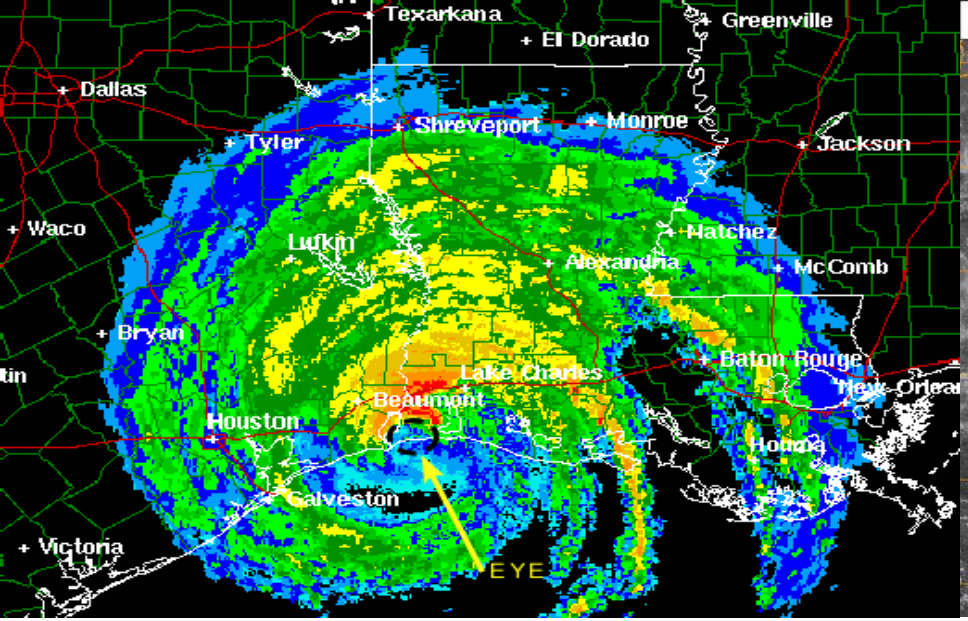
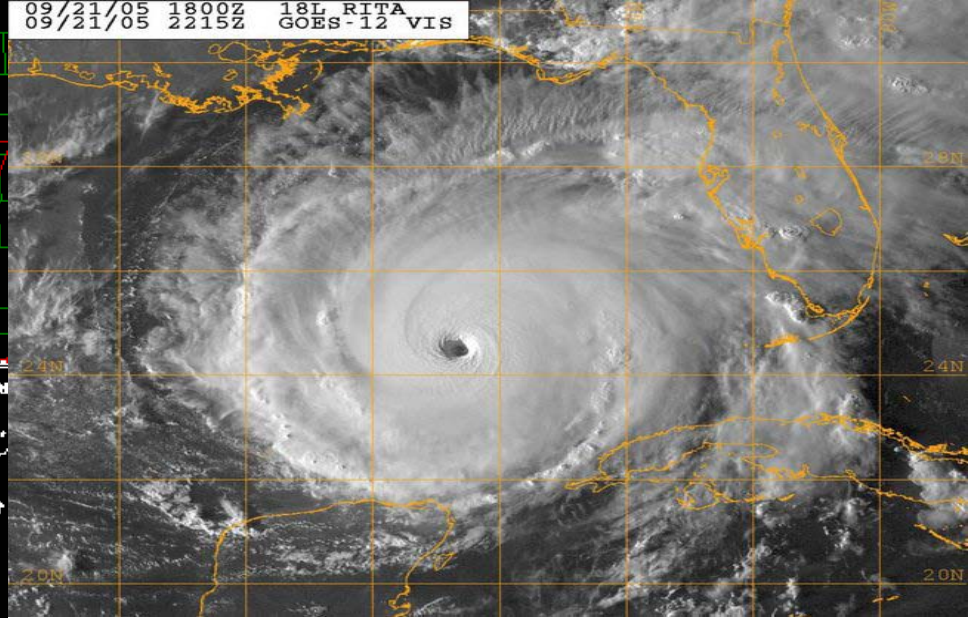
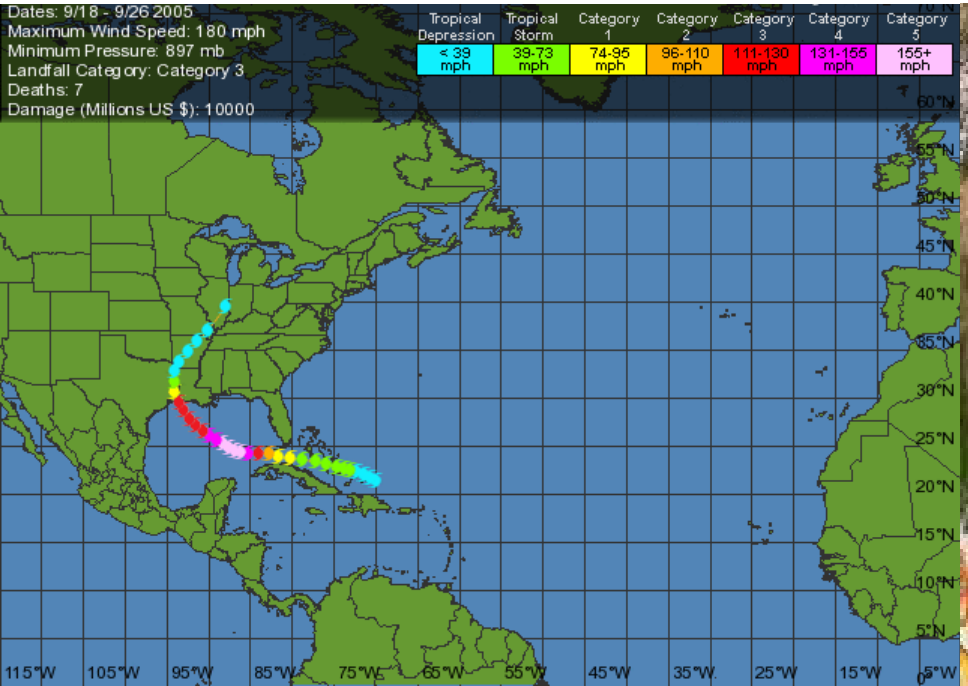

