METR 130: Take-Home Assignment for Exam #1 (Spring 2011)
Due Date: February 24, 2011

Question 1: For the following typical midday conditions …

- A value for incident solar radiative flux at surface of 700 W/m^2.
- A measured skin temperature from a downward directed radiometer of 25°C.
- Swinbank's equation for calculating incident downward longwave radiative flux at surface.
- A measured two-meter air temperature and relative humidity of 20°C and 70%, respectively.
- A measured ten-meter wind speed of 5 mph.
- $C_H = C_Q = k^2/\ln^2(z_a/z_0)$, where k = 0.4, z_a is the height of the wind measurement, and z_0 is the roughness length, which we will set to 0.1 m for this exercise.
- A soil texture that is 30% sand, 30% clay and 40% silt**.**
- A surface soil moisture content that is 20% above wilting point**.**

Calculate the following:

1. Potential evaporation (kg$_{vap}$/m^2-sec and mm/day)
2. Actual evaporation (kg$_{vap}$/m^2-sec and mm/day)
3. Latent heat flux (W/m^2)
4. Sensible heat flux (W/m^2)
5. Bowen Ratio
6. Ratio of Ground Heat Flux to Net Radiation

How do your calculated values of these coincide with values shown in graphs and ratios given in lecture and/or in the text? Roughly consistent? A bit larger? A bit smaller?

Question 2: From reading through Chen and Dudhia (2001), briefly bulletpoint some ways (two or three perhaps) with brief explanation in which the following land surfaces are accounted for their model?

1. Vegetation cover
2. Snow coverage