

1. Record Nr.	UNINA9910456912503321
Autore	Slingerland Rudy
Titolo	Mathematical modeling of earth's dynamical systems [[electronic resource]] : a primer / / Rudy Slingerland and Lee Kump
Pubbl/distr/stampa	Princeton, : Princeton University Press, c2011
ISBN	1-283-00917-X 9786613009173 1-4008-3911-4
Edizione	[Course Book]
Descrizione fisica	1 online resource (246 p.)
Altri autori (Persone)	KumpLee R
Disciplina	550.1/5118
Soggetti	Gaia hypothesis - Mathematical models Geobiology Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Frontmatter -- Contents -- Preface -- 1. Modeling and Mathematical Concepts -- 2. Basics of Numerical Solutions by Finite Difference -- 3. Box Modeling: Unsteady, Uniform Conservation of Mass -- 4. One-Dimensional Diffusion Problems -- 5. Multidimensional Diffusion Problems -- 6. Advection-Dominated Problems -- 7. Advection and Diffusion (Transport) Problems -- 8. Transport Problems with a Twist: The Transport of Momentum -- 9. Systems of One-Dimensional Nonlinear Partial Differential Equations -- 10. Two-Dimensional Nonlinear Hyperbolic Systems -- Closing Remarks -- References -- Index
Sommario/riassunto	Mathematical Modeling of Earth's Dynamical Systems gives earth scientists the essential skills for translating chemical and physical systems into mathematical and computational models that provide enhanced insight into Earth's processes. Using a step-by-step method, the book identifies the important geological variables of physical-chemical geoscience problems and describes the mechanisms that control these variables. This book is directed toward upper-level undergraduate students, graduate students, researchers, and professionals who want to learn how to abstract complex systems into

sets of dynamic equations. It shows students how to recognize domains of interest and key factors, and how to explain assumptions in formal terms. The book reveals what data best tests ideas of how nature works, and cautions against inadequate transport laws, unconstrained coefficients, and unfalsifiable models. Various examples of processes and systems, and ample illustrations, are provided. Students using this text should be familiar with the principles of physics, chemistry, and geology, and have taken a year of differential and integral calculus. Mathematical Modeling of Earth's Dynamical Systems helps earth scientists develop a philosophical framework and strong foundations for conceptualizing complex geologic systems. Step-by-step lessons for representing complex Earth systems as dynamical models Explains geologic processes in terms of fundamental laws of physics and chemistry Numerical solutions to differential equations through the finite difference technique A philosophical approach to quantitative problem-solving Various examples of processes and systems, including the evolution of sandy coastlines, the global carbon cycle, and much more Professors: A supplementary Instructor's Manual is available for this book. It is restricted to teachers using the text in courses. For information on how to obtain a copy, refer to: http://press.princeton.edu/class_use/solutions.html