Hurricanes as
Heat Engines





Different ways to look at a hurricane

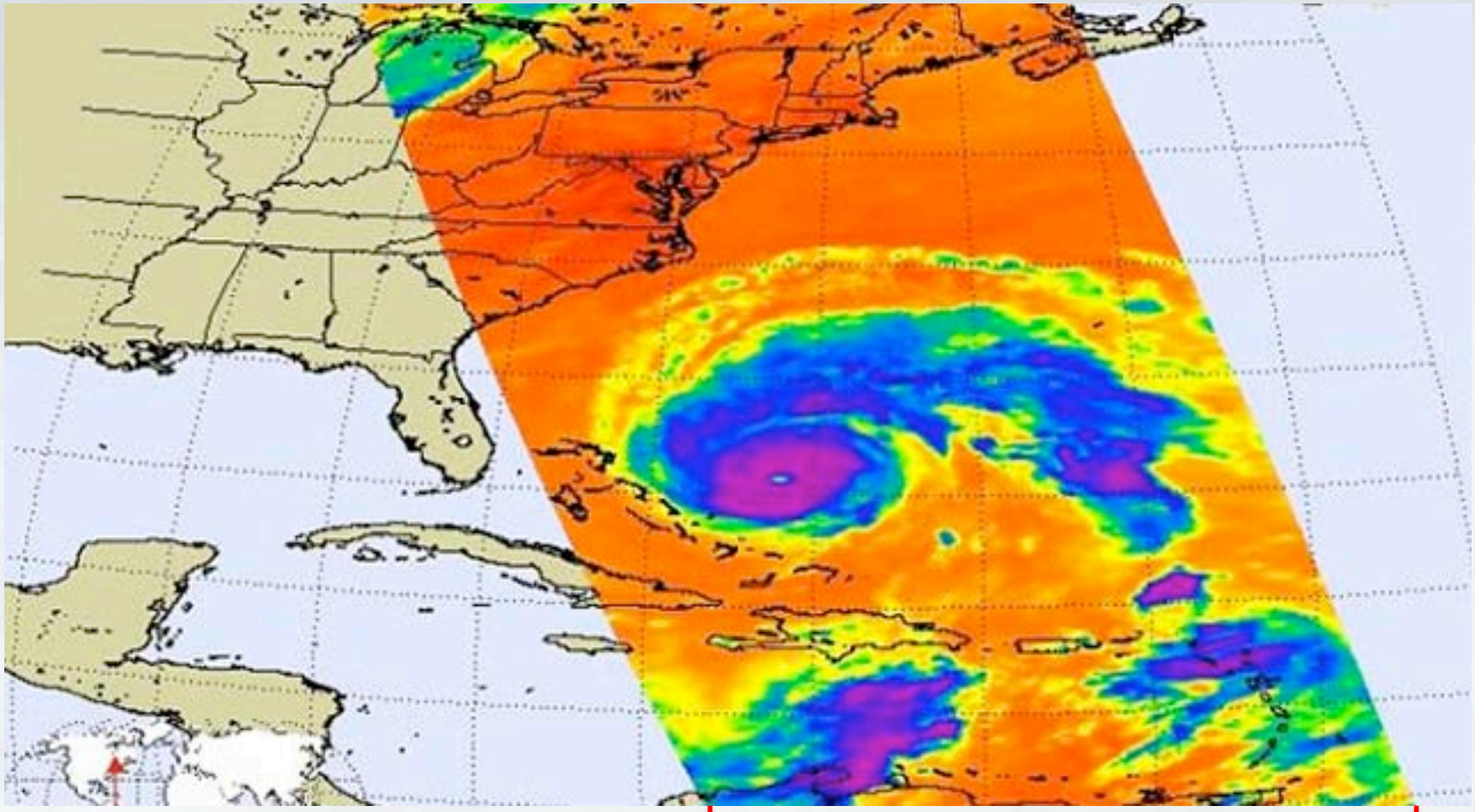



What do you know
about hurricanes?

