

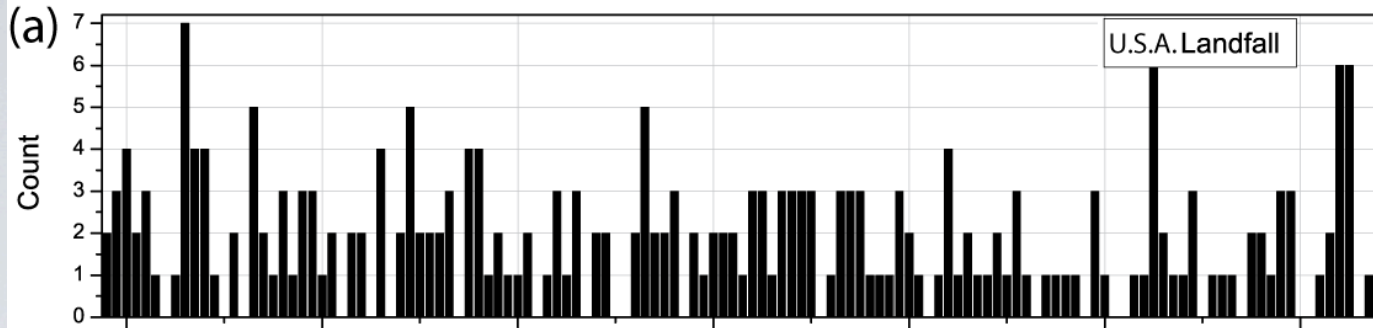
# Multi-decadal changes in hurricane activity

Gabriel Vecchi  
NOAA/GFDL

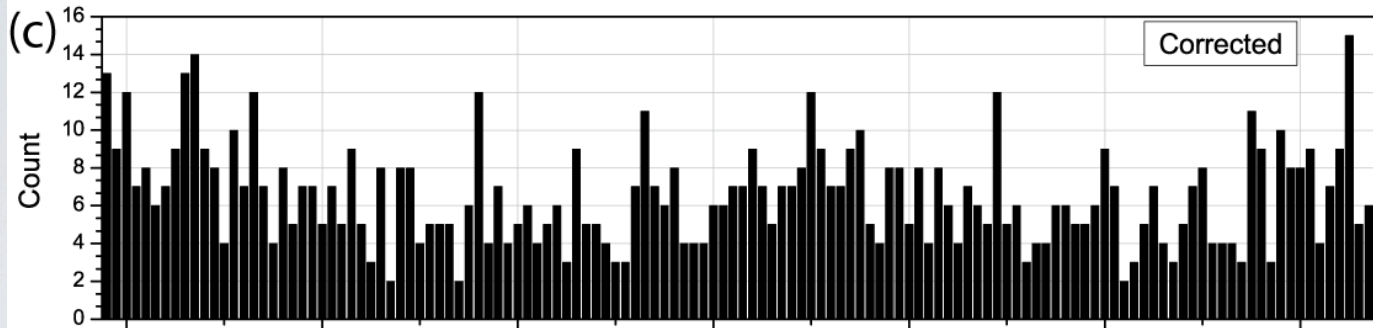
## Summary

- Premature to conclude we have seen TC change due to CO<sub>2</sub>
- Models allow estimates of TC sensitivity:
  - Next couple of decades: internal variability dominant player  
(some may be predictable, some not)
  - NA Hurr. Response to CO<sub>2</sub>: maybe fewer, probably stronger.
- Sea level rise, precipitation increase & demographic changes key to future risk.

