1. Write a short story (at least one paragraph) that describes the “adventures” of a helium balloon named “Roland” after it is accidentally released by a small child at a county fair. Include in your story descriptions of the wind experienced by the balloon and the variations in its horizontal and vertical motions as it rises through the surface layer and into the free atmosphere. Be creative if you would like.

2. 5.1 in Campbell and Norman.

3. 5.2 in Campbell and Norman.

4. 5.3 in Campbell and Norman.

5. If you only had three anemometers and a single 10–m mast or tower, and you wanted to experimentally determine the friction velocity $u^*$ and also the roughness length $z_m$ of a bare soil surface, at what heights above the ground would you place/mount your anemometers to best estimate $u^*$ and $z_m$? Why?

6. Write and answer your own question based upon the information presented by Jason Patton in class on Thursday, February 3.

Example question: What are eddies, what do they do, and how large can they be? Answer: Eddies are circular motions of air. Eddies redistribute energy and mass (e.g. pollutants, carbon dioxide, water vapor) in the atmospheric boundary layer of Earth’s surface. Eddies can be as large as the atmospheric boundary layer itself, which can be up to a kilometer in thickness.

7. Read the Eos article “Where are the Hottest Spots on Earth?” on the course website. Eos is a weekly periodical published by the American Geophysical Union (http://www.agu.org), a professional association supporting the study of Earth and space science.

(a) What is the current world record air temperature (at the time that the article was written), and where was it recorded?
(b) What does the acronym LST stand for?

(c) The MODIS sensor on NASA’s Aqua satellite discussed in this article consists of several radiometers. A radiometer is an instrument that measures electromagnetic radiation. We’ll learn later in this class about how all objects/surfaces emit radiation, and that this radiation is related to the temperature of the object/surface. When an instrument measures the radiation emitted by an object/surface and we interpret that measurement of radiation in terms of a geophysical quantity (in this case temperature), this is called a remotely–sensed measurement. What is an advantage of using remotely–sensed measurements of LST?

(d) What is a disadvantage of using remotely–sensed measurements of LST?

(e) According to MODIS, what is the hottest Earth LST, and where did it occur?

(f) How does vegetation influence LST? Explain.

(g) How does irrigation influence LST? Explain.

8. Semester project prospectus (will be scored as two problem set problems). Describe the project in sufficient detail so that its viability and relevance to this course is evident. Include the following:

(a) A general description of the general topic area.

(b) Potential quantitative models that you will investigate. Review what we have talked about in class, and take a look at what is covered in future chapters of the book.

(c) Potential figures that will be included in the report. Plan for three to five figures. You are not bound to include exactly the figures you describe in this prospectus, but brainstorming now will be useful.

(d) Data that will be required.

(e) Some possible sources for this data. I can work with you to obtain the data, but your ideas of where to look will be helpful.