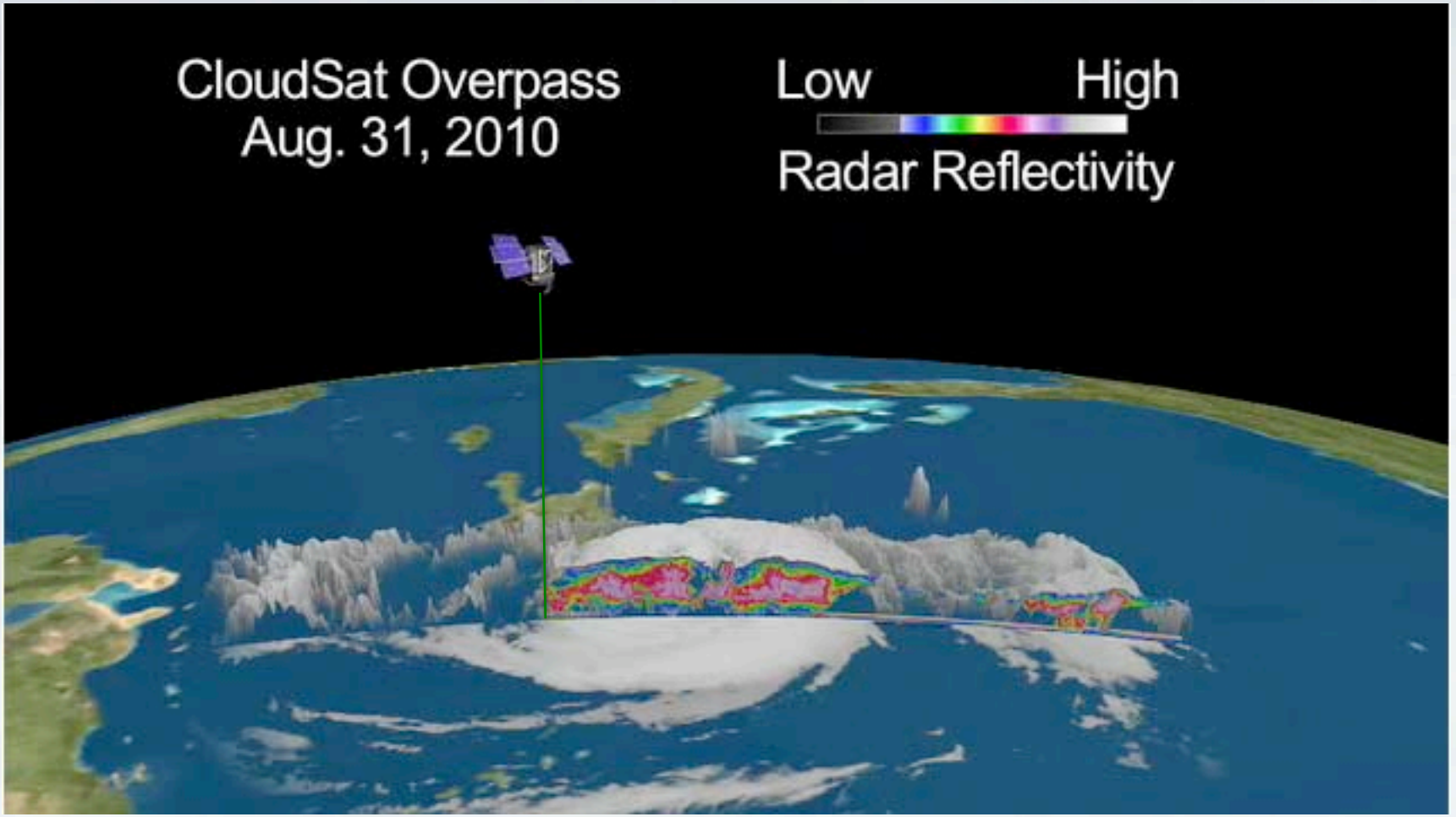
Factors that Influence Hurricane Formation

- Warm Sea Surface Temperature
- Rapid cooling of air as it rises
- Rotation in a low pressure system
- Available moisture

How do we Study Hurricanes at NASA?



How do we Study Hurricanes at NASA?



Lets take a closer look at Sea Surface Temperature

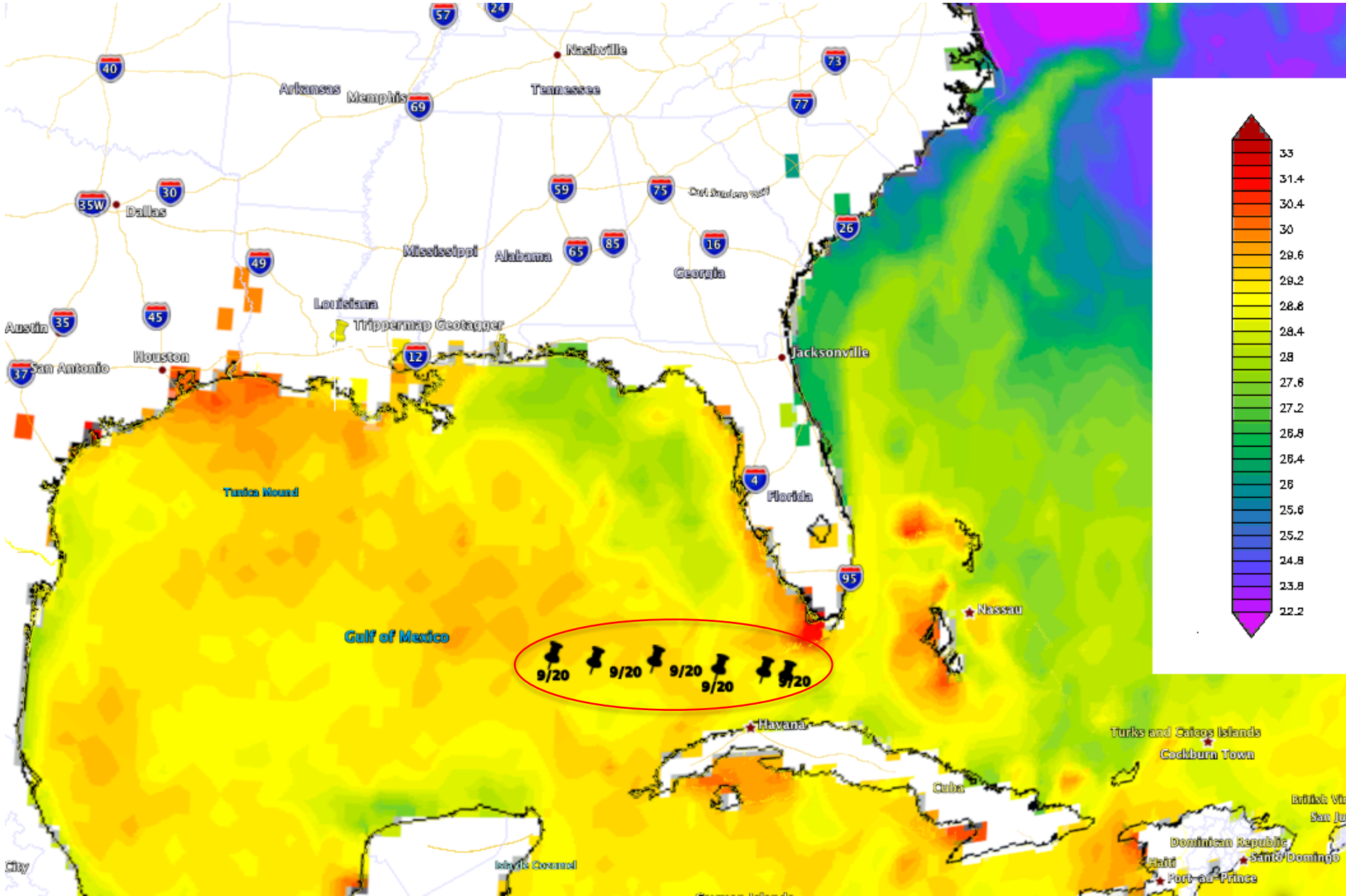
What to look for:

- Changing sea surface temperatures as shown in the color plots to follow
- Length of time it took for the water temperature to change (is there a delay or is there a sudden change in temperature?)

