Eric D. Rappin

Personal Data
Dept. of Atmospheric and Oceanic Sciences
University of Wisconsin-Madison
1225 W. Dayton St.
Madison, WI 53706

edrappin@aos.wisc.edu
(608) 262-2572 (office)
(608) 213-8342 (cell)
United States citizen

Research Interests

Research directed at improving the understanding of tropical cyclone intensity and track forecasts through numerical simulations.

Education

Doctor of Philosophy, Atmospheric Science, Dec. 2004
University of Wisconsin – Madison, WI
Dissertation: The role of environmental inertial stability in tropical cyclone intensification.
Advisor: Professor Michael C. Morgan
Ph.D. Minor: Computational Fluid Dynamics

Bachelor of Science, Physics, May 1996
Rensselaer Polytechnic Institute, Troy, NY

Research Experience

Research Assistant, 1997 – Present

- Applied wavelet analysis to isolate and remove tropical cyclones from 3-D data sets to determine tropical cyclone steering currents. Used a potential vorticity center of mass approach to establish the depth of steering currents.

- Developed a multigrid algorithm for potential vorticity inversion with large grids.

- Built a 2-D (*x*-*z* plane) primitive equation model using a 3rd order Runge-Kutta time splitting technique on a staggered grid. (Details: semi-implicit differencing in the vertical, enstrophy conserving 2nd order centered differences for momentum and scalar advection, Crank-Nicholson on diffusion, explicit sound wave terms on fast time step.

- Manipulated and applied a hierarchy of numerical models, ranging from a highly parameterized two-layer model to a 3-D, full physics, primitive equation model to gain insight on the role of outflow layer dynamics on tropical cyclone intensification.

Technical skills

- Experience using UW-NMS, MM5, and WRF numerical models (including the development of an initialization algorithm for the WRF model to handle idealized data sets).
- Extensive experience in Matlab programming and visualization.
- CFD understanding:
    - Implicit and explicit schemes.
    - Temporal differencing such as Euler explicit, Adams-Bashforth, Runge-Kutta and leapfrog with Asselin filter.
    - Time-splitting
    - Advection – centered, upwind, finite volume (positive definite)
    - Numerical diffusion and divergence damping
    - Turbulent diffusion (first order and one-and-a-half order closure)
- Linux, Unix, Macintosh, Windows, Fortran, shell scripts, GEMPAK, VIS5D and web page design.

Teaching Experience

Undergraduate dynamics courses. Lab instructor.

- Prepared and executed both lectures and experiments (e.g. deformation and vorticity inversion codes).
- Taught introduction to numerical methods and visualization software (e.g. Matlab and GEMPAK)

Relevant Coursework

Finite Difference Methods

Development of finite difference methods for initial and boundary value problems for hyperbolic, parabolic (ADI methods), and elliptic partial differential equations. Analysis of accuracy and stability of difference schemes. Direct and iterative methods for solving elliptic difference schemes (e.g., SOR and preconditioned conjugate gradient method). Applications from science and engineering.

Computational Fluid Dynamics

Developed code to solve the laminar boundary layer equations utilizing the Keller box method.

Developed code to solve the 2-D (*x*-*y* plane) incompressible laminar Navier- Stokes equations utilizing 2^{nd} order Adams-Bashforth time integration on a staggered grid. (with 3^{rd} order upwind advection, iterative solver for Poisson pressure equation and Crank-Nicholson viscous terms).

Publications

Rappin, Eric D., Michael C. Morgan, and Gregory J. Tripoli: The role of environmental inertial stability in tropical cyclone intensification. Part I: Symmetric environment (in preparation).

Rappin, Eric D., Michael C. Morgan, and Gregory J. Tripoli: The role of environmental inertial stability in tropical cyclone intensification. Part II: Asymmetric environment (in preparation).

Abstracts and Presentations

Rappin, Eric D., Michael C. Morgan, and Gregory J. Tripoli. 2004. The tropical cyclone – jet interaction (part II). 26th Conferences on Hurricanes and Tropical Meteorology. Miami, FL.

Rappin, Eric D. and Michael C. Morgan. 2003. The tropical cyclone – jet interaction. 10th Conference on Mesoscale Processes. Portland, OR.

Rappin, Eric D. and Michael C. Morgan. 2001. The role of upper tropospheric inertial stability in hurricane intensification. 9th Conference on Mesoscale Processes. Ft. Lauderdale, FL.

Rappin, Eric D. and Michael C. Morgan. 1999. Instantaneous diagnosis of tropical cyclone steering flow using PV inversion. 8th Conference on Mesoscale Processes. Boulder, CO.

References

Michael Morgan
morgan@aurora.aos.wisc.edu
608-262-1957

Gregory Tripoli
tripoli@aos.wisc.edu
608-262-3700

Jonathan Martin
jon@aos.wisc.edu
608-262-9845

Matthew Hitchman
matt@aos.wisc.edu
608-262-4653