Assignment #1 ATM S 211: Climate and Climate Change

Due Tuesday, Jan 11, 11:30am

1. Using the relation °F = (9/5) °C + 32, find the temperature where °F=°C; i.e. where Fahrenheit and Celsius temperatures are the same. *Show work.*

2. Temperature measurements. Please refer to figures in Chapter 1 of the text.

a. About how far back in time do **direct** measurements of Earth's surface temperature extend?

b. By what percentage did the concentration of carbon dioxide (CO2) in the atmosphere increase between 1850 and 2000? *Show your work*. Why did it increase?

c. By what percentage did the average surface temperature increase over this same time period? Assume that the average over the entire period is 15°C. *Show your work.*

d. Briefly explain the seasonal oscillation (ups and downs) in the observations of CO2 from Mauna Loa.

3. Feedbacks. $\Delta T = \lambda \Delta F$

a. Explain in words what this equation means, including what each variable represents.

b. Give three examples of ΔF that are relevant for Earth's climate.

1.

2.

3.

4. Daisyworld has a companion planet that is similar in all ways except that the daisies are black and are growing in white sand.

a. What is the effect of an increase in black-daisy coverage on planetary temperature? Express your answer graphically and label your axes.

b. Assuming that the effect of temperature on daisy coverage is the same on black-daisy Daisyworld as on white-daisy Daisyworld, draw a stability diagram – a diagram analogous to Figure 2-10a – for black daisy Daisyworld. Label the two equilibrium states P1 and P2.

i. Are these equilibrium states stable or unstable? *Label each*.
ii. If the temperature is less than the optimum temperature for daisies, explain what happens if the surface temperature is increased slightly.

5. Write a 200 word description of the climate of an area that you have lived (ideally besides Seattle).