



Hurricanes: Now and in the future

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NERD NITE MIAMI –
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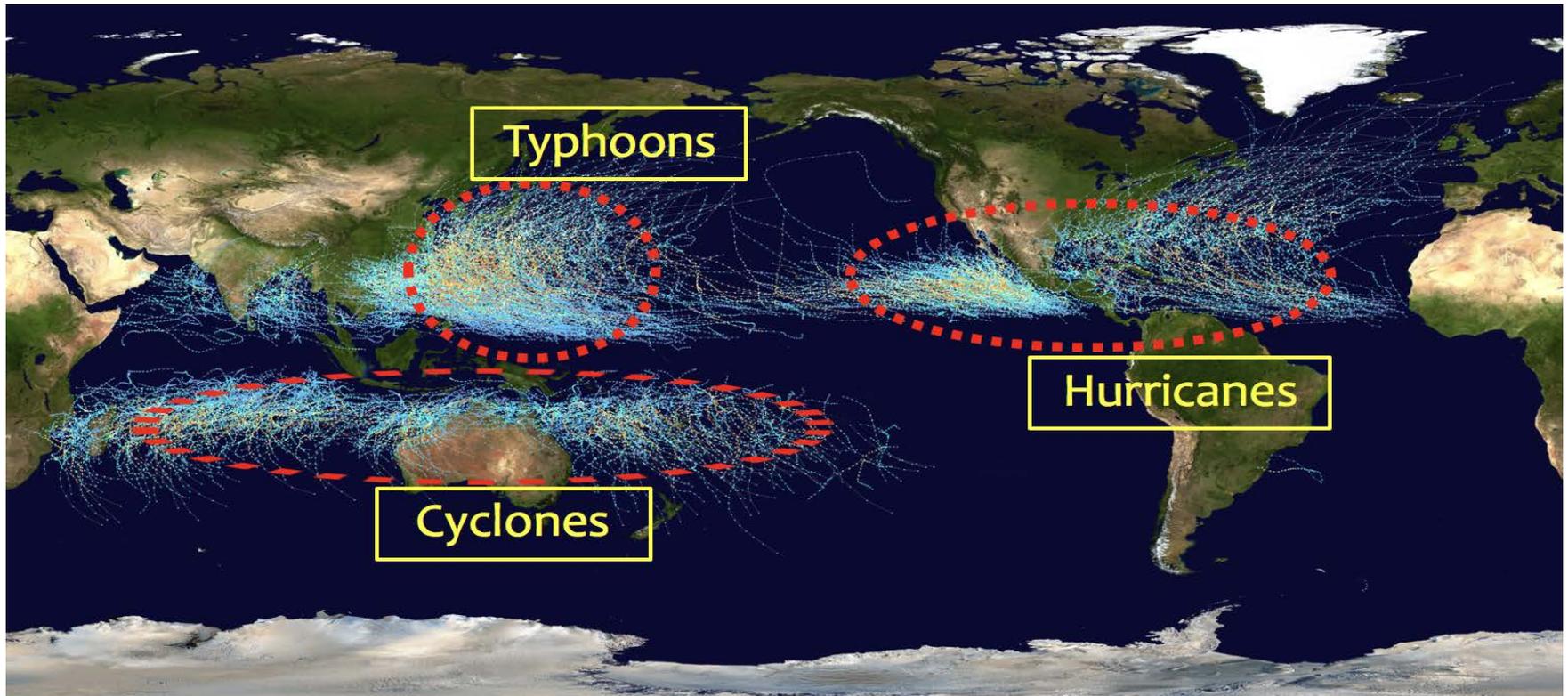
Outline