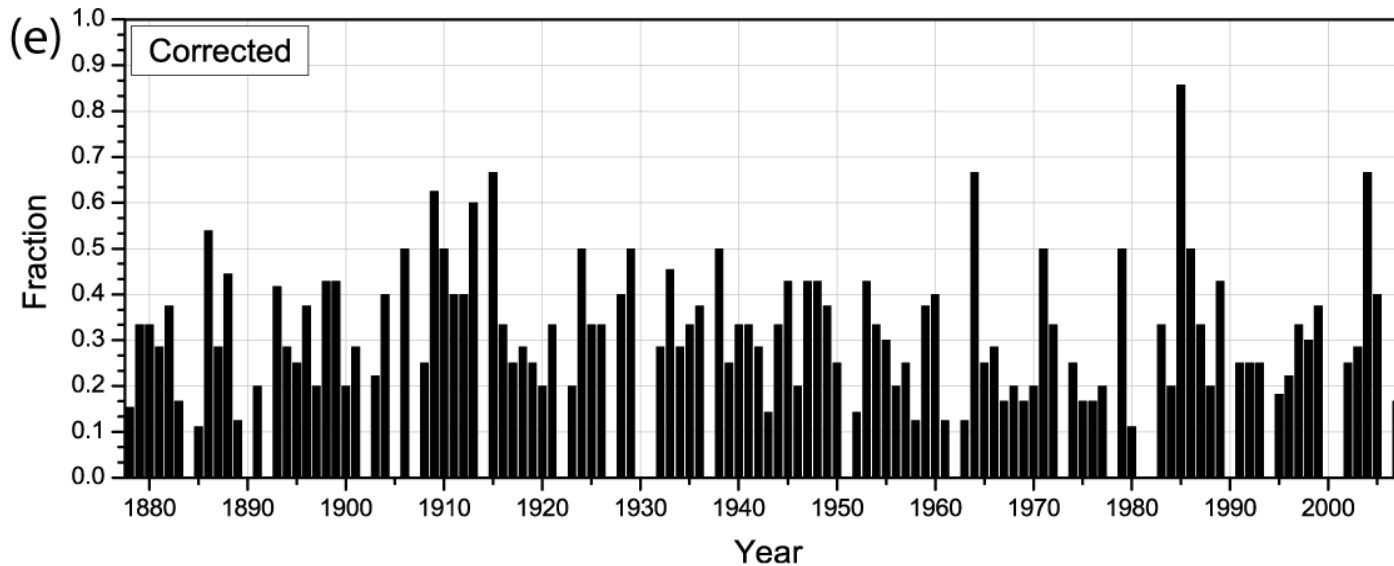
# Seasonal hurricane counts



U.S. Landfalling  
Hurricanes

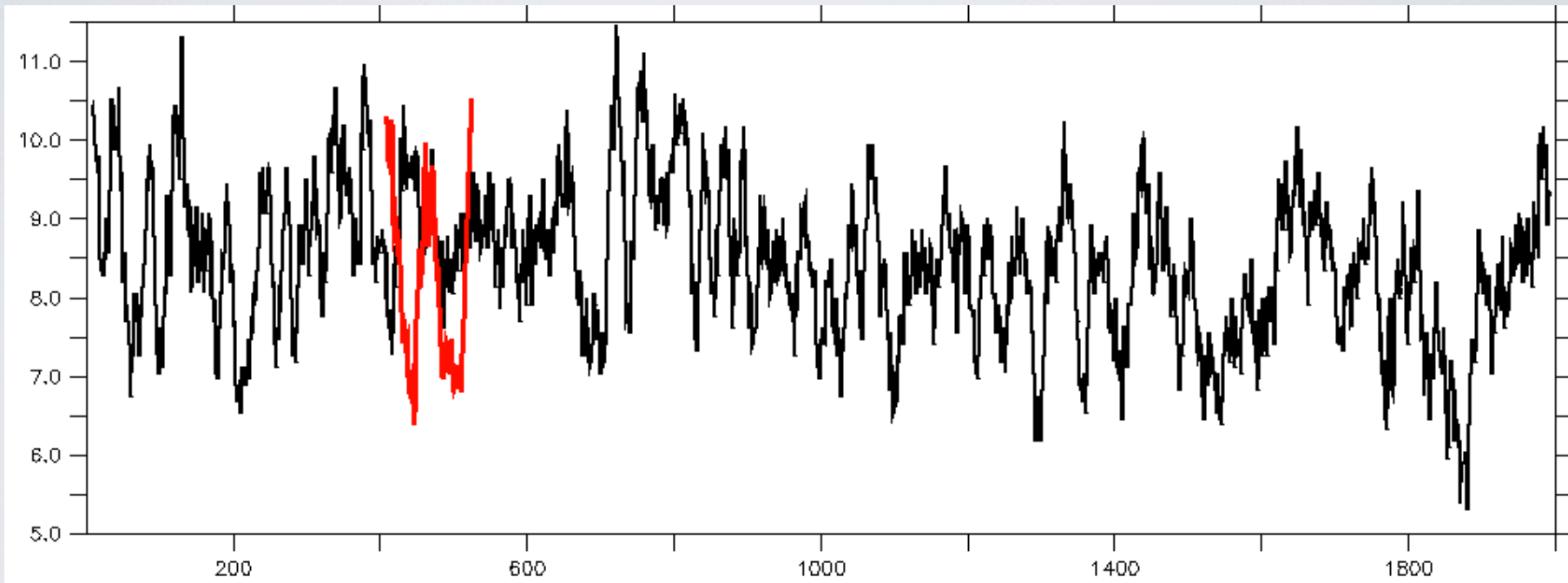


Basinwide  
Hurricanes



Fraction of  
Basinwide  
Hurricanes  
Making U.S.  