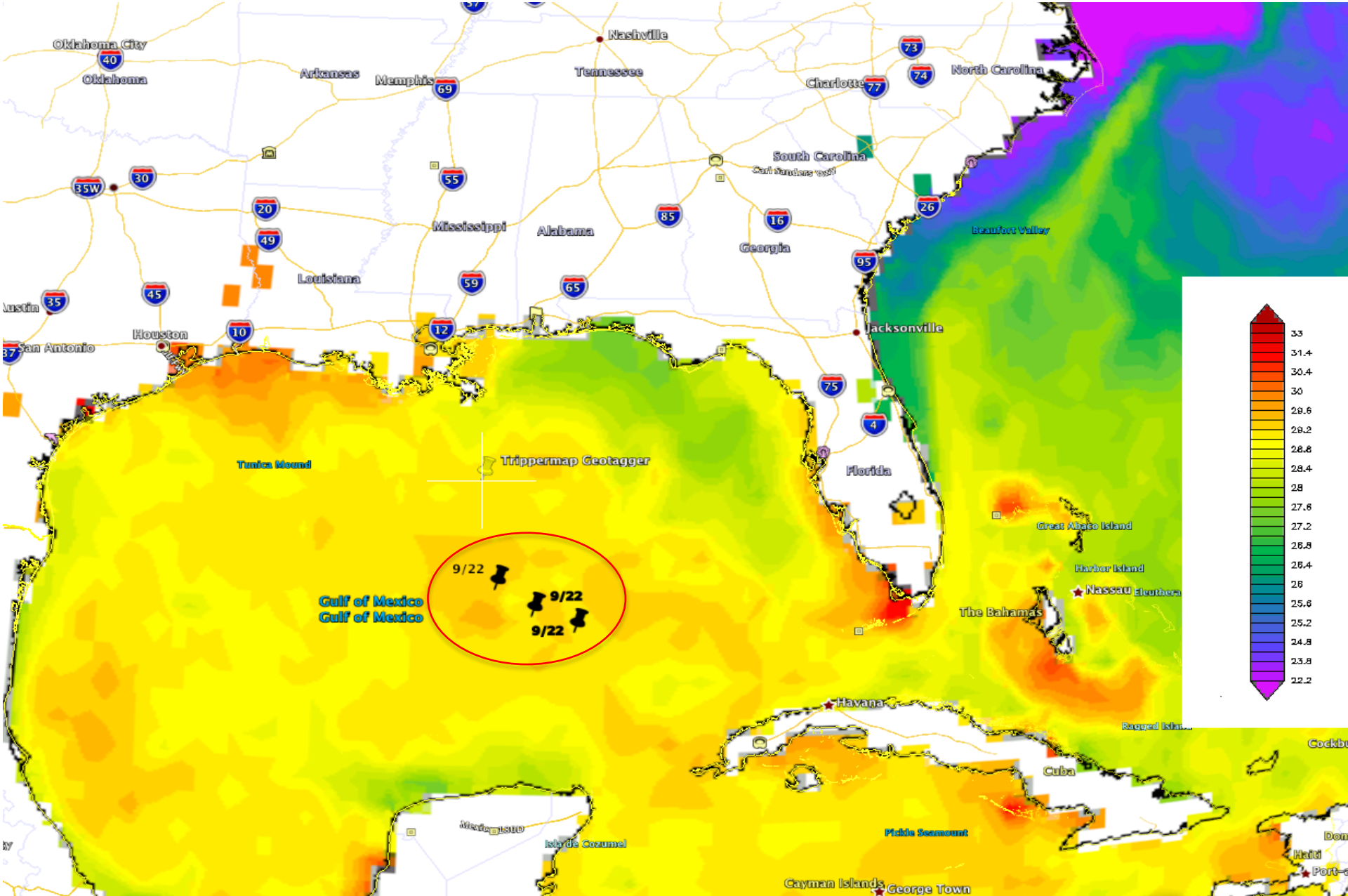
Some Background Information:

The passage of a hurricane causes a large transfer of heat between the ocean surface and the atmosphere. It also causes surface waters to diverge, bringing cooler water from below to the surface (upwelling). These effects are so large that they can be seen by a drop in sea surface temperature (SST) in satellite data observations along the path of the storm. The cooler water conditions may last for a week or longer after the storm.

