

## Homework #4: ATM OCN 718

Assigned: Tuesday 20 March 2018

Due: Thursday 5 April 2018

The purpose of this assignment is to familiarize you with the basic features of mesoscale convective systems such as squall lines and bow echoes, and their relationship to the environmental vertical wind shear. First, read sections MR9.1 and MR9.2. Then, use the MetEd module “An MCS Matrix” located at <http://www.meted.ucar.edu/convectn/mcsmatrix/> to complete the following.

- 1) In the MCS Matrix, click “Overview” and read through a description of the 2D, 3D, and 3D with Coriolis simulations.
- 2) For the 2D simulations, answer the following:
  - a) Compare simulations A1, C1, and G1. What is the overall impact of vertical wind shear on the evolution of these lines?
  - b) Which of these three cases produces the strongest rear-inflow jet (this is a downward current of air that descends to the surface behind some squall lines)?
  - c) Which of these three cases produces the most stratiform precipitation?
  - d) Which of these three cases produces embedded bow echoes?
  - e) Compare simulations C1, D1, E1 and also simulations G1, H1, and I1. How does the orientation of the shear vector relative to the squall line orientation effect system evolution?
  - f) Compare simulations C1 and F1. What is the effects of a jet-type profile on system evolution?
- 3) For the 3D simulations, answer the following:
  - a) Compare A1 and A2, as well as C1 and C2. How does the addition of line ends alter the system evolution?
- 4) For the 3D simulations with Coriolis, answer the following:
  - a) Compare A2 and A3, as well as C2 and C3. How does the addition of Coriolis forcing alter the system evolution?
  - b) Which of the 3D simulations with Coriolis (A3 through J3) produce the strongest, most elevated rear-inflow jet?
  - c) Which of the 3D simulations with Coriolis (A3 through J3) produce the most stratiform precipitation?
  - d) Which of the 3D simulations with Coriolis (A3 through J3) produce the most well-formed bow echoes?