Landfall

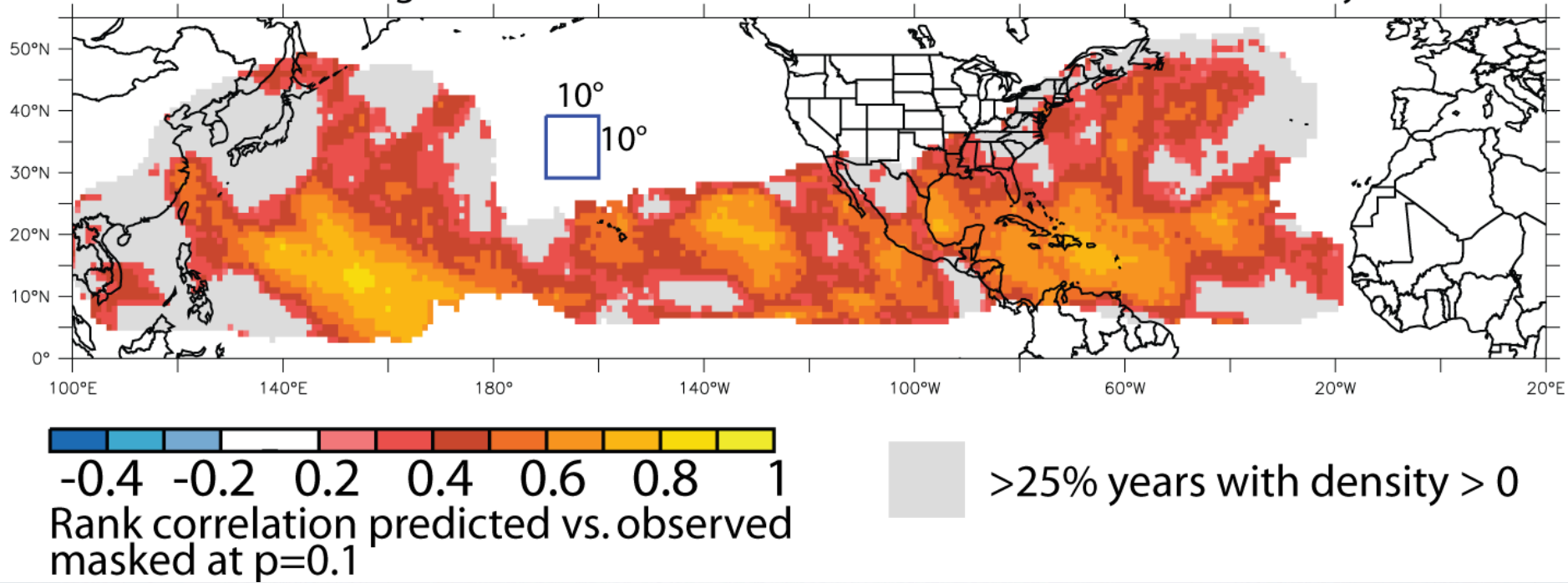
Even without changes in radiative forcing, Atlantic storm frequency shows large multi-decadal variability over a 2,000 year simulation, reminiscent of **observed**



