on mass movements; Al Boost of Caltrans on the San Fernando earthquake; Peter Weigand of California State University Northridge, Greg Davis of University of Southern California, and Kerry Sieh of Caltech on the Northridge earthquake; Mary Leech of San Francisco State University on slot canyons; and the photo libraries of the US Geological Survey (USGS), National Oceanic and Atmospheric Administration (NOAA), and National Aeronautics and Space Administration (NASA).

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I sincerely appreciate the talents and accomplishments of the McGraw-Hill professionals in Dubuque who took my manuscript and produced it into this book. For the shortcomings that remain in the book, I alone am responsible. I welcome all comments, pro and con, as well as suggested revisions.

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