

Homework Question Set #6
NATS 101, Section 13
Fall 2010

The following questions cover Lectures 26-29. Provide thorough, complete answers for maximum credit. Three of the following questions will be randomly graded, with equal credit given to each question.

Due Wednesday, November 17 by 5pm. Submit completed assignment to D2L as .doc or .pdf file. Scanned copies of handwritten answers are fine, provided the document is neat and clearly legible. Note that diagrams or pictures can—and should—be used to answer many of the questions. Please scan in any drawings or diagrams in your answers, if possible. For the problems involving calculations, clearly label and provide appropriate accompanying textual description for equations used.

1. What atmospheric conditions are necessary for the development of an ordinary air mass thunderstorm? Describe the life cycle of an ordinary air mass thunderstorm? How long does this process take? How are ordinary air mass thunderstorms similar and/or different to more severe and organized types of thunderstorms?
2. Where do the largest and most violent tornadoes on Earth tend to occur in the central part of the United States? Why are strong tornadoes (EF 3 and above) nearly unheard of in Arizona?
3. Describe the structure of a supercell thunderstorm. How would this type of thunderstorm appear on a radar reflectivity image, for example as you would see on a TV weather report or on the Weather Channel? What kind of severe weather warning(s) would you expect with this type of storm? What would a National Weather Service meteorologist specifically look for in real-time data (for example weather balloon, radar, and/or satellite imagery) to determine whether a severe warning is warranted?
4. You are driving on Interstate 40 through Oklahoma and see a large tornado approaching. Which of the following is the safest course of action: (a) Pull over, get out of the car, and seek shelter in a ravine; (b) Pull over, get out of the car, and seek shelter under an underpass; (c) Hit the gas and try to outrun the tornado. Explain your reasoning. Are there certain months(s) of year would this situation be more likely to occur? Why or why not?
5. Why does nearly all lightning occur over or very near to large islands and continents, and not over the open ocean?
6. Explain the sequence of events in the development of a cloud-to-ground lightning stroke in a cumulonimbus cloud. To answer this question, it may be helpful to view the

slow motion video of a lightning strike shown in class lecture. Why does the sound of thunder always accompany lightning, but occur after the flash?

7. Question #2, Problems and Exercises, Chapter 14, Ahrens.

8. Now that you have successfully survived a tornado in Oklahoma, you are playing golf in Tucson and a severe thunderstorm with lots of lightning is approaching. What is the best course of action: (a) get in a parked car; (b) seek shelter under a tree; (c) try to lie low somewhere in an open space, like the middle of a fairway; (d) jump in the water hazard pond, if there is one, and try to submerge most of your body. Explain your reasoning. What time(s) of year would this situation be more likely to occur and from which direction would the thunderstorm most likely be approaching from? Assume the golf course is somewhere near the University of Arizona campus or downtown area.

9. Why are narrow mountain canyons, like Sabino Canyon in Tucson, particularly dangerous places to be recreating outdoors when summer thunderstorms occur in the western United States, as compared to other locations? What should you do if you are caught in a canyon during such a circumstance?

10. Where does a hurricane derive its energy? How is this similar or different than a mid-latitude cyclone?

11. What meteorological preconditions are necessary for the development of tropical cyclones? Describe how and how each of these preconditioning factors is important.

12. For each of the following popular vacation destinations in North America, address whether or not it is possible to experience a major hurricane: (a) southern California; (b) Florida; (c) Jamaica; (d) Costa Rica. Explain your reasoning. If your answer is “yes” to any of the locations, during what time(s) of year would hurricanes most likely occur and why? You will need to look at a map of North America if you don’t know where these places are.

13. Darwin, Australia, is located on the north coast of the country and can experience strong tropical cyclones. If you are living in Darwin and such a strong tropical cyclone is approaching the coast, would you expect the greatest damage to occur if the eye of the storm is forecast to pass to the east or west of the city? What time of year would this situation be most likely to occur? Explain your reasoning.