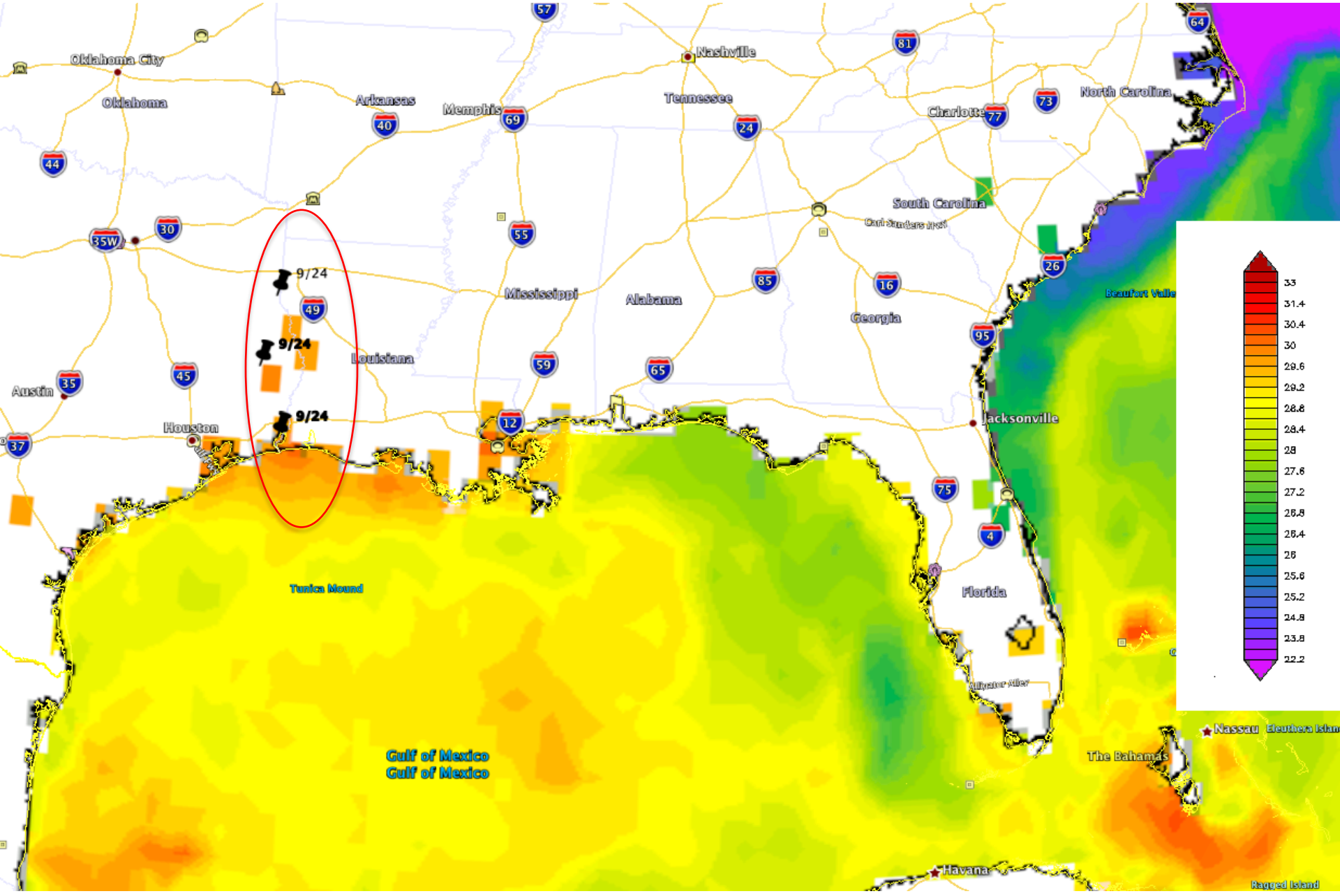
September 20, 2005



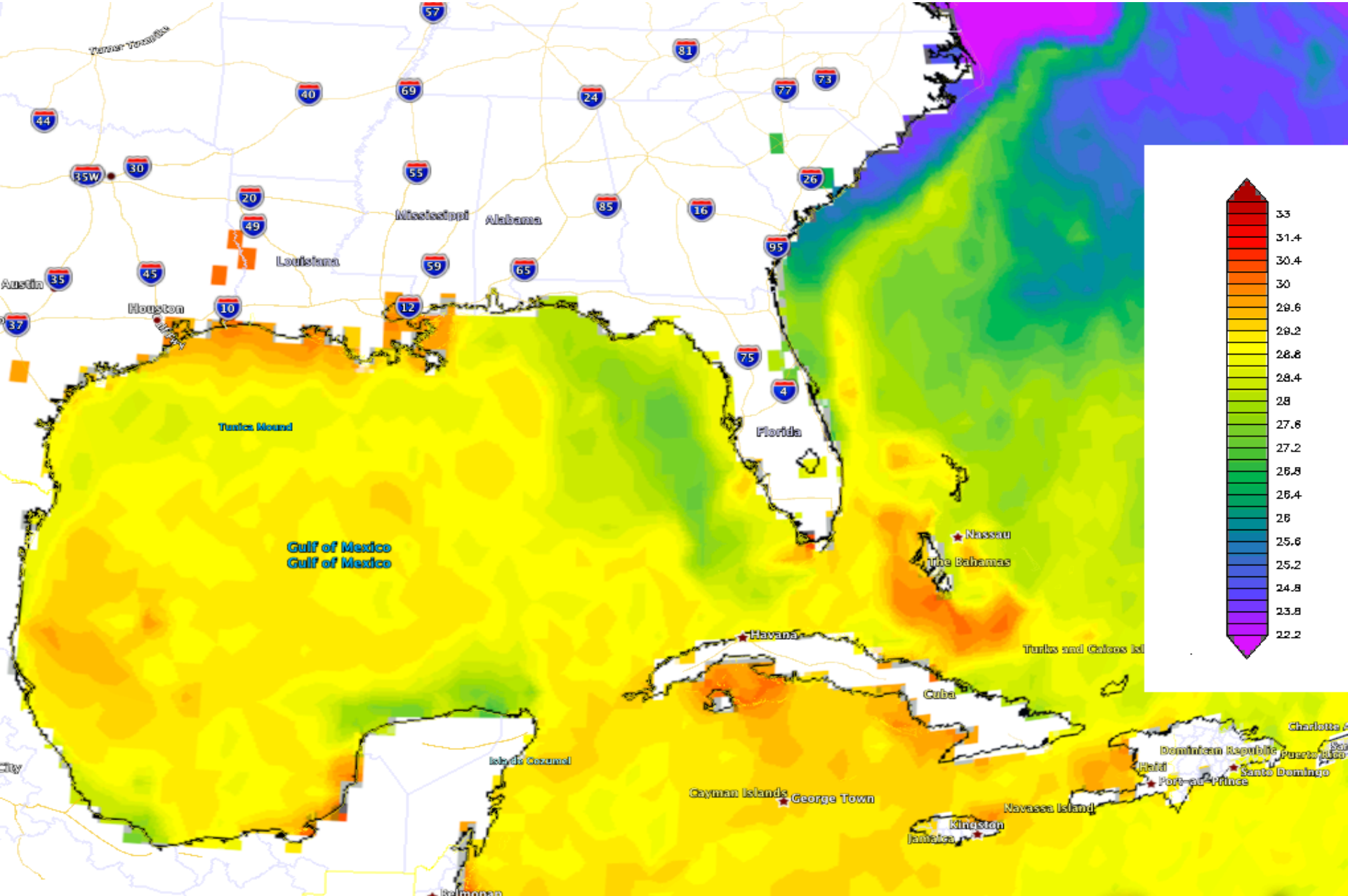
September 22, 2005



