**Introduction to Meteorology**

**Homework #6**

**Answers**

**1. What is a hurricane?**

 An intense storm of tropical origin with sustained winds exceeding 74 mph

**2. a)What are hurricanes called in the western North Pacific Ocean?**

 **b) In the Indian Ocean?**

 **c) What is the category of storms they fall into (what are they all called)?**

a) Typhoons

 b) Cyclones

 c) Tropical cyclones

**3. What is the weather like in the “eye” of a hurricane?**

Skies tend to be clear, the air is warm and winds are light

**4. Where in a hurricane is the wind and rainfall most intense?**

The eyewall

**5. The enormous amount of**  latent heat  **that is released in the eyewall**

 **creates a “warm core” in the center of the storm that results in**

 low  **pressure at the surface but**  high  **pressure aloft**

**6. What are the three ingredients required for hurricane formation?**

1. Warm sea surface temperature of at least 80°F

 2. Must be at least 5° latitude north or south of the equator

 3. Weak Vertical Wind Shear

**7. When is Atlantic hurricane season?**

June through November

**8. Hurricanes develop from**  clusters of thunderstorms **within**

 **the**  ITCZ **.**

**9. What type of equatorial “waves” are responsible for the development of the**

 **majority of hurricanes in the Atlantic Ocean basin?**

African Easterly Waves

**10. What does a hurricane derive its “energy” from?**

The direct transfer of sensible and latent heat from the warm ocean surface

**11. What are the three mechanisms responsible for weakening and demise of**

 **hurricanes?**

1. Cool sea surface temperatures

 2. Strong vertical wind shear

 3. Land

**12. a) In regard to the life cycle of a tropical cyclone, what is it called when it**

 **develops a low pressure center and cyclonic circulation?**

 **b) During which stage of its life cycle is it given a name?**

a) Tropical Depression

 b) Tropical Storm

**13. The movement of tropical cyclones is initially directed westward by**

 the easterly trade winds **but eventually its motion is directed in a**

 **clockwise direction by**  the subtropical high pressure systems  **.**

**14. a) How many hurricanes are there, on average, in the Atlantic Ocean basin**

 **every year?**

 **b)What percentage of Atlantic hurricanes make landfall?**

a) 6

b) 25%

**15. a) Where in regard to the path of the hurricane are the strongest winds?**

 **b) The greatest storm surge?**

a) To the right of the eye

b) To the right of the eye

**16. What is responsible for 90% of all hurricane deaths?**

The storm surge

**17. a) What is the scale called that is used to categorize hurricane intensity?**

 **b) What is the scale based upon?**

a) Saffir-Simpson

 b) Wind speed

**18. a) From where do we receive most of the information regarding past**

 **climates and atmospheric composition (what method is used)?**

 **b) Is this information likely most accurate in regard to the composition of**

 **the atmosphere at any given time in the past or the global temperatures**

 **at that time?**

 **c) What has this method told us about the composition of the atmosphere**

 **for the last 100 years compared with the previous 650,000 years?**

a) Ice cores from the Greenland and Antarctic Ice Sheets

b) More accurate in regard to composition of the atmosphere than global

 temperatures

c) The concentration of certain greenhouse gases (e.g. carbon dioxide,

methane) have increased during the past 100 years to unprecedented levels relative to the natural variation over the past 650 thousand years

**19. It can be determined with a fairly high degree of certainty that**

 **temperatures now are**  higher than they have been at any time within

 the past 1000 years .

**20. The Intergovernmental Panel on Climate Change (IPCC) is**  a scientific

body whose reports are widely regarded as the most authoritative statements of scientific knowledge on climate change .

**21. What are the four general causes (both external and internal) of climate**

 **change?**

1. Changes in incoming solar radiation

 2. Changes in the composition of the atmosphere

 3. Changes in earth’s surface

 4. Natural “internal” variability

**22. Why is it unlikely that “Plate Tectonics” or changes in life on earth are**

 **responsible for earth’s recent “abrupt” warming?**

Because these causes have resulted in cooling of the atmosphere and these

changes have occurred over millions of years, a time frame irrelevant to our recent rapid warming

**23. a) What is the most likely cause of the 100,000 year cycles in earth’s**

**atmosphere that is responsible for our glacial (Ice Age) and interglacial periods?**

 **b) Are we presently in a glacial or interglacial period?**

 **c) Why is it unlikely that this is the cause of earth’s recent abrupt**

 **warming?**

a) Variations in earth’s orbits (Milankovitch Cycles)

 b) Interglacial

 c) 100,000 year time scale is too long

**24. a) Why is it unlikely that variations in solar output (sunspots) or volcanic**

 **eruptions are responsible for earth’s recent “abrupt” warming?**

 **b) Why is it unlikely that it is due to “natural” oscillations (natural**

 **[internal] variability)?**

a) The increased trend in volcanic eruptions should have led to a cooling over

the past 50 years and solar activity has held steady or decreased over the past 50 years

b) Their interannual time scale is too short to be responsible for the

 persistent warming over the past century

**25. Due primarily to**  the burning of fossil fuels **the concentration of several**

**greenhouse gases (e.g. carbon dioxide, methane, nitrous oxide) have increased to unprecedented levels over the past century.**

**26. What are two reasons that the observed warming of the atmosphere over**

**the last century is less than would be expected from the increase in the concentration of greenhouse gases alone?**

1. The net cooling caused by the addition of reflective aerosols (solid

 particles) to the atmosphere by the burning of fossil fuels

2. The increased volcanic activity over the past 50 years

**27. Taking into account all of the scientific evidence, the IPCC states that:**

**“Most of the observed increase in globally-averaged temperatures since the mid-20th century is**  very likely (>90% probability) **due to the**

 observed increase in anthropogenic greenhouse gas concentrations .

**28. a) What are three positive feedback mechanisms in regard to global**

**warming that are likely occurring presently within earth’s climate system?**

 **b) What is a possible negative feedback mechanism?**

 **c) Which type, positive or negative, will increase the likelihood of *greater***

 **than expected global warming?**

a) 1. Water vapor greenhouse gas effect

2. Snow/ice albedo feedback

3. Thawing tundra

b) Increase in cloudiness

 c) Positive

**29. a) In regard to global warming, is there *greater warming* over high or low**

 **latitudes?**

 **b) Continents or oceans?**

a) High latitudes

b) Continents

**30. Why is a rise in sea-level probably the most feared consequence of global**

 **warming?**

Since 40% of earth’s population lives within 50 miles of the coast and a significant change in sea-level could lead to population shifts with pronounced socio-political consequences