The Natural Hurricane Barrier Along the U.S. Southeast Coast, Past and Present

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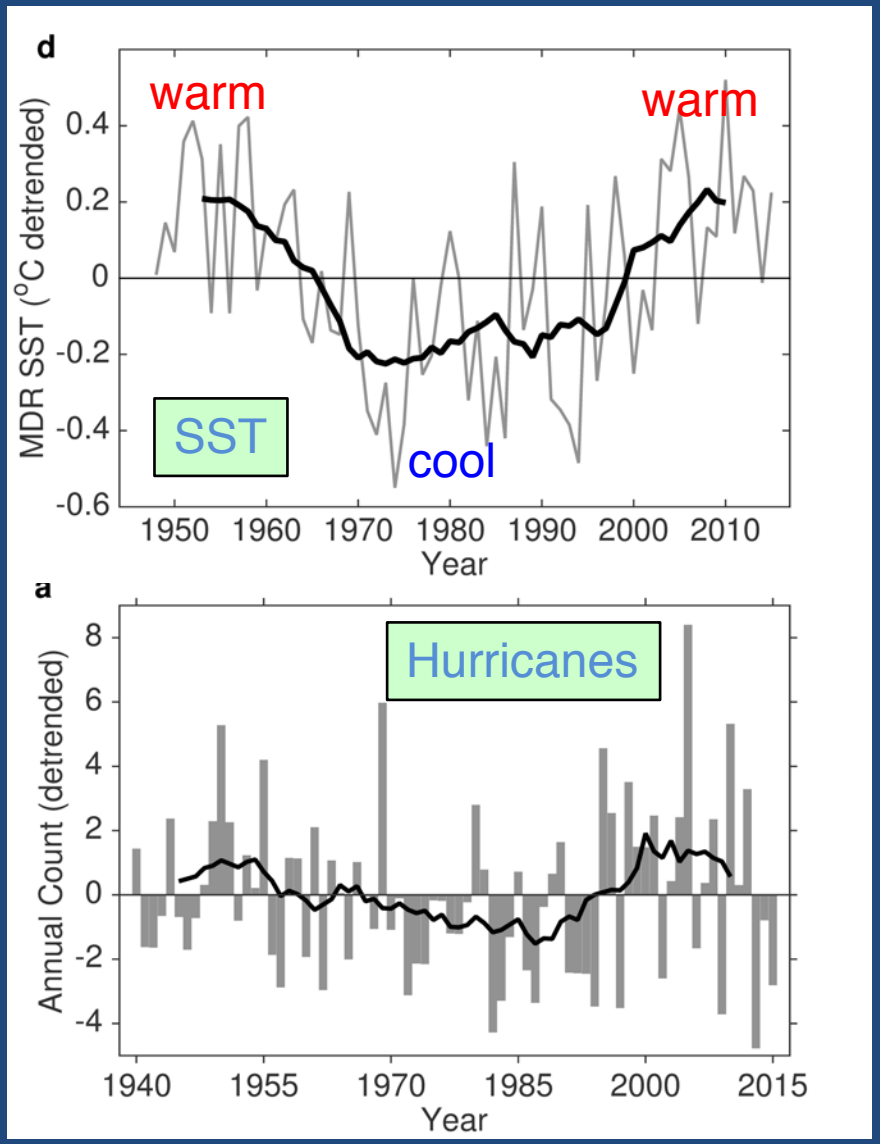
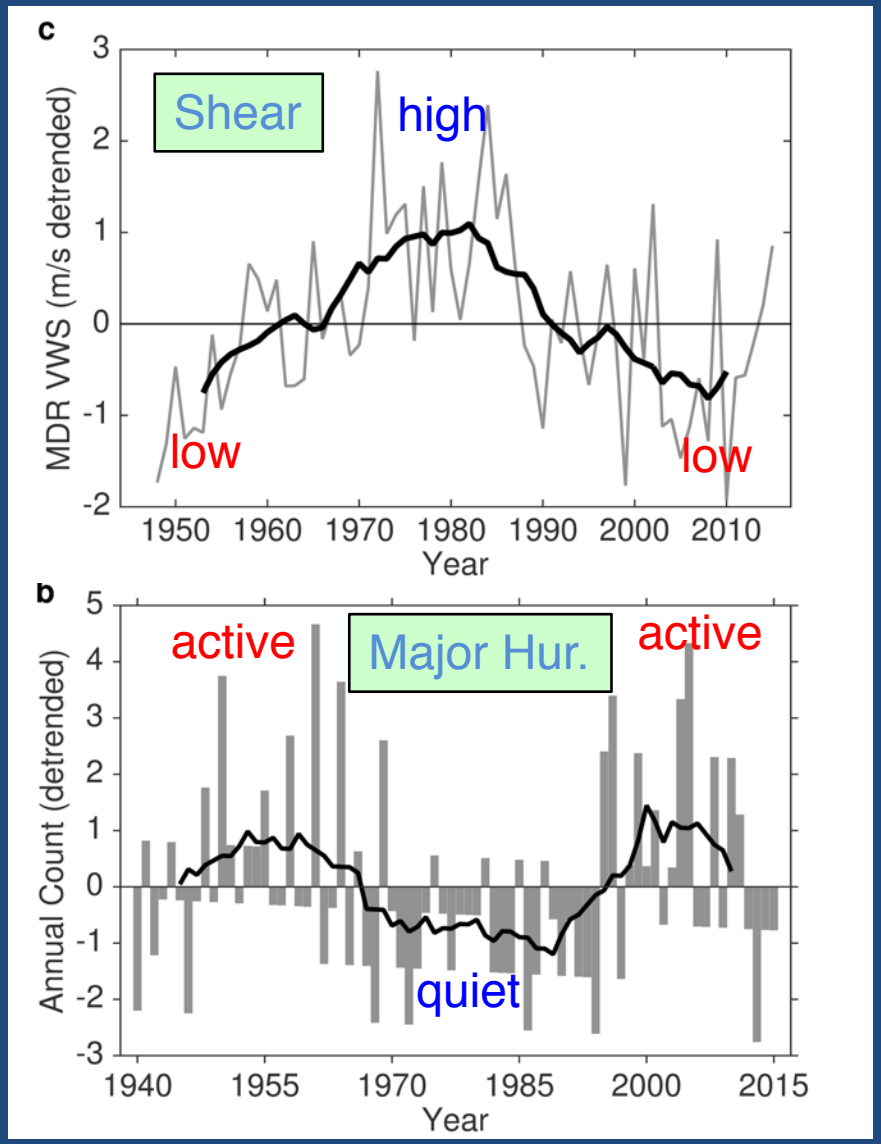
Multi-decadal variability in the tropical North Atlantic, and basin-wide Atlantic hurricane activity





