

Supplementary Materials:

Observed Data

For the observed tropical cyclone track data (6-hourly output of location, maximum wind speed, and central pressure, we utilized the National Hurricane Center Data Base 2 [34] for the period 1900–2015 (<https://www.nhc.noaa.gov/data/hurdat/>). We obtained observed TC and MH landfall frequencies in the North Atlantic from the National Oceanic and Atmospheric Administration (NOAA)'s Atlantic Hurricane Database (http://www.aoml.noaa.gov/hrd/hurdat/UShurrs_detailed.html) [9] that were used for the comparisons to the buffer output from the HURDAT2 data. We downloaded the observed Niño-3.4 index from the web page at the Climate Prediction Center (<http://www.cpc.ncep.noaa.gov/data/indices/>).

Control Simulations

We generated control climate simulations using HiFLOR [28–33] by prescribing radiative forcing and land-use conditions representative of the years 2015 (2015 control), 1990 (1990 control), 1940 (1940 control), and 1860 (1860 control). The fixed forcing agents for the control simulations were atmospheric CO₂, CH₄, N₂O, halons, tropospheric and stratospheric O₃, anthropogenic tropospheric sulfates, black and organic carbon, and solar irradiance at the respective year's level. The source code for the HiFLOR Climate model can be addressed at <https://www.gfdl.noaa.gov/cm2-5-and-flor/>.

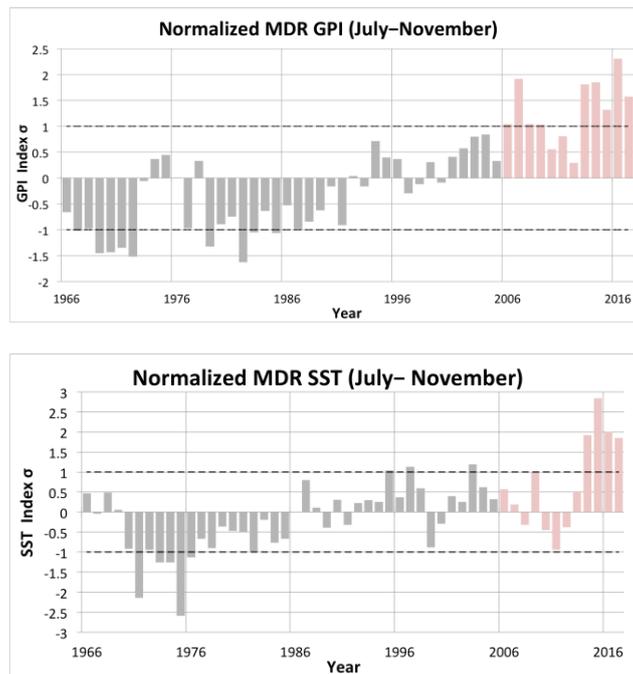


Figure S1. Normalized July–November GPI and SST in the Main Development Region (10– 25°N and 20– 80°W) between 1966 and 2015 (in terms of σ). Red bars were years during the 11-year MH landfall drought. GPI and SST were favorable for MH activity during the years of the longest recorded MH landfall drought.

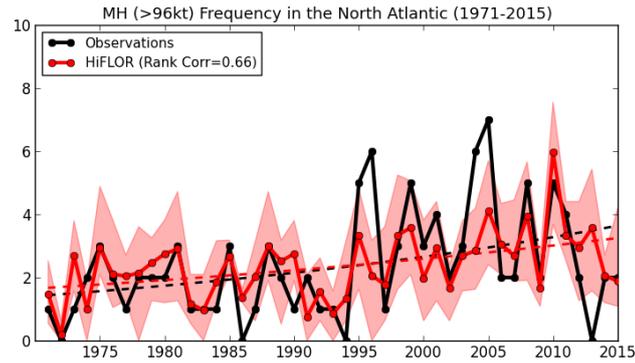


Figure S2. Interannual variations of annual MH frequency in the North Atlantic according to observations and results of ensemble SST-restored experiments with HiFLOR (1979–2015) [see 28 for more details on the experimental design]. The red line represents the mean of six ensemble experiments by HiFLOR. Shading indicates the range of the minimum and maximum among the six ensemble members. The black line denotes the observations. Correlation coefficient between HiFLOR and observations is 0.66, which is statistically significant at 99% confidence level.

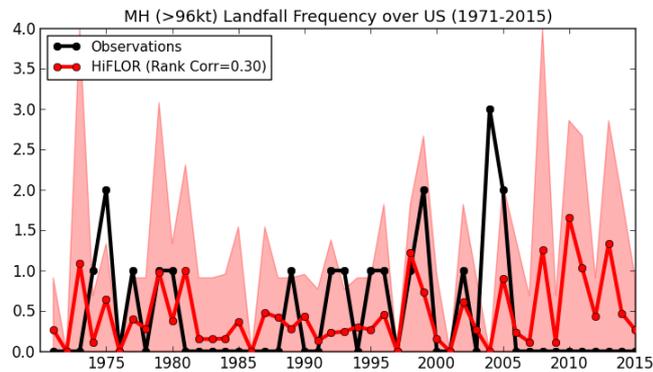


Fig S3. Interannual variations of annual MH landfall frequency over the United States using the 200-km buffer according to the 6-hourly HURDAT2 (black) and results of the 6-member SST-restored experiments toward the observed SSTs with HiFLOR (1979–2015) [see 28 for more details on the experimental design]. The red line represents the mean of six ensemble experiments by HiFLOR. Shading indicates the range of the minimum and maximum among the six ensemble members. Correlation coefficient between HiFLOR and HURDAT2 is 0.30, which is not statistically significant.

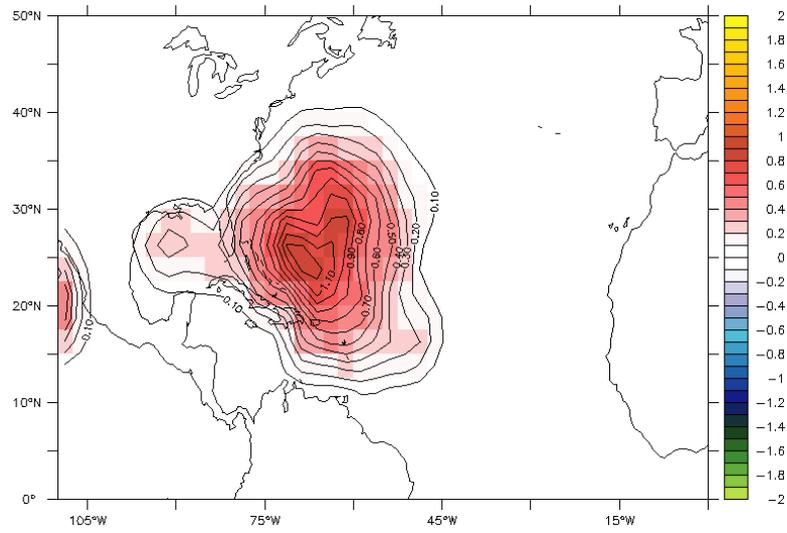


Figure S4. Projected mean changes in major hurricane density (shadings) counted for every $2.5^\circ \times 2.5^\circ$ grid cell by the 2015 control relative to that by the 1860 control. Contours indicate climatological mean major hurricane density by the 1860 control. The first 50 years of both simulations have been removed, to eliminate climate drift in the simulations. Units are frequency $\times 10$ per season (July–November).