For Students Interested in Graduate Study in Atmospheric Science

As a professor, I know that there are many important topics that are not covered within the standard undergraduate core curriculum. This document introduces various topics of relevance for students who are interested in advanced study in atmospheric science.

Survey of Meteorology

For all students desiring to obtain the Operational Meteorology concentration, there are two online sources that you should thoroughly go through before you graduate.

1. Practical Meteorology by Roland Stull is an excellent algebra-based survey of atmospheric science presented at the 100- level. This textbook is a companion book to PHYS 105 and should be used as you walk through your 100/200 level courses.

2. Atmospheric Science by Wallace and Hobbs presents a survey of the major topics of atmospheric science at the 300/400 level. This book should be thoroughly used in PHYS 225 and all your 300/400 level courses.

Quasi-Geostrophic (QG) Theory

QG theory is introduced and applied qualitatively in PHYS 215 (Synoptic Meteorology). For students who are interested in pursuing graduate study in meteorology, it is necessary to understand the mathematical basis of QG theory. The notes below assume that the student has taken (or is currently taking) synoptic meteorology (PHYS 215) and is comfortable with vector calculus.

QG Theory and Prediction
Equations of QG Theory
Q-Vectors
Cyclone Development in QG Theory
Application of Petterssen-Sutcliffe Development Theory
Frontal Development in QG Theory
Isentropic Potential Vorticity (IPV)

Isentropic analysis is introduced and applied qualitatively in PHYS 215 (Synoptic Meteorology). For students who are interested in pursuing graduate study in meteorology, it is necessary to understand the applications of isentropic analysis in more detail. It is assumed that the student has taken (or is currently taking) synoptic meteorology (PHYS 215) and is comfortable with vector calculus.

Isentropic Analysis
Introduction to Isentropic IPV
IPV Anomaly Structures and Impacts
Impacts of Diabatic Heating and Friction upon IPV
Cyclone Development from an IPV Perspective

Numerical Weather Prediction (NWP)

For students who are interested in pursuing a career in operational meteorology, understanding how to use numerical weather models is an important skill, and it is highly recommended that students take an independent study course in this topic. For students who do not have the time to take an operational meteorology course, the notes below give an overview of numerical weather prediction. It is assumed that the student has taken (or is currently taking) synoptic meteorology (PHYS 215) and is comfortable with vector calculus. To use the links below, you must register with the UCAR COMET program.

Introduction to NWP
Effective Use of NWP in the Forecast Process: Introduction
Gridded Products in the NWS National Blend of Global Models
How Mesoscale Models Work
Introduction to Ensemble Forecasting Systems
NWP Model Fundamentals
Adding Value to NWP Guidance