

Mesoscale Weather Analysis and Forecasting

Review sheet for Midterm 1: to be held on 5 February 2009

This exam will count for 12.5% of your final grade.

The exam will be conceptual, and will not require you to do derivations. However, we spent some time using and working out some important equations. You should have enough familiarity to recognize these equations, and to apply them physically. Examples include:

- Rossby number (what does this have to do with “mesoscale”?)
- Physical meanings, strengths, and weaknesses of the thermodynamic variables and indices we reviewed in class
- Definition of buoyancy and resulting equation for Dw/Dt using “parcel theory”
- Meanings of “surface-based” vs. “most unstable” parcels
- Definition of CAPE, CIN, and DCAPE and their relationship to w
- Radar reflectivity factor (Z , dBZ)
- Mesoscale pressure perturbations associated with basic configurations of buoyancy and wind

Other things to have down:

- Know your way around a skew- T ln- p diagram, a hodograph, and a wind profiler time-height plot, including how to find basic environmental parameters such as CAPE, CIN, LCL, LFC, EL, lifted index, shear vector magnitudes (e.g. 0–6 km), helicity (e.g. 0–3 km) and SR helicity (if you’re given the storm motion)
- Know how to decode basic METAR observations, how to read surface charts, etc. You don’t need to know the code for “well developed dust/sand whirls” (it’s PO!), but you should know what all the standard groups mean, and the most common phenomenon codes. For a review, see:
<http://www.nws.noaa.gov/oso/oso1/oso12/document/guide.shtml>
- All basic conversions... °F to °C and K, kts to m/s, temperature to potential temperature, etc.
- Know the basic kinds of products produced by the Storm Prediction Center, and their meanings

Questions/topics for thought and review:

- What is the mesoscale dynamically? What are the appropriate size and time scales? What phenomena are included?
- What might a convergence line look like in Doppler radial velocity data? A low-level jet? A vortex? A wind profile that veers with height?
- When are satellite data useful in mesoscale meteorology? What do typical mesoscale features look like?
- What are the basic elements of a forecast for deep moist convection? For severe convective storms?

Relevant chapters in the textbook: Chapters 1 and 2 and Appendix A.