

## Meteorology 2020 Invitational Test

Johns Hopkins University

February 8, 2020

Scores: A: \_\_\_\_/20

B: \_\_\_\_/18

C: \_\_\_\_/32

D: \_\_\_\_/30

Total \_\_\_\_/100

Tiebreakers: 1. Score on Problem 5 \_\_\_\_

2. Score on Problem 12 \_\_\_\_

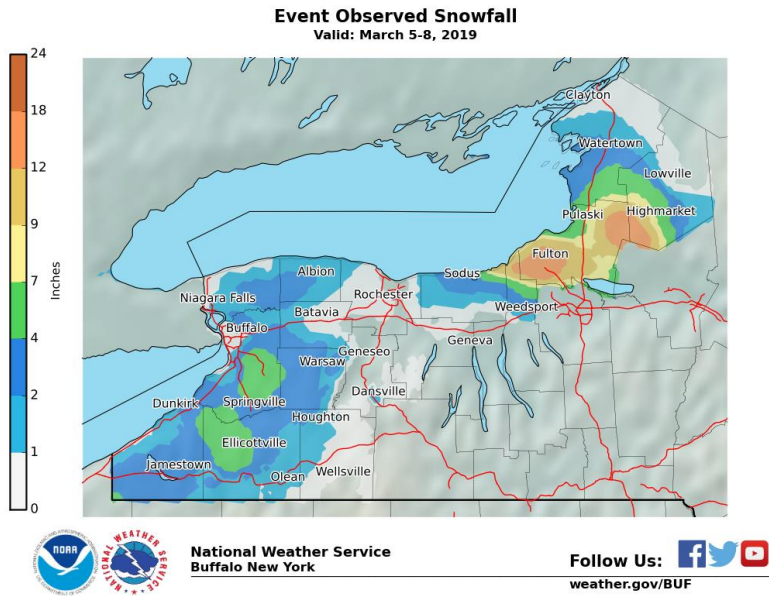
3. Score on Section A \_\_\_\_

4. Score on Section D \_\_\_\_

5. Score on Section B \_\_\_\_

6. Score on Section C \_\_\_\_

A. Winter storms



The following questions refer to the plot at left showing snowfall from an event in 2019 covered by the National Weather Service Office at Buffalo, NY.

1. In what direction do we expect the winds to have been blowing towards during this event? (5 pts)

2. Mark on the plot the locations with the highest snowfall (in inches) seen in this plot. How much snow fell at these locations? (5 pts)

3. Of what phenomenon is this event an example of? (5 pts)

4. Meteorologists have suggested that decreasing ice over the Great Lakes might be associated with more snow in these regions. Describe how this might happen. (5 pts)

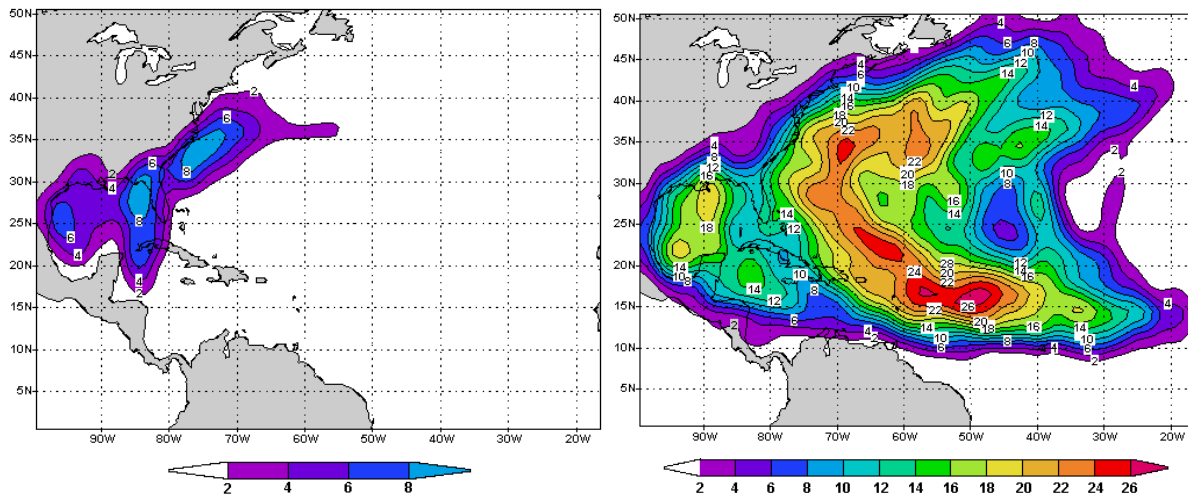
B. Atmospheric physics

5. Draw a picture of a fully developed cumulonimbus cloud in cross-section, labeling the following components, cloud base, updraft, downdraft, anvil, overshooting top, tropopause, gust front. (8 pts, T1)