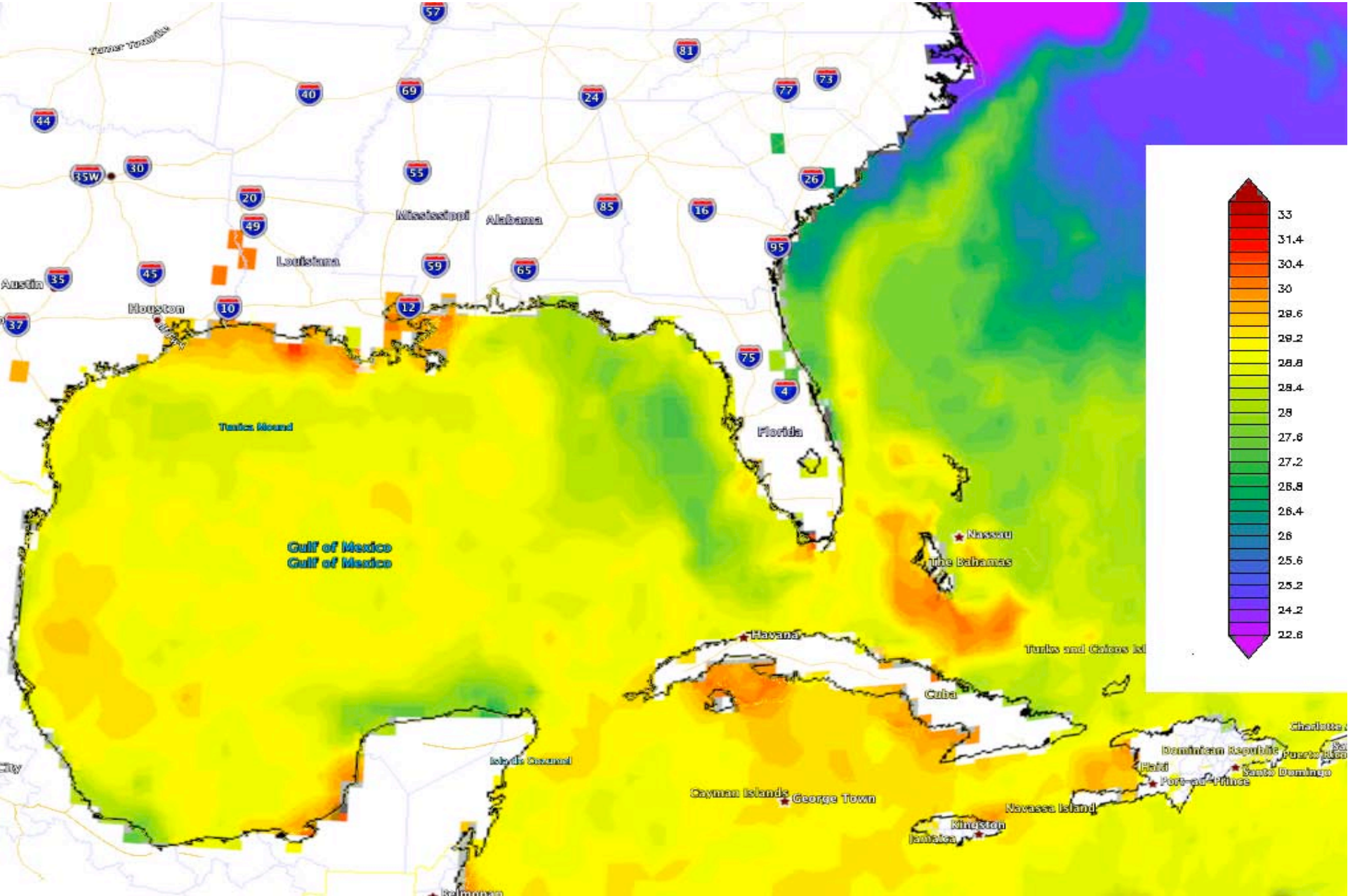
September 24, 2005



September 27, 2005



September 28, 2005



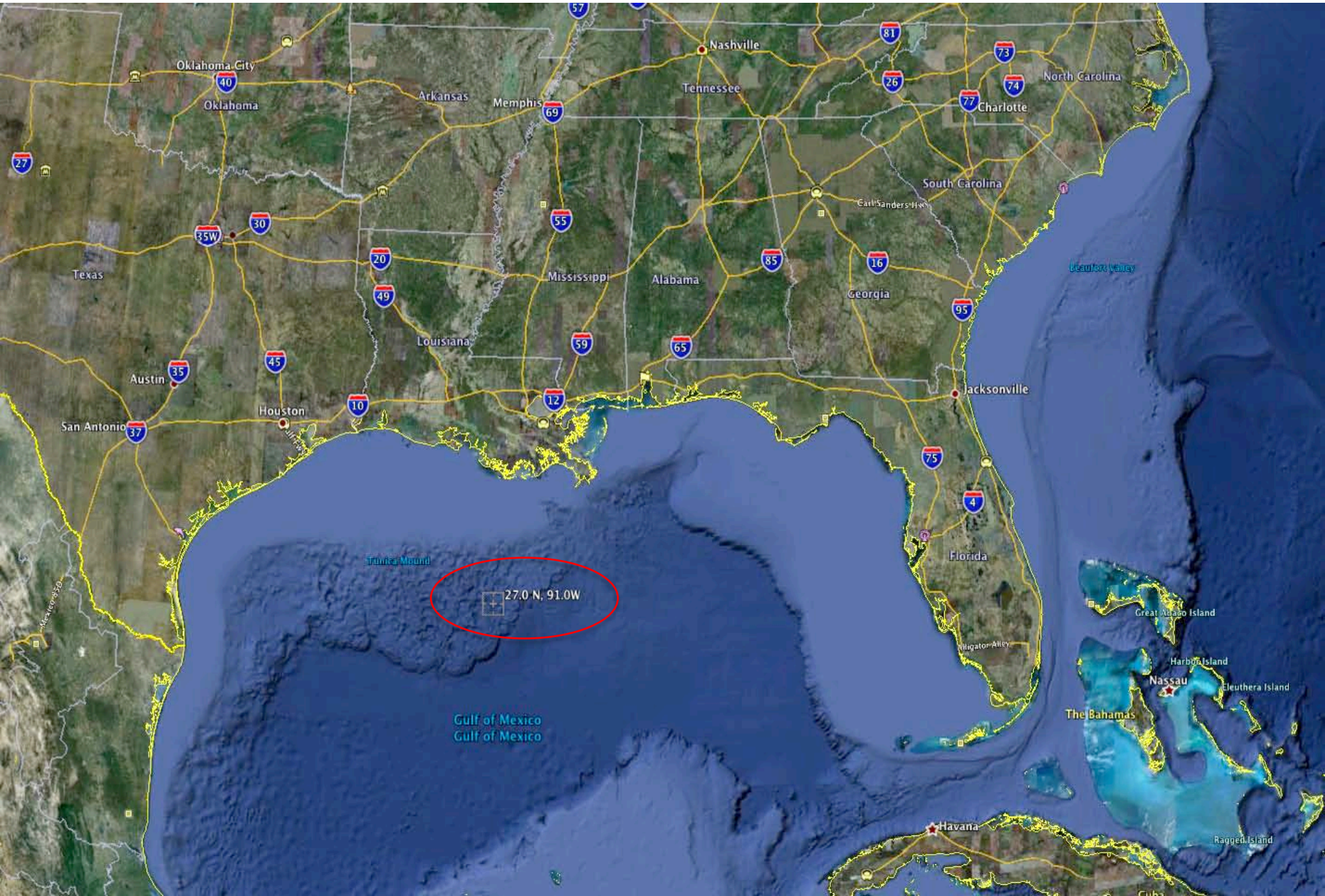
