Many studies have cited radiation as the most important contributor to snowmelt (e.g. Marks and Dozier 1982). However, as we discussed in class, radiation is hard to measure in snowy environments.

We're getting ready to run an energy-balance-based snow model, and we need to select input values for that model. For this homework, we will return to Dana Meadows and to the Tuolumne River Watershed in Yosemite National Park, California. In this location, we have an assortment of shortwave sensors (pyranometers) and no longwave sensors (pyrgeometers). For this assignment, we will plot data from the in situ shortwave sensors at Tuolumne and Dana Meadows (co-located with the snow pillows we just analyzed) and from a nationally available product from the North American Land Data Assimilation System (NLDAS) that is available anywhere in the continental U.S. (see Cosgrove et al. 2003 and the README.NLDAS2.pdf under files for more information). We will focus on calendar year 2003. (Note that water year 2003 is October 1, 2002 to September 30, 2003, so that we would start and end with no snow.) Load radiation_data_HW3.mat into Matlab. The variables are timeSW (hourly timeseries, in matlab datevec format), SW_TUM (hourly shortwave measured at Tuolumne Meadows), SW_DAN (hourly shortwave measured at Dana Meadows), and SW_NLDAS (hourly shortwave for the 1/8th-degree grid-cell that includes Dana and Tuolumne). All of the shortwave units are in Watts per meter squared (W m-2).

1) Plot all three timeseries, using different linetypes, and label your graph. Create scatterplots of one measurement against another. Comment on how these measurements compare overall.

2) Now let's look in detail a few periods. First, March 3 to 5, 2003
Print a copy of this zoomed in graph (or rather, save to jpeg or png format and add to your homework document). What do you think is going on here? Are all of the measurements to be trusted? Which do you think is most reliable and why?

3) Now, July 22 to 25, 2003.
What do you think is going on here? Are all of the measurements to be trusted? Which do you think is most reliable and why?

4) Shading by surrounding terrain (either mountains or tall trees) at certain times of day is a common problem for radiometers placed in the mountains. Can you find evidence of local shading in the Tuolumne and

Dana records? Provide a graph and explain why you think this is evidence of shading. Which of these two instruments do you think is more influenced by local shading?

5) Your boss wants you to provide an authoritative, "most-correct," timeseries of shortwave irradiance to use in your snow model. Which of the three provided here would you pick? Or, would you combine them in some way? Explain why.