

AOS 100/101
Spring 2019

HOMEWORK #3
(Due Friday March 1)

- 1) a) Though the current tilt of the Earth's axis is 23.5° , it varies from 22.1° to 24.5° over a period of $\sim 40,000$ years. Describe the basic differences in the annual cycle of temperature that Madison experiences in the course of one of these cycles.

b) Explain how feedbacks during the low tilt periods might exacerbate the conditions you described for those times in (a). What feedbacks could you imagine might occur on the other end of the cycle?
(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 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)