15-year running counts: model and **obs.**

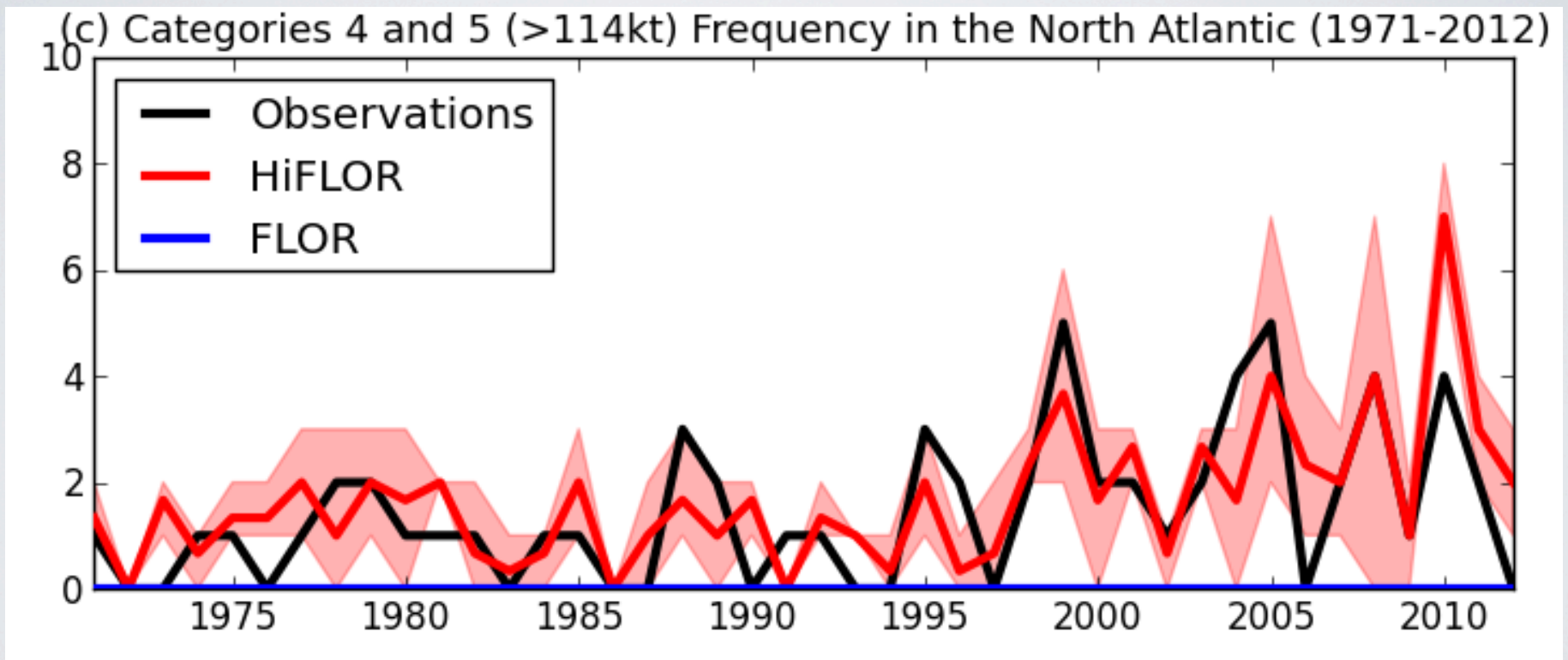
# New seasonal hurricane prediction systems show promise at regional scales

