

TRACKING HURRICANES

North American meteorologists from the National Oceanic and Atmospheric Administration (NOAA)'s Hurricane Research Division have recently improved the success rate in their forecasting of where hurricanes are likely to hit land by an estimated 15 to 30%. This increase in accuracy is due to the use of instruments called GPS-dropwindsondes, which can probe the atmosphere surrounding a hurricane while it is still out at sea. The atmospheric characteristics of hurricanes over land are well understood because an investigation is possible with weather balloons containing sophisticated meteorological instruments. When hurricanes are out of reach of balloons, gathering information is decidedly more difficult. Little is known of the weather conditions that guide hurricanes towards land.

An accurate estimation of where a hurricane will strike is essential in order to reduce the loss of life and property. Hurricane Andrew, the most costly hurricane in U.S. history, killed 15 people and caused damage of \$35 billion, in today's dollars, in 1992. However, the unnamed : Category 4 2 hurricane, which struck south-east Florida in 1926 and killed 243 people would have caused an estimated \$77 billion if it had struck today. The reason for this is the explosion in population growth and development along the south-east coast of the U.S. during the last half century.

Hurricanes occur in cycles every few decades, the last intense period in the U.S. being from 1940 to 1969. 'Camille', a Category 5 hurricane of such catastrophic force that it caused over a billion and a half dollars worth of damage at the time and killed 256 people, struck the coast of the Gulf of Mexico in 1969 with winds over 320 km/h. Yet, for the last quarter century, hurricane activity has been relatively mild. Scientists do not know the precise reason for the cycles of hurricane activity, but they could be caused by a phenomenon called the 'Atlantic Conveyor'. This is the name given to the gigantic current of water that flows cold from the top of the globe slowly along the Atlantic ocean floor to Antarctica and

resurfaces decades later before flowing back north, absorbing heat as it crosses the equator. Since hurricanes derive their energy from the heat of warm water, it is thought that an increase in the speed of the 'Conveyor', as it pulls warm water to the north, is an indicator of intensifying hurricane activity.

The use of GPS-dropwindsondes began in 1997. Small sensing devices dropped from planes at very high altitudes and over a wide area, they are far more revealing than previously used sensors. Because they weigh only 0.4 kilograms, they are able to stay aloft for longer periods and broadcast more data to the ground. Each sonde carries its own global positioning satellite receiver. The GPS signals received are used to calculate the direction and speed of the wind, and data on temperature, humidity, and barometric pressure at half second intervals all the way down to the ocean surface.

Dropwindsonde information is fed into a special meteorological computer in Maryland which generates a global computer model of wind patterns. Data analysts have discovered a greater variability in the winds at sea level than previously believed, but many forecasting problems are beyond a solution, at least for the time being. For instance, it is not yet known why hurricanes can suddenly change in intensity; current computer models often fail to predict whether a hurricane will reach land or else cannot pinpoint where a strike will take place.

One surprising result of a recent computer simulation was the destruction of a large part of downtown New York. Hurricane researchers believe that the city is

more likely than Miami to suffer a direct hit in the near future. Also, certain geographical features of the coastline near New York make it conceivable that a wall of water called a storm surge pushed ashore by hurricane winds would cause a devastating flooding of Manhattan. A storm surge was responsible for the more than 8000 deaths caused by the hurricane that destroyed the city of Galveston in 1900.

1 the custom of naming hurricanes began in the early 1950s.

2 hurricanes are categorised according to their wind speed from Category 1 (least intense) to Category 5 (most intense).

Questions 1 - 4

You are advised to spend about 5 minutes on Questions 1-4.

Refer to Reading Passage 25 "Tracking Hurricanes", and look at Questions 1 - 4 below.

Write your answers in boxes 1 - 4 on your Answer Sheet. The first one has been done for you as an example.

Example: What do the letters NOAA stand for?

1. Which instruments have recently increased the success rate of U.S. hurricane forecasts?

2. What reason is given for the lack of knowledge of hurricanes at sea?

3. Why was the hurricane which struck in 1926 not given a name?

4. What is the name of the strongest hurricane mentioned in the article?

Questions 5-11.

Look at the table below. According to Reading Passage 1, to whom or what do the phrases on the right refer?

Write your answers in boxes 5 -11 on your Answer Sheet. The first one has been done for you as an example.

Note that you must give your answer IN NO MORE THAN THREE WORDS.

WHO or WHAT ?

Ex : *Meteorologist* have improved their forecasts for hurricanes.

5 become stronger every few decades.

6 energises all hurricanes.

7 is a huge current of water flowing from north to south.

8 could not stay in the air for a long time.

9 know more about surface winds than they knew before.

10 recently predicted a catastrophe for the city of New York.

11 is a huge wave of water blown on land by a hurricane.

Questions 12 -15

Refer to Reading Passage 25, and decide which of the answers best completes the following sentences.

Write your answers in boxes 12 -15 on your Answer Sheet. The first one has been done for you as an example.

Example: The main point of the passage is to give information about:

- a) previous U.S. hurricanes
- b) future U.S. hurricanes
- c) forecasting hurricane activity
- d) why hurricanes change in intensity**

12. The intensity of U.S. hurricanes:

- a) has increased by 15 to 30% recently
- b) depends on the GPS-dropwindsondes

c) was greater from 1940 to 1969 than at any previous time

d) can be more accurately measured by satellite assistance

13. The Category 4 hurricane which hit Florida in 1926:

a) was the most catastrophic to hit the U. S. this century

b) caused \$77 billion worth of damage

c) caused an explosion in population growth

d) none of the above

14. Hurricane 'Camille':

a) caused \$1.5 billion dollars damage in today's money

b) was the worst U.S. storm this century in terms of life lost

c) was named in the 1950s

d) was not as intense as the hurricane of 1926

15. The writer of the passage probably believes that:

a) accurate tracking of hurricanes might be possible in the future

b) storm surges only occur within computer simulations

c) computer predictions are unreliable

d) the worst hurricanes occur in the U.S.

ANSWER

1. GPS-dropwindsondes
2. (weather) balloons
3. (the custom of) naming hurricanes began in the (early) 1950s
4. Camille
5. Hurricanes
6. heat (of water) / warm water
7. (the) Atlantic Conveyor
8. previously used sensors
9. data analysts
10. (a) computer (simulation) / hurricane researchers
11. (a) storm surge
- 12.
13. d
14. b
15. a