

AOS 100/101
Spring 2017

HOMEWORK #3
(Due Friday March 3)

- 1) a) Describe the changes we would experience in the summer and winter temperatures in Madison if the tilt of the Earth's axis increased to 45° . Explain why these changes would occur. Draw a diagram that demonstrates the differences between this hypothetical case and current reality.

b) If the Earth's axis were tilted at 45° , in what direction would your shadow point at noontime on June 21 at the Memorial Union Terrace? Explain.
(10 pts)
- 2) a) During the last ice age the global average temperature was lower than it is now. Explain why it is not surprising that the concentration of CO_2 (carbon dioxide) in the atmosphere was considerably lower then than it is now.

b) Increased snow and ice at the surface would serve to increase the *albedo* of the planet (i.e. the fraction of incident solar radiation that is reflected at the surface). How might this further change the global temperature and why?
(10 pts)
- 3) Consider the following observations taken on successive, cloudless autumn mornings. On the first day, a considerable amount of frost is on the grass at sunrise. On the second day, only dew appears on the grass. On which day is the *temperature increase* in the ONE HOUR following sunrise the largest? Explain your answer.
(10 pts)
- 4) Would high or low cloud cover result in a warmer overnight surface temperature? Explain your reasoning. (HINT: High clouds are clouds located at high elevation in the troposphere while low clouds are located nearer the surface).
(10 pts)