48-Member Average FLOR, FLOR-FA, FLOR-A06, FLOR-FA.05 Initialized 1-July

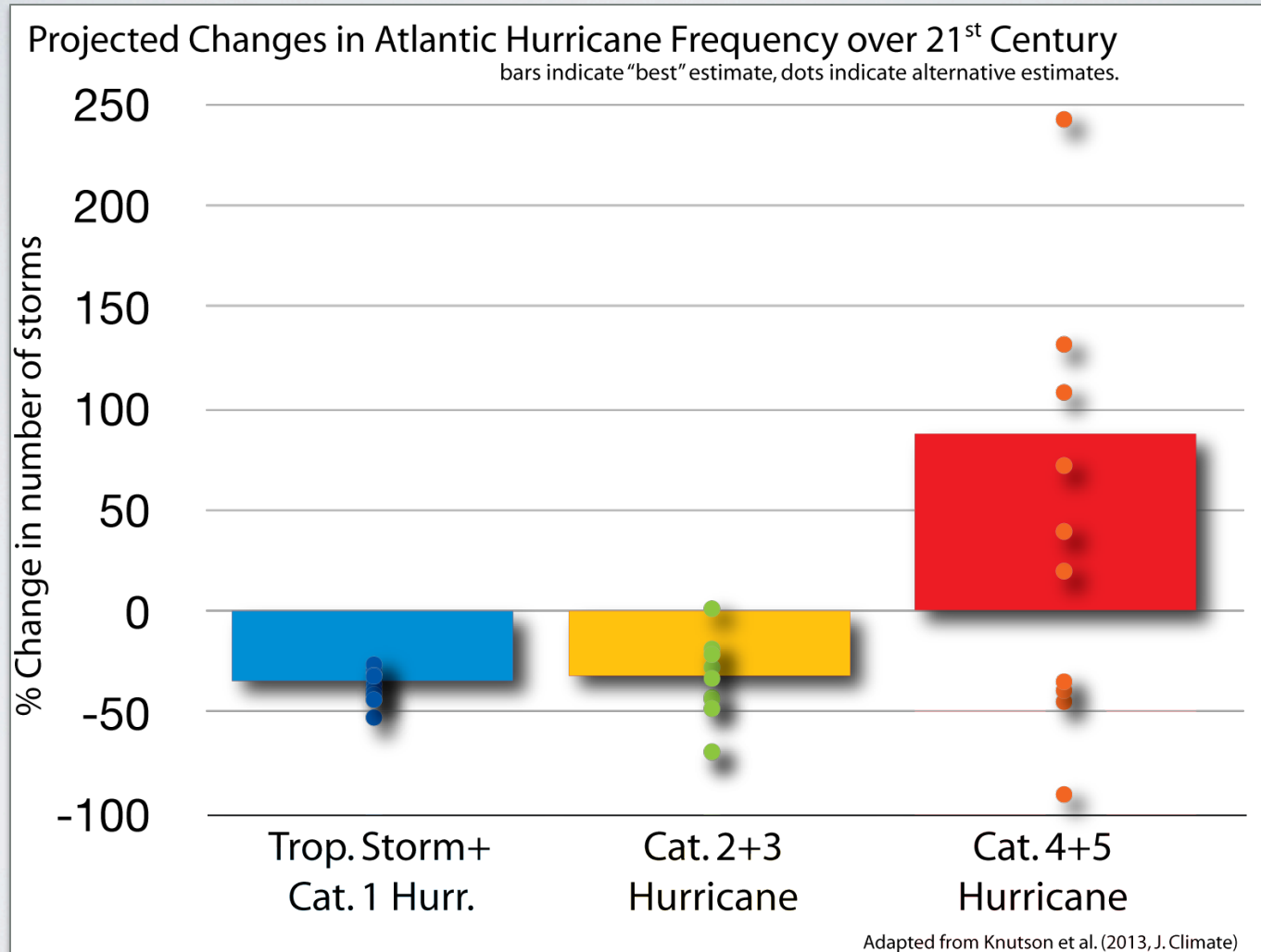


Shaded: “retrospective” predictions 1980-2012 tend to distinguish between years with many and few storms nearby

New prototype NOAA-GFDL prediction model is able to recover history of Cat. 4-5s...experimental predictions underway...