Hurricanes now

Hurricanes in South Florida
Formation conditions

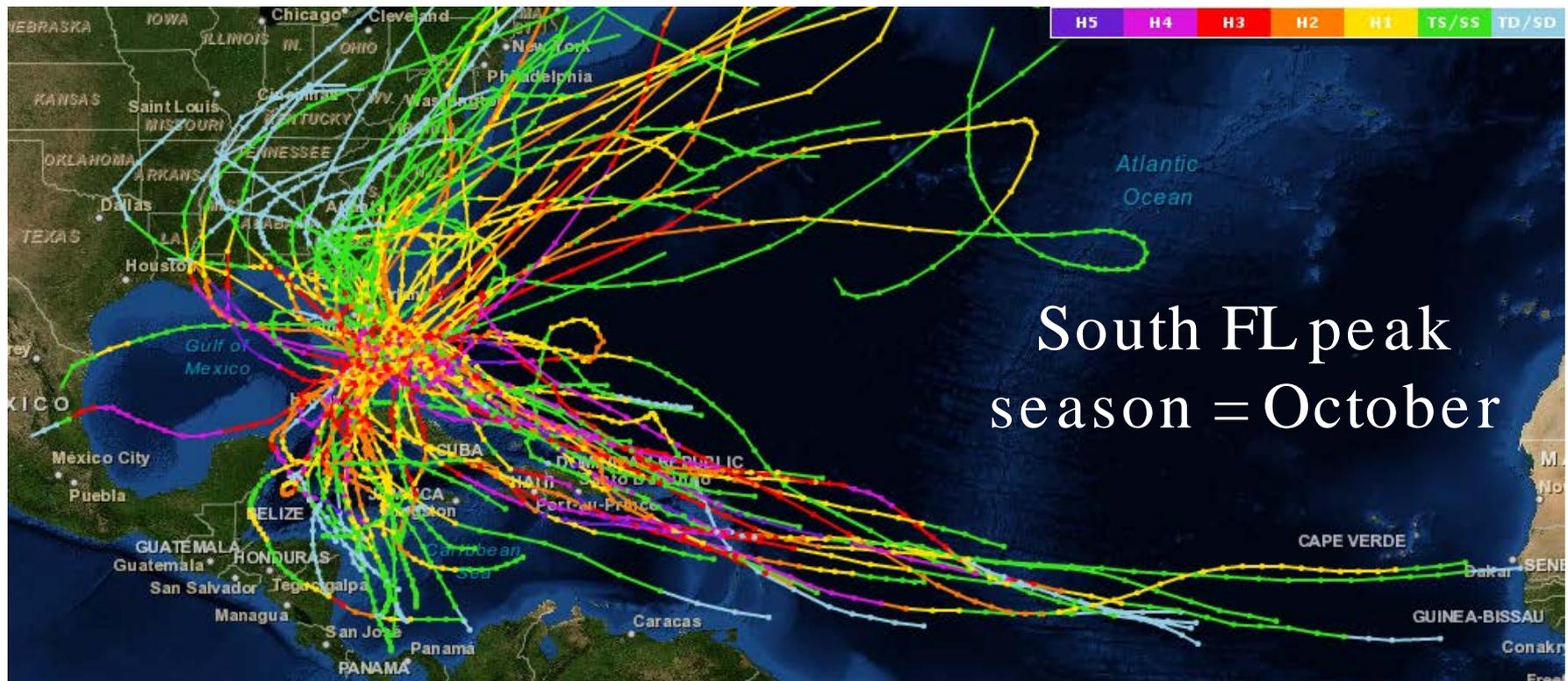
Hurricanes in the future

The climate change debate

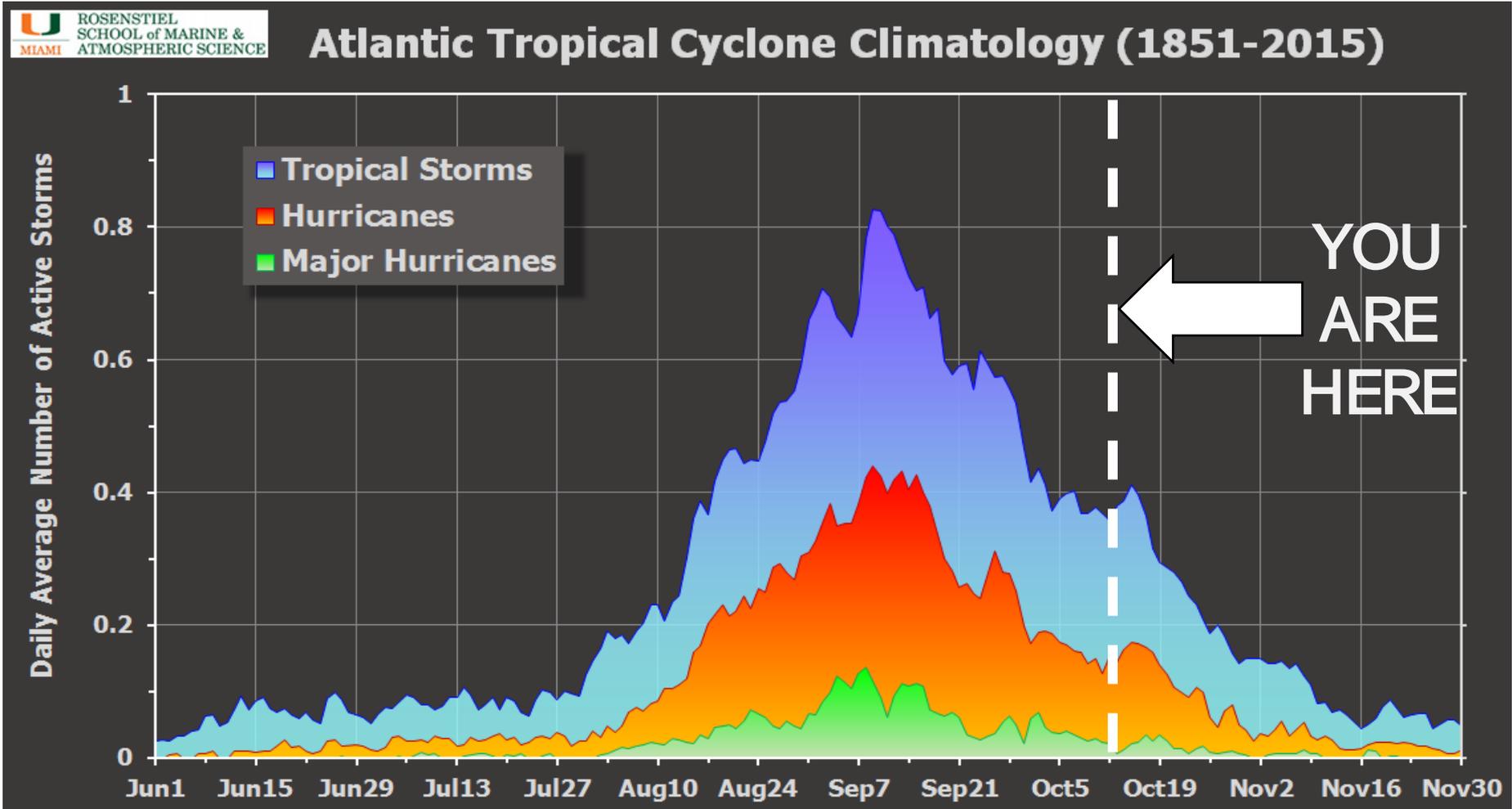


South Florida

63 (31 major) Hurricanes Passed Through South Florida from 1851-Present



Hurricane Season



Does size matter?



However, Hurricane Andrew was a small storm but was devastating for Miami-Dade

Hurricane Recipe



**LOW VERTICAL
WIND SHEAR**



**MOIST
ATMOSPHERE**

**DEEP LAYER OF
WARM OCEAN**

HURRICANE MATTHEW



Hurricanes
& climate
change

*" Alright,
Alright,
Alright "*

The future of hurricanes

What does a climate modeler look at?

