Atmospheric Sciences 5200
Exercise 3: Photographing Snowflakes and Cold-Cloud Microphysics

The first three questions are based on the "Photographing Snowflakes in Freefall" seminar by Tim Garrett, and the remainder on the lecture and reading on the microphysics of cold clouds.

1. Table 6.2 in Wallace and Hobbs lists ten types of solid precipitation. Which of these types were most commonly photographed by Tim Garrett's camera during the Nov 9-11 precipitation event?

2. Two measures of the shape of a precipitating ice particle preresented in seminar were "aspect ratio" and "complexity.
   (a) How is each of these defined?
   (b) How did each of these change during the course of the Nov 9-11 precipitation event?

3. What were the typical fall speeds of the precipitating ice particles measured during the Nov 9-11 precipitation event?

4. Cold clouds are clouds that exist at temperatures less than 0° C.
   (a) What is a *mixed-phase* cloud?
   (b) What is a *glaciated* cloud?

5. List and briefly describe the four ways in which ice particles can be formed or *nucleated*.

6. When ice crystals coexist with supercooled cloud droplets, what happens?

7. Once an ice particle is formed, it may grow by three processes.
   (a) List and briefly describe these processes.
   (b) Which of these processes can grow ice particles most rapidly?

8. What factor determines the basic *habit* (shape or form) of an ice crystal?