Kossin, J. P., 2017: Hurricane intensification along United States coast suppressed during active hurricane periods. *Nature*, **541**, 390–393.

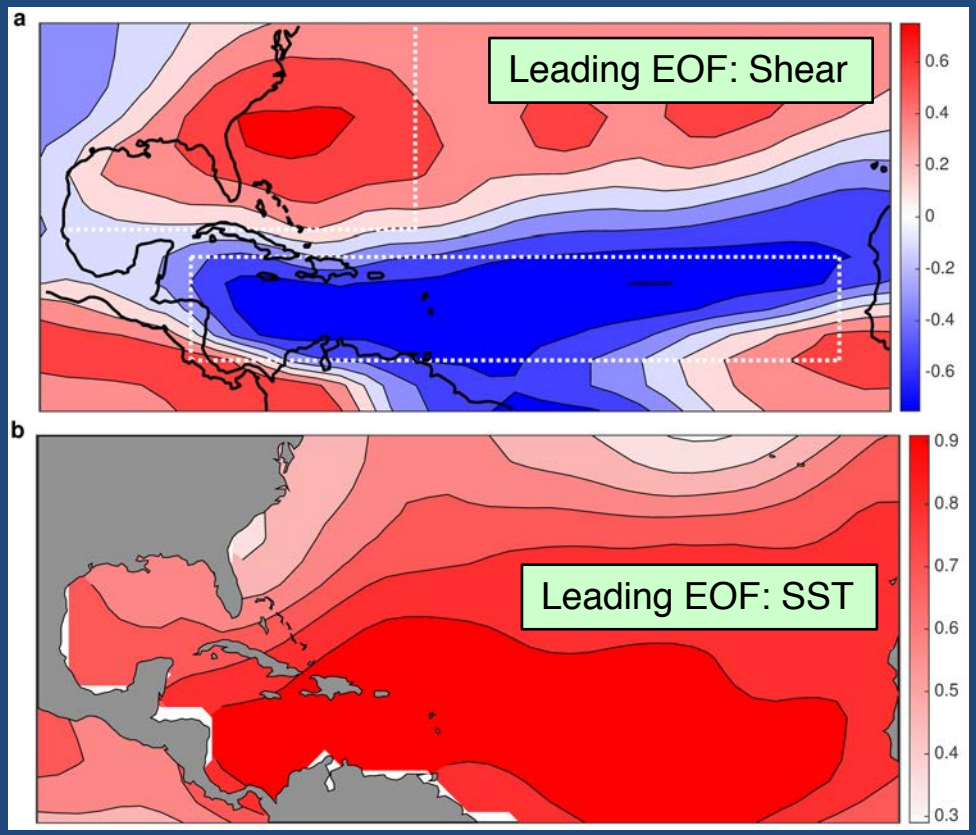
There have been more than twice as many major hurricanes per year during the contemporary warm period compared to the last cool period

