

MEA444: Mesoscale Analysis & Forecasting due: start of class on Wednesday 8 April, 2009
Pre-lab 8

Mesoscale convective systems: Squall lines and bow echos

Pre-lab assignment: You will do COMET's "MCS Matrix" as a lab in-class on Wednesday April 8. Before we do the in-class lab, you should work through the following questions and make sure that you understand them. **You will need to turn your pre-lab in along with your lab, and the TA will grade it.**

I. Answer the questions below, which are posed at:

<http://meted.ucar.edu/convectn/mcs/mcsweb/exesum1.htm>

By going to this web address, you will see links to specific parts of a larger module about MCSs. The links will direct you to the components that are relevant to the questions you must answer below.

1. Why does the strength and longevity of an MCS depend on the strength of environmental vertical wind shear?
2. What produces the mesoscale pressure patterns observed with MCSs?
3. How is a rear-inflow jet generated, what controls its strength, and what impact does it have on MCS strength and evolution?
4. How are line-end or bookend vortices generated, and what impacts do they have on MCS strength and evolution?
5. How does the Coriolis force impact MCS evolution?
6. How can we better anticipate whether an MCS is apt to produce severe weather?

II. Answer the following question, which is posed at:

<http://meted.ucar.edu/convectn/mcs/mcsweb/pp/sumexe1q.htm>

Q: Given a 100 km (55 nm) long MCS evolving in a moderate low-level shear environment (~15 m/s below 3 km AGL), place the following events in order of occurrence, from first to last.

1. Cold pool/shear balance creates an erect system-scale updraft
2. A rear-inflow jet develops in response to mid-level mesolow
3. Vertical wind shear and horizontal vorticity create a downshear-tilted system
4. Coriolis causes the northern line-end vortex to become dominant
5. A dominant cold pool outruns the system
6. The RIJ first descends, creating strong winds at the surface
7. Cold pool circulation begins to overwhelm the shear, causing the system to tilt upshear.

*This is a very long module, but it has a lot of great information. You are **strongly** encouraged to work through the entire thing, even though this is not required to get full credit.*