Observations of the past 150 years of climate

+

Equations for dayyyyyyyssss

(The Navier-Stokes equations – similar to those used for weather forecasting)



Projections of future climate

Question: How does this relate to hurricanes?

The future of hurricanes

Hurricanes strongly depend on both the ocean and atmosphere

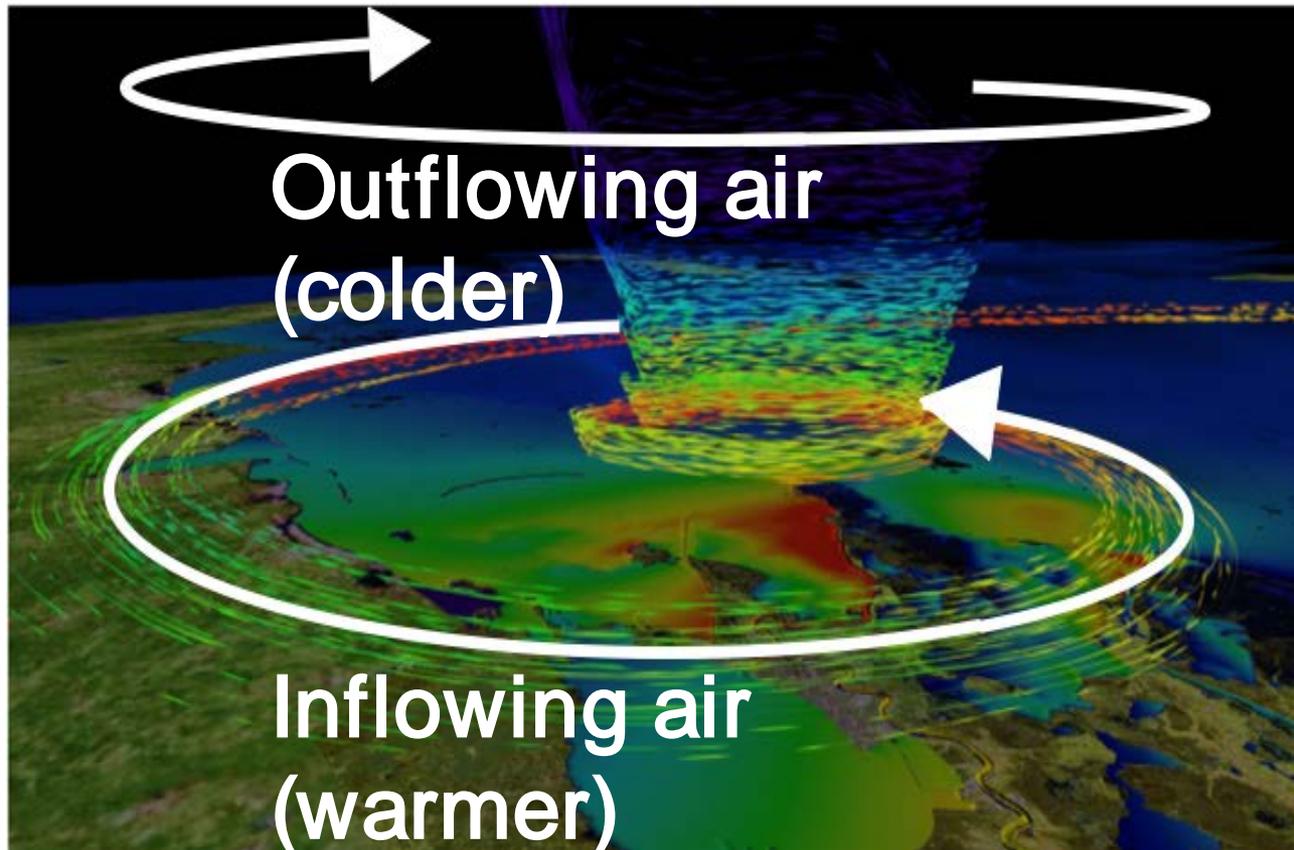
Both the ocean and atmosphere will get warmer, but the spatial differences in temperature may change