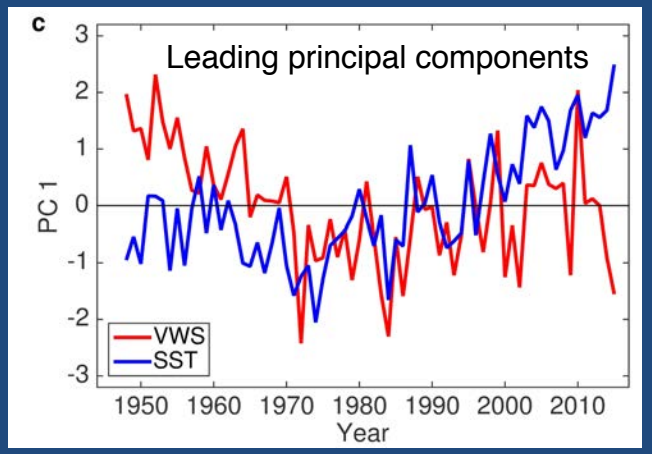
	All	Tropical Storms	Category 1–2	Category 3–5
1970–1994	**9.3**	**4.3**	3.5	**1.5**
1995–2015	**14.7**	**7.2**	4.1	**3.4**

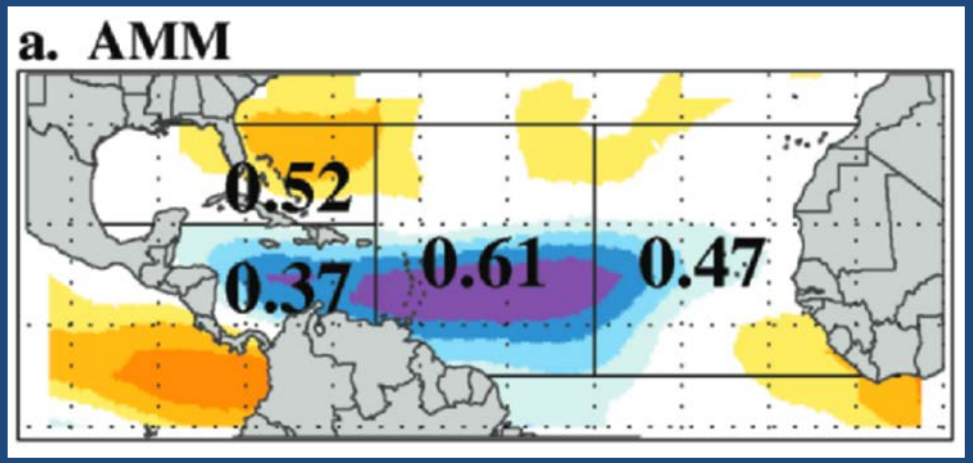
These statistics reflect *basin-wide* activity and environmental factors such as shear and SST are typically measured in the "Main Development Region", which resides in the tropical North Atlantic.

Are there any regional patterns of variability that may be relevant but missing from these types of analyses?

Leading patterns of variability of shear and SST (1948–2015)