Questions

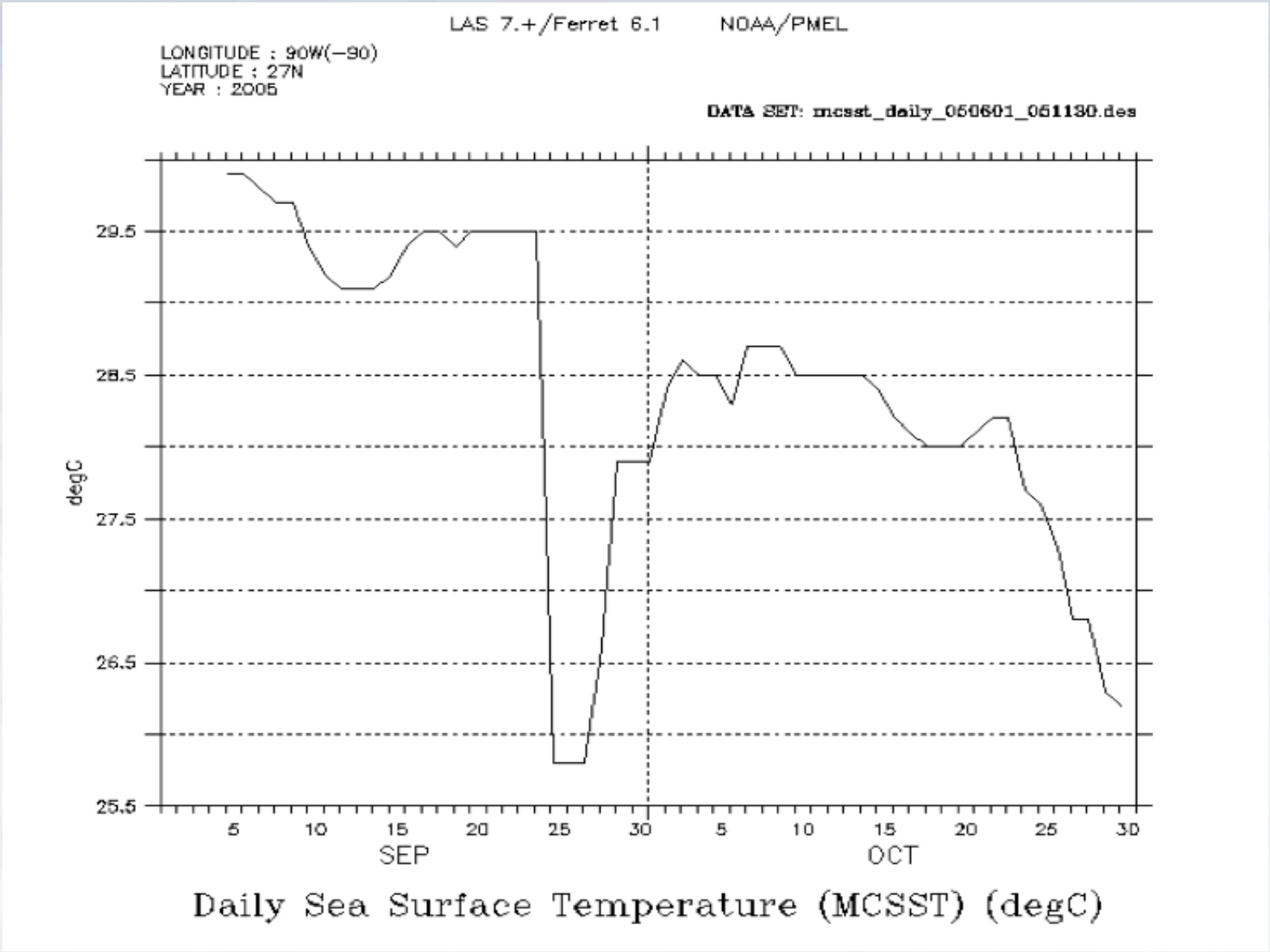
1. Did you see any evidence of lowered sea surface temperature in the data maps?

