ATOC 7500: The Art of Climate and Environmental Modeling
Final modeling project
Report due: 4pm Monday 8 May 2006
Email topic/title/descriptive sentence to David Noone (dcn@colorado.edu) by **Monday 3 April**

Assignment
Numerical models are invaluable tools for examining complex problems. Being able to build and using models in appropriate and meaningful ways given the ultimately limitations of any model is central to most active areas of research.

Construct and use a numerical model to investigate a research question of interest.

The research question is open, and may be one related to your dissertation research. The model you build should capture the fundamental physics and be appropriately accurate. The numerical aspects of the model should draw on issues and aspects developed in class. Discussion with others is highly encouraged, but what you hand in will be your own and be based on you specific research problem.

***Option 1*)** Start with our quasi-geostrophic general circulation model, and add components to this for the research question. This can be done in a coordinated group to add multiple components and thus turn our simple GCM into a climate model.
Examples: add a hydrologic cycle and clouds to investigate water vapor feedbacks, add radiative transfer to investigate effects of greenhouse gases on jets streams, add land surface to investigate partitioning of latent and sensible heat flux, add an ocean and sea ice to investigate influence of ENSO, convert into a Mars or Venus GCM to investigate circulation regimes and if the weather is more chaotic on other planets

Option 2) Build a model that is specific to your problem
Examples: Importance of cloud properties in radiative convective equilibrium, isotope transport to Antarctic, role of permafrost in soil hydrology, ..

Option 3) (discouraged, but not discounted): Use an existing model (RAMS, CAM, MM5…), and add some new component. Please talk to David before deciding on this, since it could easily get to be a huge amount of work and computational task.

Reporting
This project constitutes 50% of your grade for this class. You will be assessed on your written report and on your oral presentation. You will submit a **final report** that completely described your study. You should style your report as a self contained manuscript for *Journal of Geophysical Research* (see http://www.agu.org/pubs/agu_jourjgra.html/). It should include a summarizing Abstract, an Introduction that gives a background for your problem (citing any key research papers) and poses the hypotheses that you will test, methods section describing your experiments and any pertinent details of your model, results and discussion sections that describe the experiment outcomes and discusses their meaning, and the all important Conclusion which describes the solution of the hypothesis, and limitations and uncertainties in the experiments or model design, and ideally how this work relates to the background you presented in the Introduction. The "nuts-and-bolts" details of your model, including any validation and testing, can be included in the main body, but might also be included as an appendix if particularly lengthy. You will be assessed on experiment design, use of appropriate modeling methodologies, analysis and critique of model results, and accurately and clearly reporting the findings.

During the last 2-weeks of class projects will be presented to the class as an **oral presentation**. This will include a description of your problem, what model you are using, and initial results. It is expect that this is an opportunity to gain feedback before you complete your report.