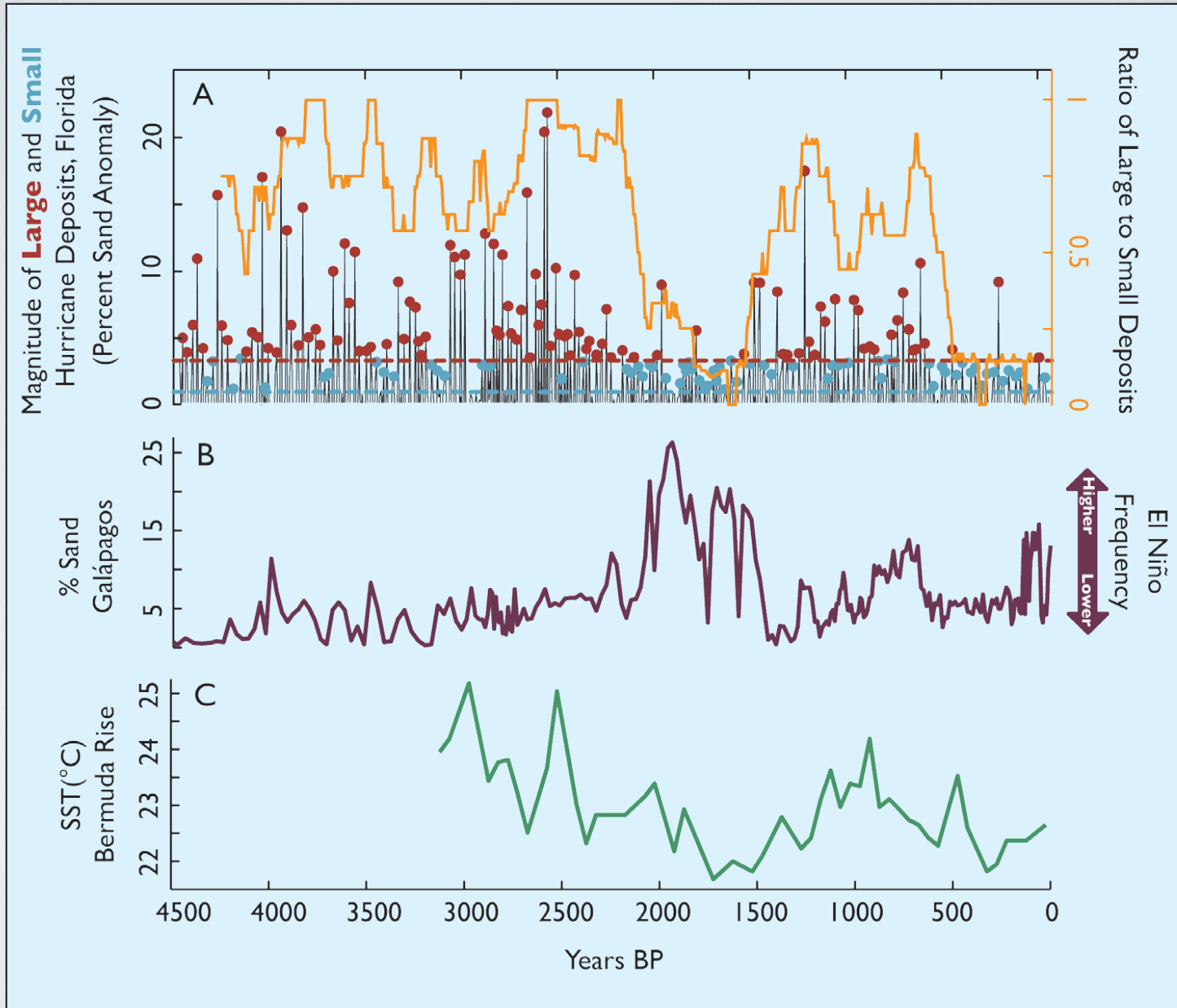
An estimate of 21<sup>st</sup> century Atlantic hurricane changes:  
Overall **frequency decrease** projected,  
but **perhaps more of the strongest storms**



