Syllabus
Department of Meteorology, Florida State University
MET 6155 – Fall 2008
Advanced Topics in Climatology: Linking Weather and Climate

Instructor: Dr. Philip Sura
Department of Meteorology
420 Love Building
Phone: 850-644-1268
Email: sura@met.fsu.edu
Office hours fall 2008: Thursday right after class and by appointment. My door is also open most of the time.

Class Meetings: Tuesday and Thursday, 11:00 am - 12:15 pm, 305 LOV

Course Objective: This graduate course has the following thematic and general objectives:
• The student should learn about modern topics and methods in climate research.
• In particular, the student should get an idea of how weather and climate are intricately linked, and how to understand and model this two-way interaction using advanced dynamics, physics, and mathematics.
• The student should also learn to become a more independent thinker/scientist in order to obtain the intellectual tools to successfully complete graduate school.

Grading: The final grade will be calculated according to the following breakdown:
• 1/3 active classroom participation.
• 1/3 oral in-class presentation of specific topic.
• 1/3 written composition of oral presentation.

Prerequisite: Consent of instructor. A background in dynamical meteorology and/or dynamical oceanography, thermodynamics, and some applied math (statistics, ordinary/partial differential equations) might be helpful.

Literature: Lecture notes and other literature will be provided. A reading list of classic and modern research articles and monographs will also be made available.

Miscellaneous: Students are expected to uphold the Academic Honor Code published in the Florida State University Bulletin, in the Student Handbook, and at the Florida State University Web Site http://dof.fsu.edu/ahpandada.html.
Course Outline:

Week 1 – 4 (climate dynamics revisited)
- Reynolds averaging and related eddy fluxes
- Barotropic and baroclinic instabilities (“weather”)
- The role of eddy fluxes (“weather”) on the zonally averaged atmospheric circulation (“climate”)
- The Lorenz energy cycle

Week 5 – 8 (physics of climate)
- Energy balance and equilibrium models of the climate system: the globally-averaged temperature as a zero-dimensional model
- Stochastic perturbations of the energy balance model
- A first look at Hasselmann’s stochastic climate model: the red-spectrum of climate variability

Week 9 – 12 (physics and math of stochastic systems)
- An introduction to the physics and math of stochastic systems: random walk, Brownian motion, stochastic differential equations, Fokker-Planck equation
- A closer look at Hasselmann’s stochastic climate model

Week 13 – 16 (up-to-date topics on linking weather and climate)
- Linear inverse models
- Stochastic ENSO models
- Stochastic stormtrack models
- Extreme events in climate and multiplicative noise