Homework #3: ATM OCN 718
Assigned: Tuesday 27 February 2018
Due: Tuesday 6 March 2018

The purpose of this assignment is to familiarize you with the basic features of the convective storm spectrum, and its relationship to the environmental CAPE and vertical wind shear profiles. Use the MetEd module "A Convective Storm Matrix: Buoyancy/Shear Dependencies" located at https://www.meted.ucar.edu/training_module.php?id=22 (you'll need to sign-up for an account).

Then, complete the following:

1) Read through the three sections describing cloud modeling, conceptual models of convection, physical processes in convection (this should mostly be a review, given the material we've discussed in class).

2) Identify storm types for all of the simulations in the "Convective Storm Matrix" section of the tutorial. Classify each case as best representing ordinary cell (O), multicell (M) or supercell (S) convection. Plot the storm type/simulation name (e.g., A2;S) on the shear-buoyancy diagram provided.

   For this purpose, we will define ordinary cell simulations as those for which there is minimal new convective activity after the initial cell, multicell simulations as those for which there is significant new convective activity after the initial cell, but with no supercells present, and supercell simulations as those in which there still may be much multicellular activity, but for which some of the cells are very long-lived (i.e., greater than 1 h) and display significant updraft rotation at mid-levels (4 km AGL).

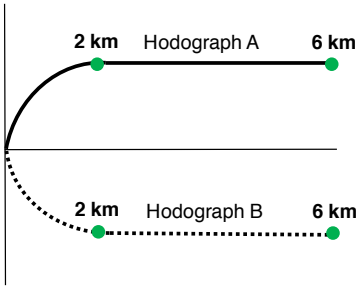
3) What CAPE/Shear environments are most favorable for each of the three storm types?

4) What is the impact of dry mid-level air on storm evolution? (compare the high-moist and high-dry simulations)

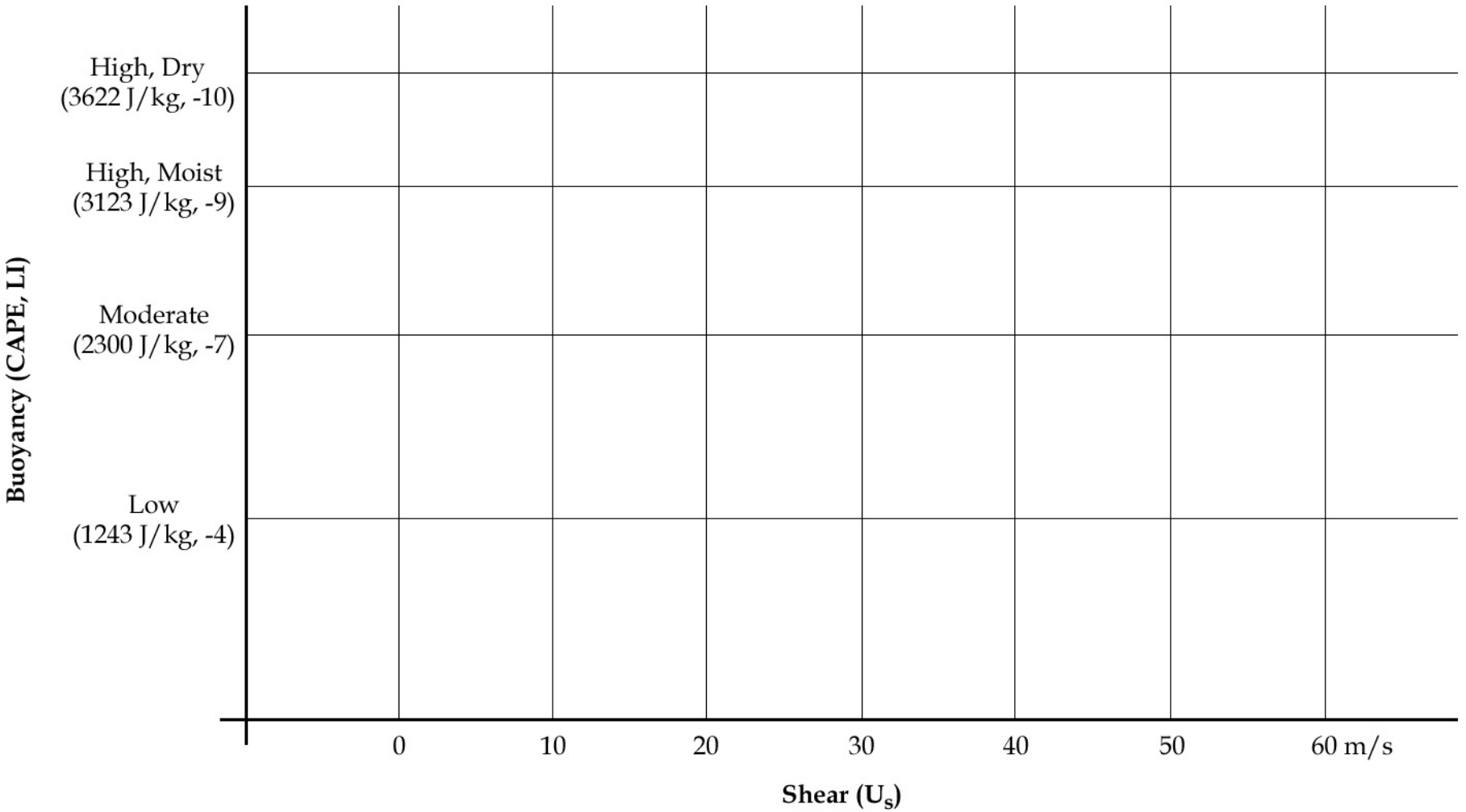
5) What is the impact of the depth of the shear layer on storm structure and evolution?

6) Which of the simulations is most similar to the CM1 run in Homework #1/2?

7) Run an additional simulation with CM1 in an environment with a *counter-clockwise rotating shear vector* (as in hodograph B below). To do so, look for the block of code in ./src/base.F that defines the wind profile used in the original simulation (iwnd=2), and adjust accordingly to produce the environmental wind profile in hodograph B. After making this change, recompile the code. Make sure to *save your original netcdf file* from the original simulation (hodograph A). **How do these two simulations differ?** Provide plots (using ncview or other software) of relevant fields to demonstrate the differences.



Question 1A Answer Worksheet
Shear (U_S) vs. Buoyancy



Plot all simulations using storm-type symbols (O, M, S).