Temperature distribution is very important

Let's consider the ocean and atmosphere separately to understand why

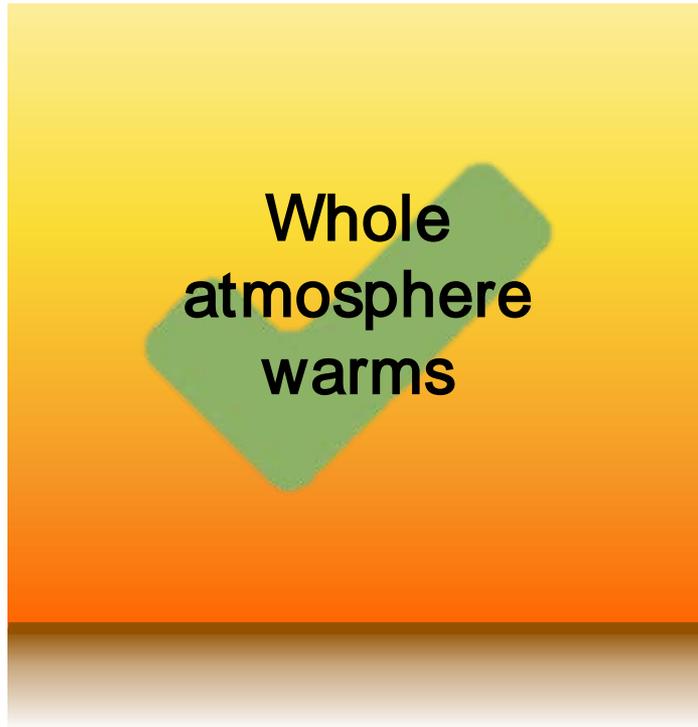
The atmosphere



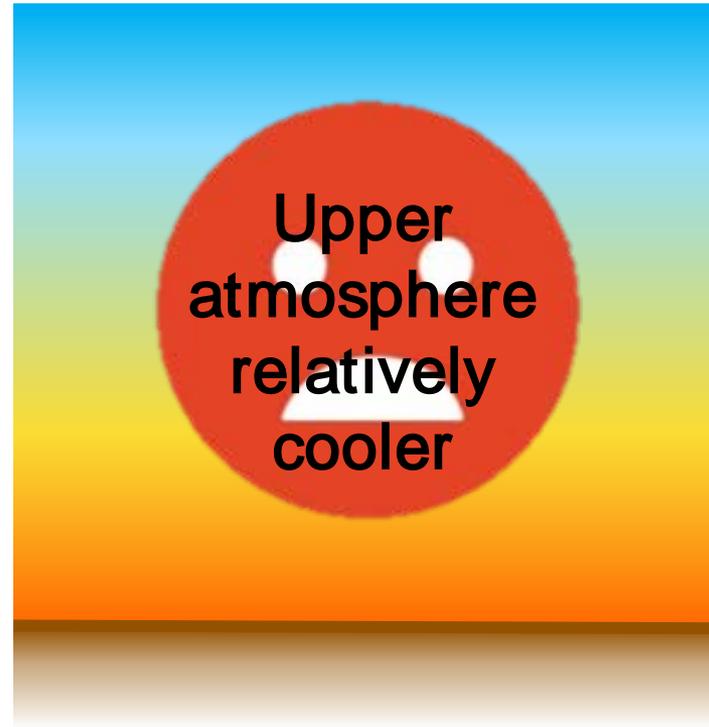
Benger et al. (2006): Hurricane Katrina

The atmosphere

Options



Better – temperature difference between upper and lower atmosphere doesn't change



Bad because it promotes convection/disturbance development

The ocean

Atlantic SSTs will **definitely warm** due to climate change

Question: Does this mean more intense tropical cyclones?

