METR 6803 SECTION 1: NUMERICAL WEATHER PREDICTION

SPRING SEMESTER 2008

Class Times: Tues / Thurs 1pm 2-15pm, Room NWC 5930

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1. ***Introduction and Course Overview***
- a brief historical perspective
- what are numerical weather analysis (NWA) and numerical weather prediction (NWP)?
- how does NWP differ from climate modeling?
- why are NWA and NWP so important?
- how good are they?

2. ***Governing Equations for NWP***
- derivation of equations
- classification of equations
- the barotropic vorticity equation
- shallow water equations
- normal modes
- forced modes

3. ***Numerical Weather Analysis I: Background***
- definitions
- concepts
- applications

4. ***Numerical Weather Analysis II: Techniques***
- local and global polynomial interpolation
- empirical linear interpolation
- least squares minimization
- emerging techniques

5. ***Geostrophic Adjustment***
- theory
- applications

6. ***Model Initialization***
- model shock and model spin-up
- static and dynamic initialization

7. ***NWP Methods I: Definitions and Operators***
- spectral and finite element methods
- finite-difference methods

8. ***NWP Methods II: Theory of Finite –difference methods***
- concepts
- consistency, convergence and stability

9. ***NWP Methods III: Types of Finite-difference Schemes***
- time differencing
- spatial differencing
- boundary conditions
- filters

10. ***NWP Methods IV: Examples of Models***
- numerics of LFM, GFS, ETA, RSM, RAMS, MM5, WRF models

11. ***Climate Modeling: An Introduction***
- a climate modeling primer

12. ***Atmospheric Predictability***
- basic concepts and definitions
- chaos theory
- error growth
- predictability of tropics vs. extra-tropics
- ensemble forecasting methods

13. ***The Future of NWA and NWP***
- a look at what we might expect over the next decade or so