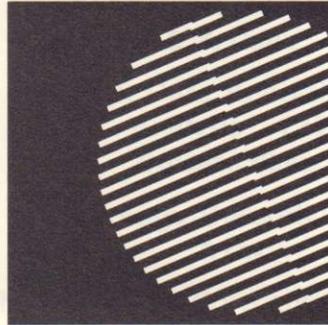


CONTENTS

ENCYCLOPEDIA OF  
EARTH  
SYSTEM  
SCIENCE



VOLUME 4

Ri-Z, Index

**William A. Nierenberg**, *Editor-in-Chief*

Scripps Institution of Oceanography  
University of California, San Diego



**Academic Press, Inc.**

Harcourt Brace Jovanovich, Publishers

San Diego New York Boston London Sydney Tokyo Toronto



---

# CONTENTS

## Guide to Using the Encyclopedia ix

---

■

River Ecosystems 1  
J. V. Ward

Rivers 13  
James R. Miller

Rock Cycle 21  
Bryan Gregor

Rock Rheology and Mass Transport in  
the Solid Earth 31  
Shun-ichiro Karato

---

■

Sea Ice 39  
W. F. Weeks

Sea Level Fluctuations 53  
W. Richard Peltier

Sea Salt Aerosols 63  
B. J. Huebert

Sea Surface Temperature Signals from  
Satellites 69  
A. E. Strong

Sediment Transport Processes 81  
Gerard V. Middleton

Sedimentary Geofluxes, Global 93  
J. T. Andrews

Sedimentary Rocks 103  
Frederick L. Schwab

Sedimentology, Walther's Law of  
Facies 117  
D. K. Larue

Seismic Data, Recording and  
Analysis 127  
Özdoğan Yilmaz

Seismology, Theoretical 153  
T. Lay

Shrubs: Adaptations and Ecosystem  
Functions 175  
Neil E. West

Silicates 183  
J. D. Dunning, J. G. Brophy, D. L. Goldsby,  
and B. J. Douglas

Smoke, Effect on Climate 191  
Steven J. Ghan and Joyce E. Penner

Snowmelt and the  
Ionic Pulse 199  
R. C. Bales

Soil Biochemistry 209  
R. J. Haynes

Soil Kinetics 219  
Donald L. Sparks

Soil Physical Condition and Plant  
Growth 231  
James A. Vomocil

Soil Physics 241  
J. W. Holmes

Soil Salinity 251  
D. L. Suarez and J. D. Rhoades

Soil Water: Liquid, Vapor,  
and Ice 259  
P. B. Black

- Solar Radiation **271**  
J. Laštovička and J. Boška
- Solar–Terrestrial Interaction **279**  
C. T. Russell and J. G. Luhmann
- Spectral Composition of the Terrestrial O<sub>2</sub>  
UV Nightglow **289**  
Jacek Stegman
- Stratigraphy—Dating **297**  
D. L. Dineley
- Strontium Isotope  
Stratigraphy **311**  
J. M. McArthur
- Substorms **317**  
D. P. Stern
- Supercontinents **323**  
Paul F. Hoffman
- Surface Slicks and Near-Surface  
Convergences **329**  
David J. Carlson
- Synchrotron Radiation in Earth  
Sciences **339**  
W. A. Bassett and G. E. Brown, Jr.
- 
- Tidal Hydrodynamics, Quantitative  
Aspects **351**  
Francisco E. Werner
- Tides **369**  
W. D. Forrester
- Tropical Reef Ecosystems and Their  
Evolution **375**  
George D. Stanley, Jr.
- Tsunamis **389**  
Kenji Satake
- Turbidity Currents **399**  
Marcelo H. Garcia
- 
- Vegetation, Effect of Rising CO<sub>2</sub> **409**  
L. H. Allen, Jr. and K. J. Boote
- Volcanic Tremor **417**  
Stephen R. McNutt
- Volcanoes **427**  
Dennis J. Geist
- 
- Water Cycle, Global **437**  
Elizabeth K. Berner
- Water Geochemistry **449**  
Yasushi Kitano
- Water, Physical Properties and  
Structure **463**  
G. E. Walrafen
- 
- Weather and Climate Modification **471**  
A. S. Dennis
- Weather Prediction, Numerical **483**  
R. T. Williams
- West Antarctic Ice Sheet **493**  
William E. Long
- Wood Moisture and the  
Environment **503**  
Chris Skaar

■ GUIDE TO USING THE ■  
ENCYCLOPEDIA

- Zonal and Meridional Winds in the Earth's  
Atmosphere **513**  
B. G. Anandarao

- Contributors **525**  
Relational Index **531**  
Subject Index **545**