Answer:



Better Answer:

There are two possibilities:

- A. Warmer Atlantic = more intense hurricanes
- B. Warmer Atlantic but it warms at the same rate as the rest of the tropics

No relative difference = no hurricane activity change (Vecchi et al., 2008)

Options A and B

Option A

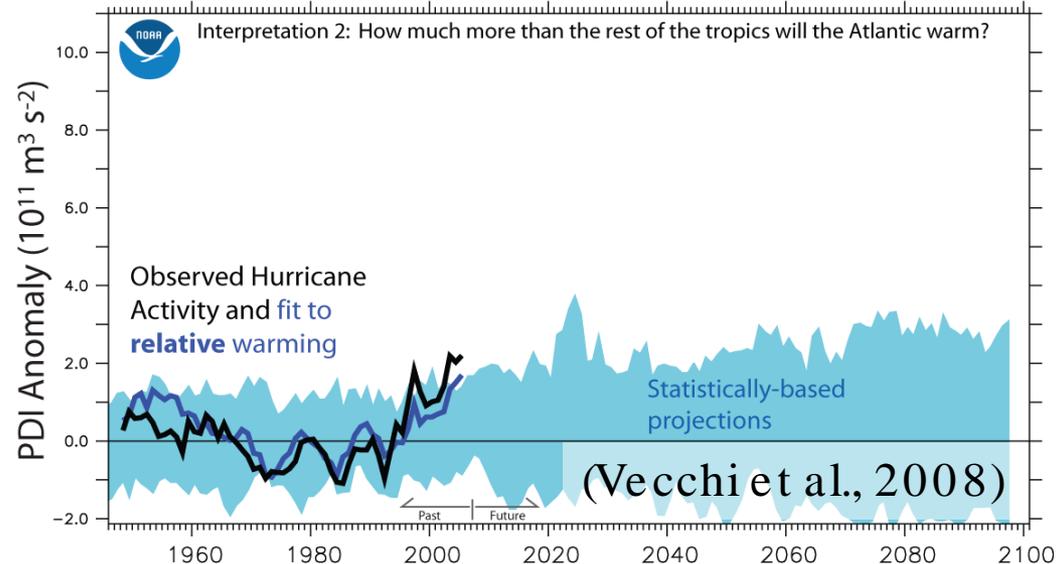
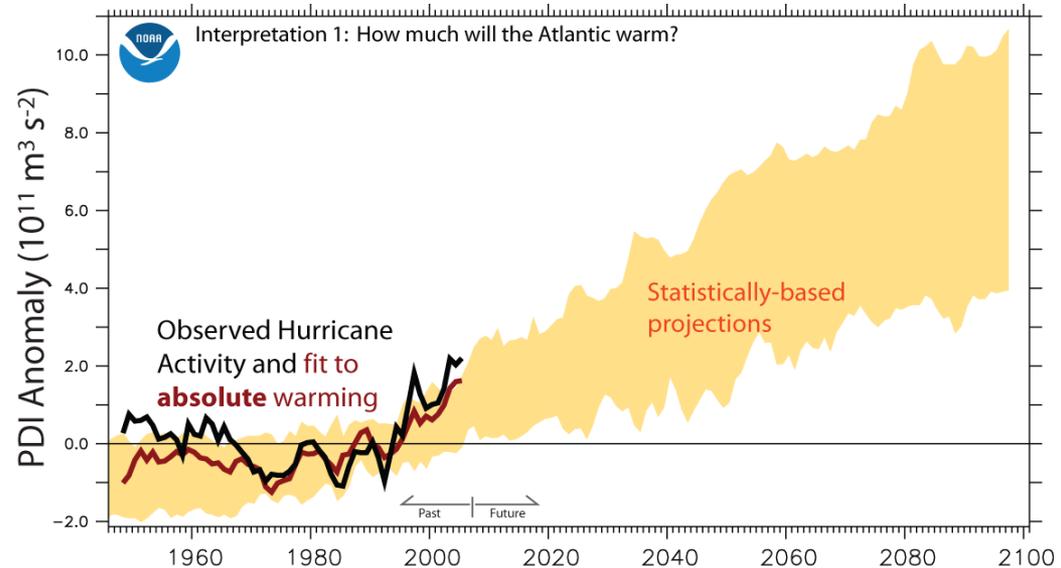
Atlantic is warmer

