

MEA 712: (An Introduction to) Mesoscale Atmospheric Modeling

Fall Semester 2009

Tentative syllabus (revised 08/12/09):

week	dates	topics
1	8/20	<i>No class (Parker out of town)</i> [†]
2	8/25, 8/27	Intro to models; basis of forecasting [†] Eulerian & Lagrangian methods; finite differences; truncation error [†]
3	9/1, 9/3	Coding finite differences in FORTRAN and other tips ^{† 1} A first look at advection and stability [†]
4	9/8, 9/10	Damping of the upstream scheme; non-iterative time differencing Fundamental equations and treatment of acoustic waves in CMM ²
5	9/15, 9/17	Choice of pressure variable and grid stagger for CMM <i>In-class work day: CMM task 1: setting up 1-D base state</i> ³
6	9/22, 9/24	Flux form of equations; interpolation on the staggered grid and impacts <i>In-class work day: CMM task 2: full 2-D grid set-up and initial condition</i>
7	9/29, 10/1	The leapfrog scheme; computational modes <i>In-class work day: CMM task 3: implementing the dry model equations</i>
8	10/6	Overview of semester project; assign “Midterm Exercise” <i>Fall Break</i>
9	10/13, 10/15	<i>In-class work days: CMM task 3 and “Midterm Exercise” (Parker out of town)</i>
10	10/20, 10/22	More on the leapfrog scheme; Asselin filtering Rayleigh damping; artificial computational diffusion
11	10/27, 10/29	<i>In-class work day: CMM task 4: adding filtering and a Rayleigh damper</i> Aliasing instability; turbulence and concept of sub-grid-scale closure
12	11/3, 11/5	Lateral boundary conditions (LBCs): periodic, mirror, and sponge conditions <i>In-class work day: CMM task 5: adding non-reflecting LBCs</i>
13	11/10, 11/12	Kessler moist physics <i>In-class work day: CMM task 6: adding moisture (Parker out of town)</i>
14	11/17, 11/19	More on LBCs: open/radiative boundary conditions Grid nesting and grid stretching
15	11/24	<i>In-class work day: semester project consultation and Q & A Thanksgiving Break</i>
16	12/1, 12/3	Brief survey of other methods not covered in this class <i>In-class work day: semester project consultation and Q & A</i>
17	FINALS	Semester project presentations during exam period

[†]there will be a short assignment for next class

¹Parker may have jury duty

²the Class Mesoscale Model

³including assessment of initial sounding's CAPE