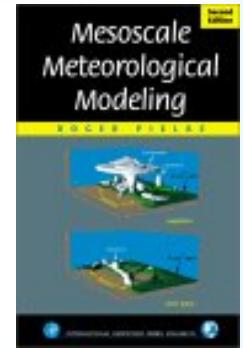# ATOC 7500: MESOSCALE METEOROLOGICAL MODELING
SPRING 2008
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MESOSCALE METEOROLOGICAL MODELING by Roger A. Pielke Sr.
Required Text, 676 pages 2nd Edition 2002
Academic Press; ISBN: 0125547668

Introduction

Mesoscale meteorological models are used in a wide range of studies and disciplines, such as weather prediction, hydrologic modeling, air chemistry, atmospheric dispersion, regional and climate assessments, and planetary atmospheres. This is a unique opportunity for graduate students to learn theoretical and practical aspects of mesoscale modeling from a world authority on the subject.

Topics

1. Governing Equations and Simplification
2. Conservation Relations
3. Physical and Analytic Modeling
4. Coordinate Transformations
5. Parameterization-Averaged Subgrid-Scale Fluxes
6. Parameterization of Averaged Radiation Flux Divergence
7. Parameterization of Moist Thermodynamic Processes
8. Boundary and Initial Conditions
9. Model Evaluation
10. Examples of Mesoscale Models

Grading

Grades will be determined from class modeling assignments on modeling advection, diffusion, and/or the pressure gradient force, as well as two projects.

1. The selection by the student of a parameterizations used in a mesoscale, regional, or global model, and its assessment in terms of how it is constructed, and an attempt to replace with a look-up-table version.

2. The selection by the student of a mesoscale, regional, or global model and the dissection of the model code using the categorizations given in the textbook.

If there is interest, we may replace these assignments with a joint class project where we build a regional model using straightforward numerical algorithms for the advection and pressure gradient force, and look-up tables for one or more of the parameterizations (particularly for a combination of all of the diabatic heating terms as described in

Pielke Sr., R.A., D. Stokowski, J.-W. Wang, T. Vukicevic, G. Leoncini, T. Matsui, C. Castro, D. Niyogi, C.M. Kishtawal, A. Biazar, K. Doty, R.T. McNider, U. Nair, and W.K. Tao, 2007: Satellite-based model parameterization of diabatic heating. EOS, Vol. 88, No. 8, 20 February, 96-97.
http://climatesci.colorado.edu/publications/pdf/R-322.pdf

We will use the North American Regional Reanalysis or the NCAR/NCEP Reanalysis to run the model to assess its performance (and real time data if we are able to obtain it).