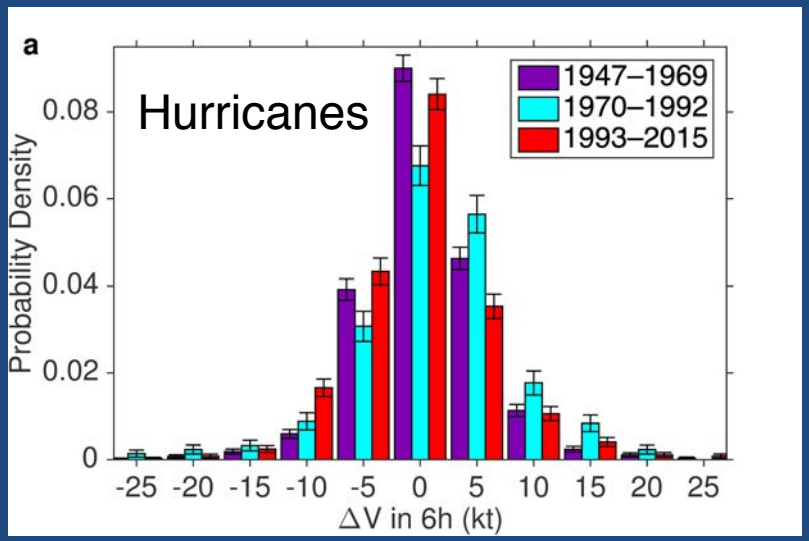


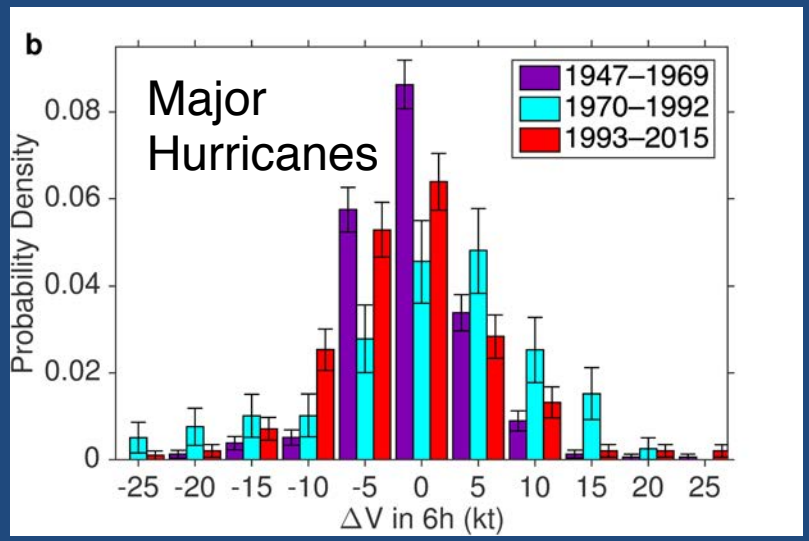


Kossin, J. P., and D. J. Vimont, 2007: A more general framework for understanding Atlantic hurricane variability and trends. Bull. Amer. Meteor. Soc., 88, 1767-1781.

What effect do these regional patterns of multidecadal variability have on hurricanes?

6-hourly intensification rates near/along the U.S. coast





Pr (Rapid Intensification of Major Hurricane) = { 10 ± 7% (last cool phase); 3 ± 2% (current warm phase)

Major hurricanes that approach or move along the U.S. southeast coast are 3 times less likely to rapidly intensify during warm periods (e.g., Hurricane Matthew 2016).

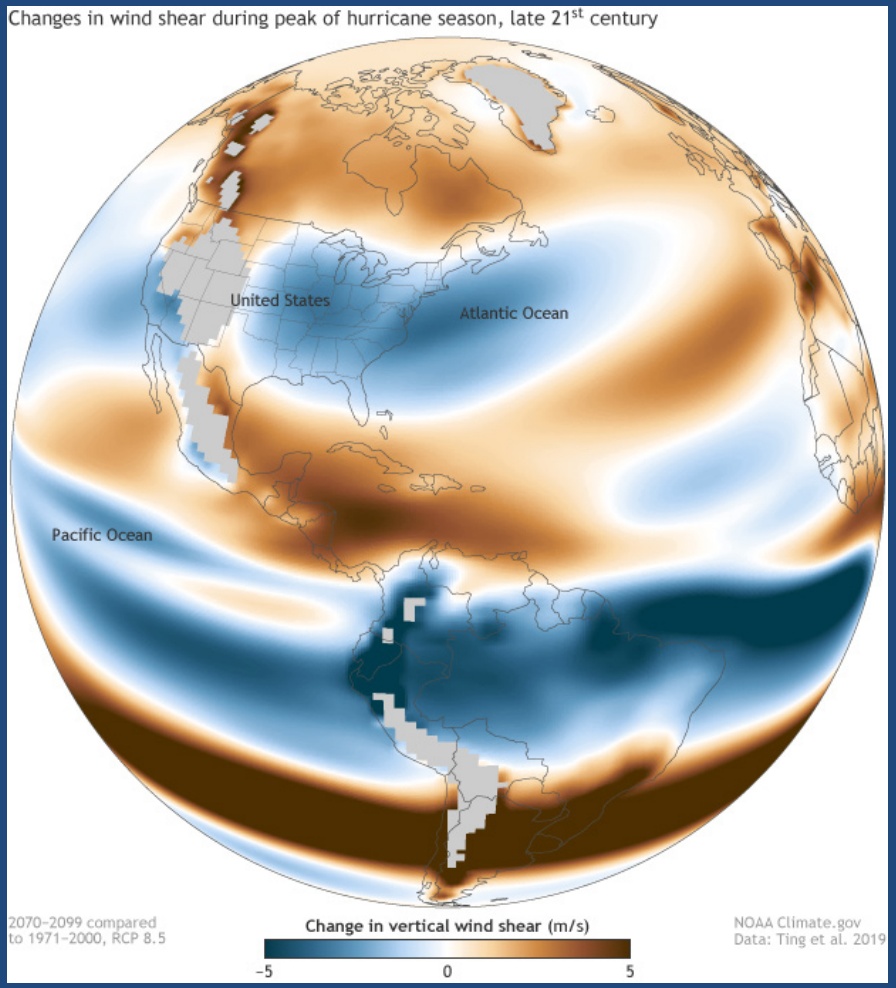
Fewer hurricanes during cool periods, but they're more dangerous and harder to forecast. Overall risk is lower, but singular events can pose greater risk (e.g., Andrew 1992).