→hurricanes more intense

Option B

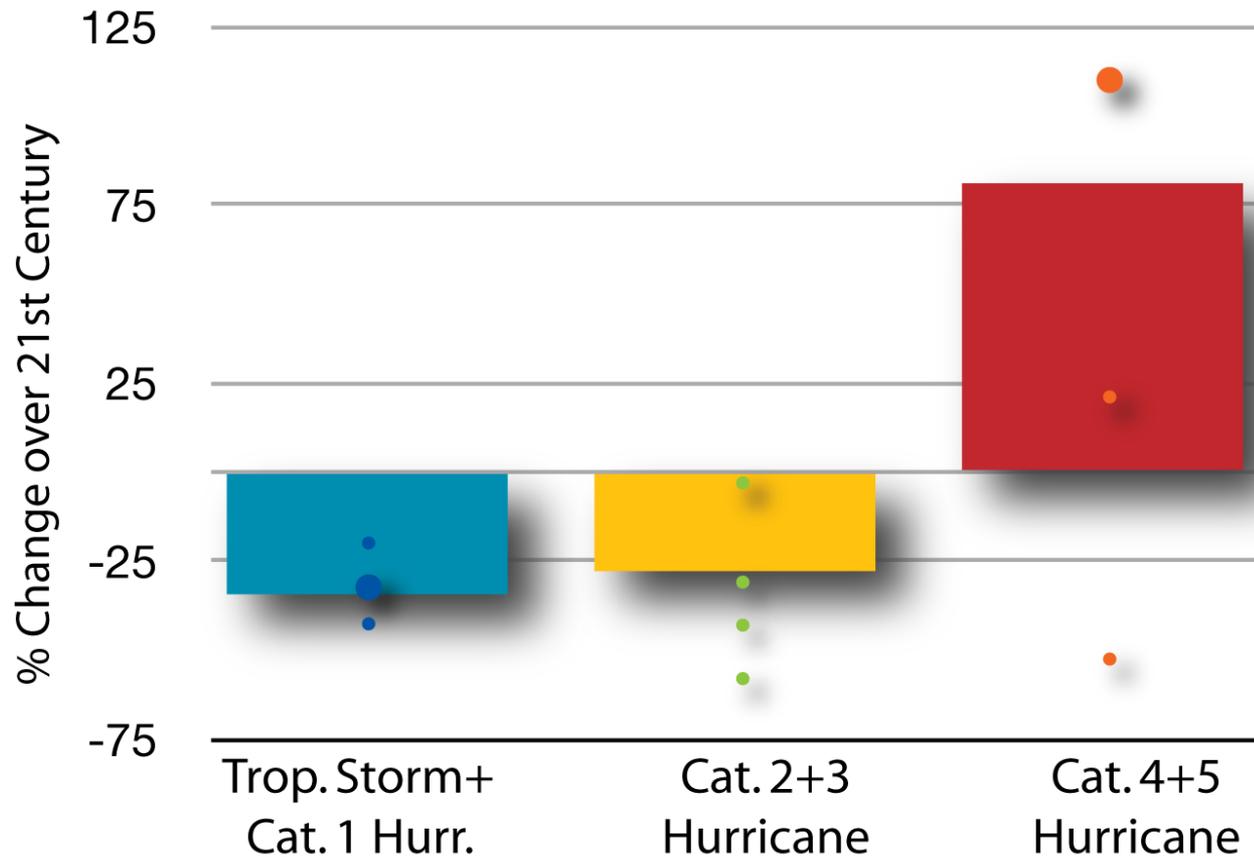
Atlantic is warmer but temperature relative to the rest of the tropics same as today

