Title: 'Patterns of Atlantic Decadal Variability and Hurricane Intensity Change Along the U.S. Coast'

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Abstract: It's well documented that Atlantic hurricane activity is suppressed during periods of cooler tropical Atlantic sea surface temperature (SST), and that mean SST in these periods is well-separated on decadal timescales. For example, a period of comparatively cool SST and suppressed hurricane activity was observed in the period from the late 1960s to the mid-1990s while warmer SSTs and greater hurricane activity have been observed, on average, from the mid-1940s to late 1960s, and again from the mid-1990s to present. The Atlantic is somewhat unique from other tropical cyclone-prone ocean basins in that SST variability is also strongly correlated (inversely) with vertical wind shear (VWS), which also modulates hurricane development and intensification. This correlation ostensibly manifests through a wind-evaporation-SST (WES) feedback mechanism, which drives tropical Atlantic variability via the Atlantic Meridional Mode (AMM). The simple upshot is that when SST is favorable for hurricane development and intensification (i.e., warm SST), so is the VWS (i.e., low VWS), and vice versa. As an aside (that's relevant to this workshop), this correlation between SST and VWS increases the sensitivity of Atlantic hurricanes to SST variability relative to tropical cyclones in other basins.

Although it's well documented that SST, VWS, and hurricane activity all co-vary decadally, the regional *pattern* of this co-variability has received less attention. In this talk, I'll show that while decadal periods of warm SST and low VWS in the tropical Atlantic correlate with increased *basin-wide* activity, the dipole pattern of the AMM creates conditions along the U.S. coast that are unfavorable for maintaining hurricanes. Conversely, when tropical Atlantic conditions are unfavorable and basin-wide hurricane activity is low, the region near and along the U.S. coast becomes substantially more favorable for maintaining and intensifying hurricanes. During these periods of reduced basin-wide activity hurricanes along the U.S. coast are 2–3 times more likely to rapidly intensify and major hurricanes are 3–6 times more likely. Thus although there are fewer hurricanes that move near or along the U.S. coast during periods of basin-wide quiescence, those that do approach the coast are much more likely to be intensifying, sometimes rapidly, at that time. This poses a significant challenge for forecasters and increases coastal risk during periods when risk is generally considered to be comparatively low.

Bibliography:

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