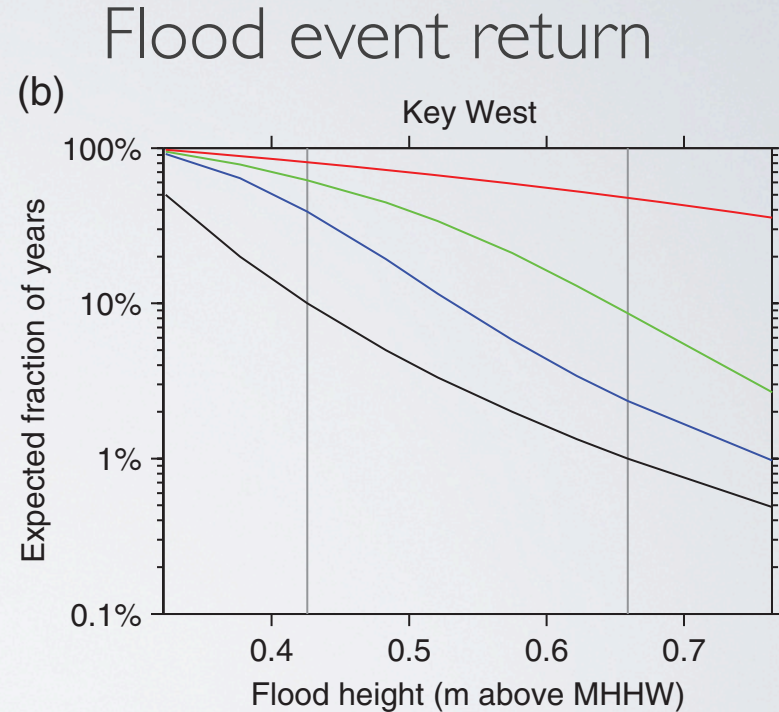
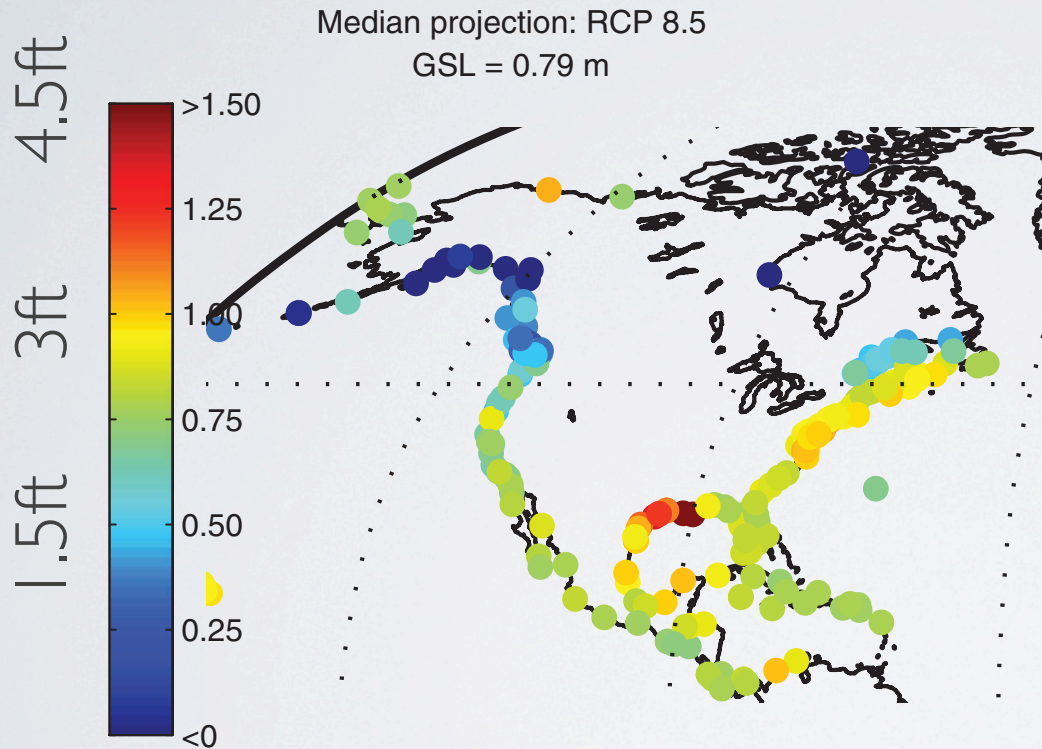
Adapted from Knutson et al. (2013, J. Clim.)  
see also Knutson et al. (2008, Nature Geosci.); Bender et al (2010, Science)

# Estimate of Hurricane LF

## Last 4,500 years in Mullet Pond, FL



Sea level is expected to continue rising along U.S. Coast, and flood events expected to become more frequent.



Change in Sea Level (2100)

Kopp et al. (2014)



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