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| 1. Record Nr. | UNISA996495168203316 |
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| Titolo | Mathematics of the weather : polygonal spline local-Galerkin methods on spheres // Jurgen Steppeler and Jinxi Li |
| Pubbl/distr/stampa | Cham, Switzerland : , : Springer, , [2022] ©2022 |
| ISBN | 3-031-07238-3 |
| Descrizione fisica | 1 online resource (328 pages) |
| Collana | Springer atmospheric sciences |
| Disciplina | 551.51011 |
| Soggetti | Atmospheric models Atmospheric models - Mathematics Physical geography Models matemàtics Geografia física Llibres electrònics |
| Lingua di pubblicazione | Inglese |
| Formato | Materiale a stampa |
| Livello bibliografico | Monografia |
| Nota di bibliografia | Includes bibliographical references (pages 311-316) and index. |
| Nota di contenuto | Intro -- Foreword -- Preface -- Acknowledgments -- Contents -- Acronyms -- Introduction -- Numerics -- Discretization on Spherical Grids -- Efficiency of the Computational Grid -- Numerical Methods -- Validations of Numerical Methods Using NWP Models -- Verifications of Numerical Methods for Climate Modeling -- Simple Finite Difference Procedures -- The Runge-Kutta and Other Time Discretization Schemes -- Homogeneous and Inhomogeneous Difference Schemes -- Some Further Properties of Finite Difference Schemes -- The Von Neumann Method of Stability Analysis -- Dynamic Equations of Toy Models -- Diffusion -- The Boussinesq Model of Convection Between Heated Plates -- The Lorenz Paradigmatic Model -- Local-Galerkin Schemes in 1D -- Functional Representations, Amplitudes, and Basis Functions -- The Classic Galerkin Procedure -- Spectral Elements -- The L-Galerkin Scheme: o3o3 -- The L-Galerkin Scheme: o2o3 -- Splines of High Smoothness -- A Conserving Second-Order Scheme Using a Homogeneous FD Scheme -- Boundaries and Diffusion -- Transfer Function Analysis -- A Numerical Test for Irregular Resolution -- |

Internal Boundaries for Vertical Discretization -- Open Boundary Condition -- The L-Galerkin scheme: $\mathcal{O}(5)$ -- The L-Galerkin Scheme: $\mathcal{O}(5)$ -- The Interface to Physics in High-Order L-Galerkin Schemes -- Polygonal Spline Solutions Using Distributions and Discontinuities -- Von Neumann Analysis of Some $\mathcal{O}(5)$ Schemes -- 2D Basis Functions for Triangular and Rectangular Meshes -- Rhomboidal Basis Functions and Sparse Grids for the Regular Grid Case -- Euclid's Lemma -- Triangular Basis Functions and Full Grids -- Triangular Basis Functions for the Rectangular Case -- The Corner Derivative Representation -- An Irregular Structured Quadrilateral Grid with Triangular Cells -- An Example of a Regularization Operator. Finite Difference Schemes on Sparse and Full Grids -- Non-conserving Schemes for Full Grids -- Alternative Methods to Compute Derivatives -- Baumgardner's Cloud Derivative Method -- Third-Order Differencing for Corner Points with a Second-Degree Polynomial Representation -- Enhanced Stencil Order -- The Full Triangular $\mathcal{O}(3)$ Method -- Sparse Grids -- L-Galerkin Schemes for Sparse Triangular Meshes -- Totally Irregular Triangular and Quadrilateral Mesh: Hexagons and Other Polygons -- Staggered Grid Systems and Their Basis Function Representation -- A Simple Cut-Cell System Based on the Staggered Low-Order Basis Functions -- A Conserving Version of the Cut-Cell Scheme -- Full and Sparse Hexagonal Grids in the Plane -- Indices and Basis Functions of Hexagonal Grids in a Plane -- Numerical Methods of Hexagonal Grids on the Plane -- Hexagonal Options -- Isotropy of the Hexagonal Grid in Comparison to Rhomboidal Grid -- Platonic and Semi-Platonic Solids -- Cubed Sphere, Icosahedron, and Examples of Semi-Platonic Solids -- Geometric Properties of Spherical Grids -- Equations of Motion on the Spherical Grid and Non-conserving Finite Difference Schemes -- Further Spherical Test Problems -- Conserving L-Galerkin Schemes on the Sphere -- A Simple Non-conserving Homogeneous Order Discretization on the Sphere -- Hexagonal Grids on the Sphere -- Numerical Tests -- 1D Homogeneous Advection Test for $\mathcal{O}(5)$ Methods, SEM2 and SEM3 -- A Numerical Example of Open Boundary Condition for a Fast Wave -- The T64 Solid for Discretization by Quadrilateral Cells -- Shallow Water Tests on the Sphere: Solid Body Rotation, Solid Body Flow, Advection, and Williamson Test No. 6 -- 2D Mountain Wave Test -- The Kalman Filter Data Analysis -- Test of the $\mathcal{O}(3)$ Scheme on the Cubed Sphere Grid Using the Shallow Water Version of the HOMME Model. Projections of Semi-platonic Solids to Triangular Surfaces -- CPU Time Used with a 3D Version of $\mathcal{O}(3)$ Scheme -- 1D Example for the QUASAR System -- Operations of Linear Spaces -- Summary and Outlook -- Computer Aspects of Parallel Processing -- Numerical Weather Prediction for Small Research Groups and Owners of Private PCs -- New Applications for NWP -- Large Eddy Simulation -- The Elliptical and the Potato Shaped Earth -- Data Assimilation -- Global Models for Forecasting and Climate Research -- Linear Algebra -- Examples of Program -- Dispersion Analysis of $\mathcal{O}(2)$ and $\mathcal{O}(3)$ Methods -- 1D Homogeneous Advection Test -- Appendix A -- Neighborhood Relations for the Full Triangular Grid and a Compact Storage System -- The Serendipity Interpolation on the Sphere -- The Quasi-arithmetic Rendition QUASAR to Obtain a Sparse Field Representation -- Glossary -- References -- Index.
