



The Dynamic Structure of the Deep Earth: An Interdisciplinary Approach

Shun-Ichiro Karato

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The study of the structure and dynamics of Earth's deep interior represents one of the most active frontiers of Earth sciences. This book provides a definitive summary of current research in this field, which is revealing many surprises. In a thorough, immensely informed, yet easy-to-understand presentation, Shun-ichiro Karato deftly integrates the atomic-level description of Earth materials that mineral physics addresses with global-scale modeling and observations on mantle and core dynamics that are the purview of seismology and geodynamics. He depicts an Earth whose interior is as active as its surface, and whose processes in the deep interior often control surface dynamics.

The richly varied dynamic processes in Earth's deep interior can be understood only through a better understanding of the properties of materials under the conditions prevalent there, Karato emphasizes. Materials properties change dramatically in the deep interior, and this has decisive consequences on mantle convection, which is the engine of plate tectonics. The importance of the hydrogen in water in determining the structure of the lithosphere-asthenosphere boundary is discussed, as is the role of phase transformation in controlling the density and plastic flow properties of Earth's materials. Models for enigmatic observations such as deep earthquakes and the anisotropic structures at the center of the Earth are covered in detail. *The Dynamic Structure of the Deep Earth* is an indispensable text for advanced-level undergraduate students and graduate students of Earth sciences, materials sciences, and physics.

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