6. Describe the difference in the source of energy between a hurricane and a mid-latitude cyclone. (5 pts)

7. Katabatic winds are found at the edge of ice sheets. Why? (5 pts)

Section B: \_\_\_/18

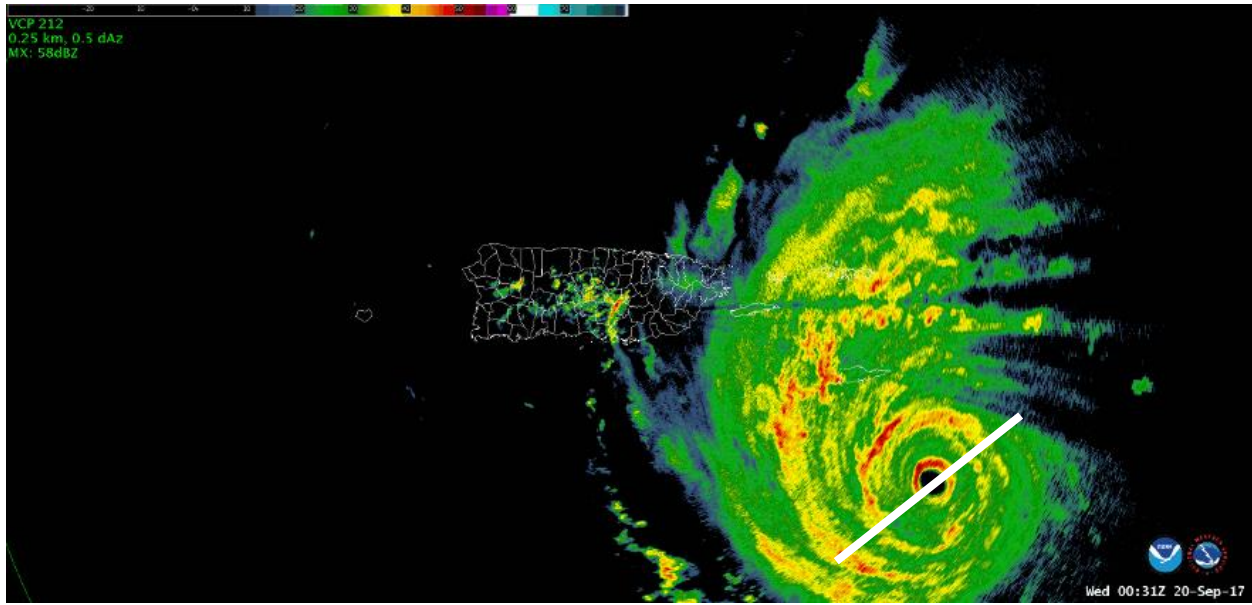


The plots above show the probability of a given point experiencing a tropical storm during the month of June (left) or September (right)

8. Describe the difference in the distribution between the two months. (5 pts)

9. Draw on the plot above an arrow showing the most probable track of a tropical cyclone. (5 pts)

10. Why are there no tropical cyclones as we move closer to the equator? (5 pts)



The plot above shows a Doppler radar image of a major hurricane that struck Puerto Rico in 2017, causing the deaths of upwards of 2000 people. The white line is a cross-section through this hurricane

11. What was the name of this hurricane? (5 pts)

12. Draw a cross-section of the wind speed toward the northwest along the white line (assume that the hurricane is moving towards the northwest). Label the eye. (7 pts, T2)

13. Draw a cross-section of the precipitation along the white line. (5 pts)

Section C: \_\_\_/32

D: Definitions

14. Define the following terms (3 pts each)

a. Fujita scale:

b. Radiosonde:

c. Barometer:

d. Relative humidity:

e. Dryline:

f. Derecho:

g. Bow echo:

h. Mesoscale convective complex:

i. Saffir-Simpson scale:

j. Storm surge:

Section D: \_\_\_/30