NATS 101 Introduction to Weather and Climate, Section 54, Fall 2005
Study Guide: Questions for 25&27 October readings

1. Give two ways that eddies are formed?

2. Give three examples of a microscale of motion?

3. What causes wind shear? What are some examples of wind disturbances resulting from wind shear?

4. Describe the balance between the PGF and CF within a low pressure (cyclonic) flow? high pressure (anti-cyclonic) flow?

5. What is a jet stream and how does it form? Why is it so predictable and persistent?

6. Give three examples of a thermal circulation. Explain how horizontal PGFs are formed in these circulations?

7. Explain the Hadley Cell. How is it formed? What does it look like?

8. Explain the three cell model of the NH global wind patterns. What are the cells called and how are they formed? What do they look like?

9. Name three measurements which reveal actual atmospheric water content.

10. What are the scales of motion in the atmosphere? Give an example of an atmospheric circulation pattern for each?

11. What determines the size of an eddy?

12. Describe the sea breeze. How does it differ from the land breeze?

13. What are the “trade winds”? How did the “trade winds” get their name?

14. Without air travel, name one way to identify the jet streams in the atmosphere.

15. What do we call the region where the northeast trades converge with the southeast trades?

16. What happens to the warm air near the surface in the doldrums?

17. What are some effects of microscale motions in the atmosphere?

a) disperse smoke
b) sway branches
c) swirl dust
d) blow papers
e) all of the above.

18. How does a wind vane work? What does it measure?

19. Jet streams form due to, (more than one answer is correct here!)

a) horizontal differences in pressure.
b) vertical differences in pressure.
c) horizontal differences in temperature.
d) vertical differences in temperature.

20. The polar jet stream is STRONGEST in the

a) summer.
b) winter.
c) equal in both seasons.

21. What is one reason why regions in northern Europe like Norway have warmer than expected temperatures in the winter?

20. The Gulf Stream brings warm currents of water north from the equator.

22. During El Nino, there is an unusually _____ in the western tropical Pacific causing _____ conditions in the eastern tropical Pacific.

a) high pressure, dry
b) low pressure, dry
c) low pressure, wet
d) high pressure, wet

23. How are atmospheric circulations linked to ocean circulations? How do they affect the energy balance?

24. In regard to the Coriolis Force, the amount of deflection depends on,

a) the rotation speed of the earth
b) the latitude of the object
c) the object's speed

25. Define divergence? Convergence?

26. Describe a Chinook wind. What are its general characteristics?

27. Which wind goes up a mountain due to hot air rising?

a) mountain breeze
b) valley breeze
c) Chinook wind
d) katabatic wind

28. What is a problem created by eddies in the atmosphere?

a) clear air turbulence
b) hurricanes
c) tornadoes
d) rainfall

29. A coastal wind that blows from ocean onto land is a

a) Chinook wind
b) land breeze
c) katabatic wind
d) sea breeze

30. What is the difference between a katabatic wind and a Chinook wind?

Solutions to select study guide questions:

2. wind gusts, smoke plumes, small thermals

3. CAT, eddies in the jet stream (an example of CAT), Kelvin-Helmholtz waves

15. ITCZ

16. Warm air rises. The rising motion causes the water vapor in the air to condense, often into large cumulus clouds and thunderstorms.

17. a) disperse smoke

    b) sway branches

    c) swirl dust

    d) blow papers

    e) all of the above. (correct)

19. Jet streams form due to,

    a) horizontal differences in pressure. (correct)
    b) vertical differences in pressure.
    c) horizontal differences in temperature. (also correct!)
    d) vertical differences in temperature.

20. The polar jet stream is STRONGEST in the

    a) summer.
    b) winter. (correct)
    c) equal in both seasons.

22. During El Nino, there is an unusually _____ in the western tropical Pacific causing _____ conditions in the eastern tropical Pacific.

    a) high pressure, dry
    b) low pressure, dry
    c) low pressure, wet
    d) high pressure, wet (correct)

23. When wind blows over an ocean surface, water piles up in one region while it is removed from another region causing a pressure gradient between the water columns. Because of the higher friction in water, water currents move much slower than the wind in the atmosphere.

Surface ocean currents, along with atmospheric winds, transport heat from the tropics to the poles. The surface ocean currents account for about 40% of the heat transport to the poles. Without this heat transport, the imbalance in energy between the tropics (excess energy) and the poles (energy deficit) would become more accentuated and the climate would slowly change.

25. Divergence - wind moving outward away from a surface high pressure region

Convergence - wind moving inward towards a surface low pressure region

26. Chinook winds are warm, dry winds on the east side of the Rocky Mountains. They form as a result of air that has been lifted up over the Rockies from the west and dried out through convection on the windward side of the mountains. They can often be predicted based on a wall of clouds observed over the Rockies.

27. Which wind goes up a mountain due to hot air rising?

a) mountain breeze
b) valley breeze (correct)
c) Chinook wind
d) katabatic wind

28. What is a problem created by eddies in the atmosphere?

a) clear air turbulence (correct)
b) hurricanes
c) tornadoes
d) rainfall

29. A coastal wind that blows from ocean onto land is a

a) Chinook wind
b) land breeze
c) katabatic wind
d) sea breeze (correct)

30. Katabatic winds are cold downslope winds while a Chinook is a warm downslope wind.