J. Kossin, NOAA Eastern Region, 30 July 2019

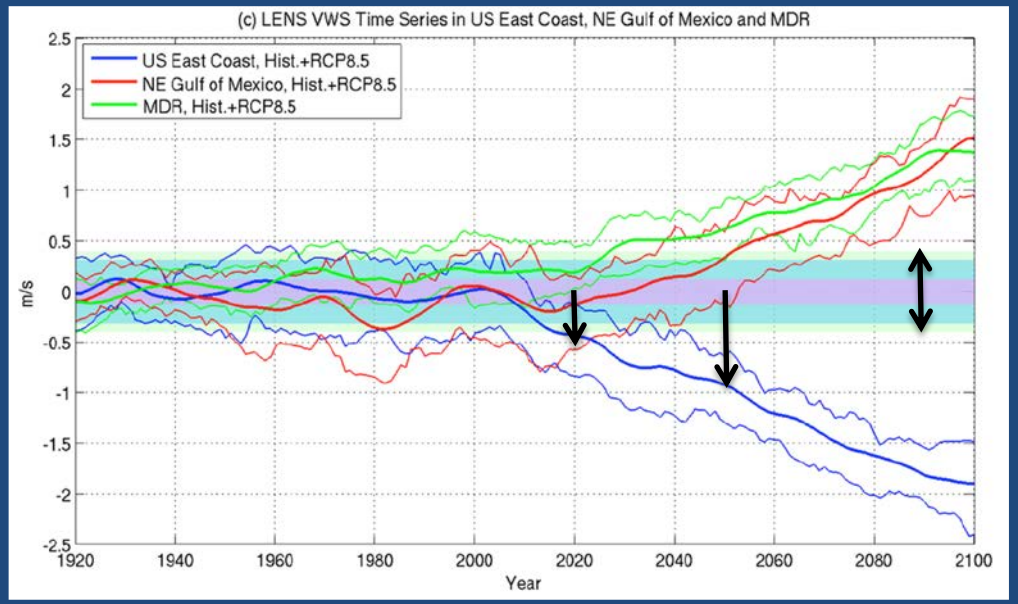
There is a natural shear barrier that helps protect the U.S. southeast coast during periods of heightened overall hurricane activity. This is tremendously fortunate.

Is this barrier sensitive to greenhouse gas warming?

If so, does GHG warming strengthen or weaken the barrier?



Projected shear changes



2020: GHG-forced shear = natural variability
2050: GHG-forced shear = 2 x (natural variability)

Ting, M., J. P. Kossin, S. J. Camargo, and C. Li, 2019: Past and future hurricane intensity change along the U.S. East Coast. Scientific Reports, 9:7795, 10.1038/s41598-019-44252-w.

The natural shear barrier that sets up along the U.S. east coast has been reducing U.S. hurricane risk. The more conducive the tropics are to increasing hurricane activity, the stronger the barrier to any hurricanes that approach or move along the coast.

This fortuitous situation is projected to erode with increasing greenhouse gas concentrations. By 2050, following the RCP8.5 business-as-usual scenario, the amplitude of the shear decrease along the coast is projected to be twice the amplitude of the natural barrier of increased shear.

All other things equal, such a trend will substantially increase hurricane risk on an individual hurricane basis, although overall risk may decrease.

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