→No change in intensity

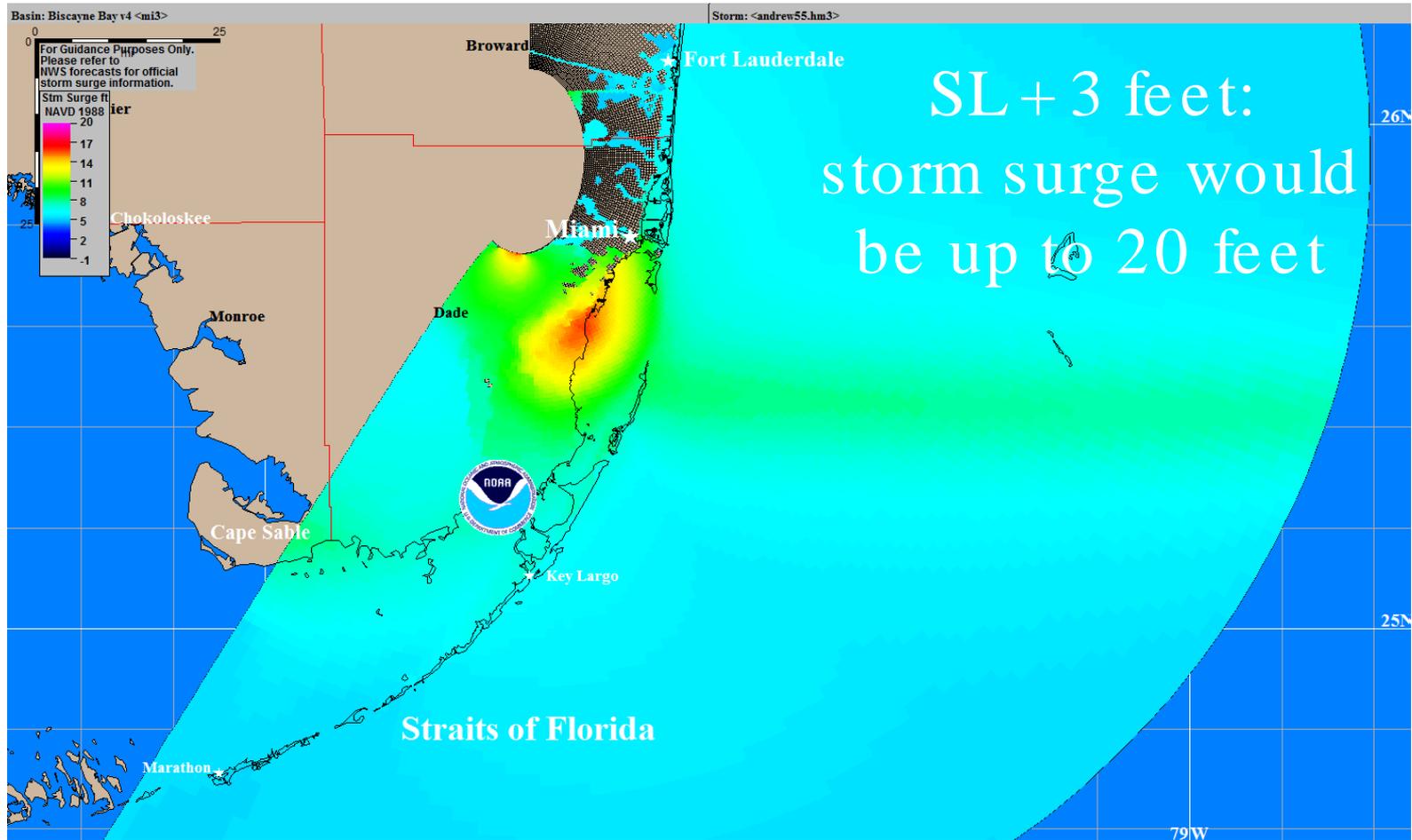


Could it be both?

Projected Changes in Atlantic Hurricane Frequency over 21st Century



SLOSH storm surge prediction



Conclusions