1. Did you notice any delay between the hurricane passage and the effect on SST?

Part II

Lets look at a time series plot for a spot along Rita's path (Sept 1- Oct 30)



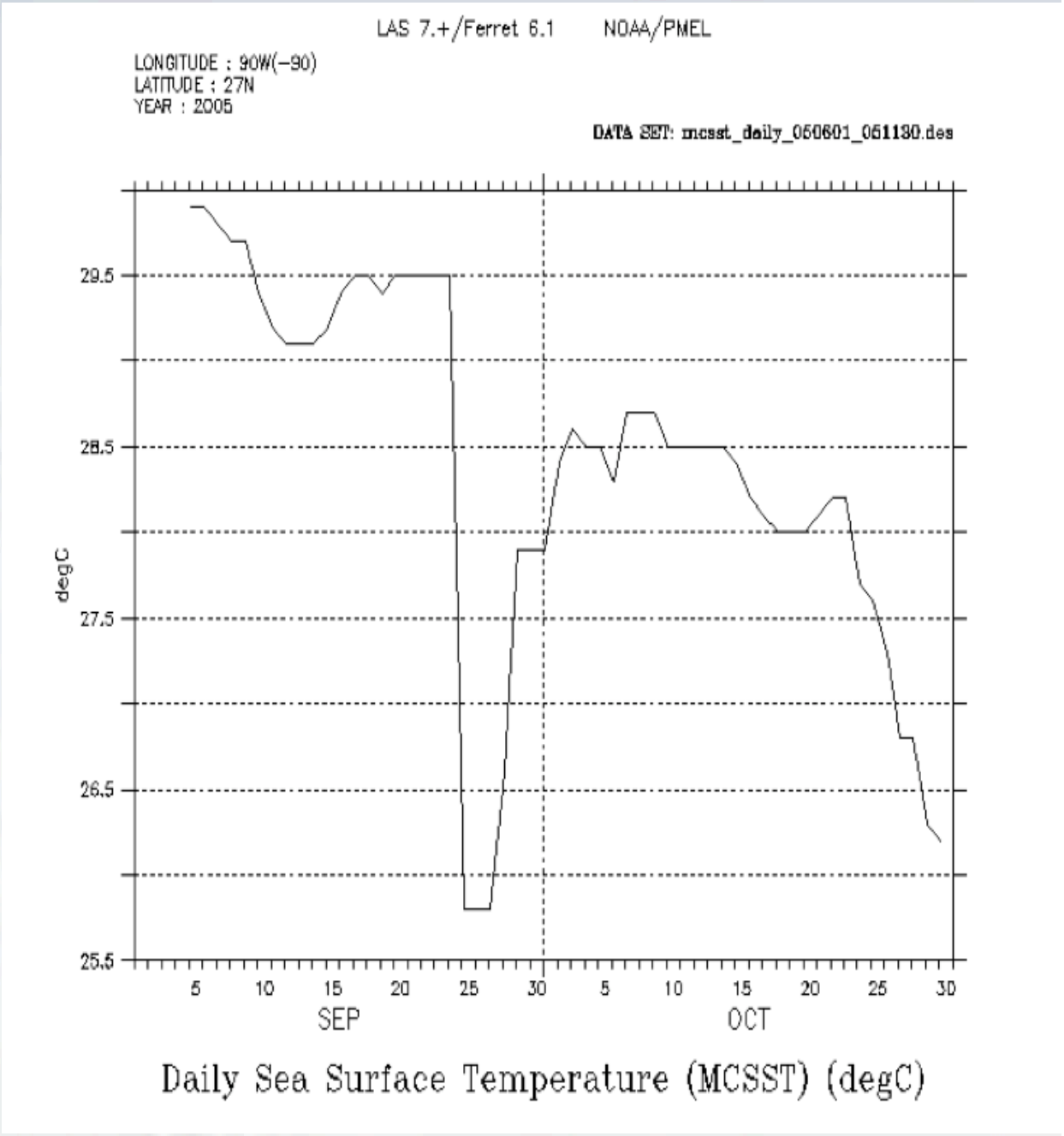

LAS 7.+/Ferret 6.1 NOAA/PMEL
LONGITUDE : 90W(-90)
LATITUDE : 27N
YEAR : 2005
DATA SET: mcsst_daily_050601_051130.des
29.5
28.5
27.5
26.5
25.5
degC
5
10
15
20
25
30
5
10
15
20
25
30
SEP
OCT
Daily Sea Surface Temperature (MCSST) (degC)

Questions:

-Examine the line plot of sea surface temperature for your selected location

1. **Can you see the effect on the temperature in your line plot after the hurricane passed?**

1. **How long did it take for the SST to return to the previous temperature?**



Questions

What conclusions can you make about how hurricanes extract heat energy from the ocean?

A Quick Wrap-up

- As hurricanes move across the water they consume energy in the form of heat from the surface of the water.
- There is a lag time after the hurricane moves past and the drop in SST
- After the drop in SST there will be a normal rebound back to normal seasonal temperatures

Are there any Questions?

For more information on how you can use real NASA satellite data – for lesson plans, science project ideas and much more – visit the MY NASA DATA website:

http://mynasadata.larc.nasa.gov/