Atmospheric Chemistry and Physics

Supporting Information for

Revisiting the Relationship between Atlantic Dust and Tropical Cyclone Activity using Aerosol Optical Depth Reanalyses: 2003-2018

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Introduction

Figure S1 shows that the peak season of African dust activity leads the Atlantic TC season. Figure S2 is similar to Figure 8, but correlating large-scale variables with regionally-averaged DAOD over the tropical North Atlantic instead of the Caribbean. Figure S3 is similar to Figure 6 but for the three strongest El Niño and three strongest La Niña years. Tables S1 and S2 are similar to Table 3 but with different domain definitions for the tropical North Atlantic and Caribbean. Tables S3 and S4 are similar to Table 2 but examining Atlantic TC activity in the top two, three and four DAOD seasons using MRC DAOD.

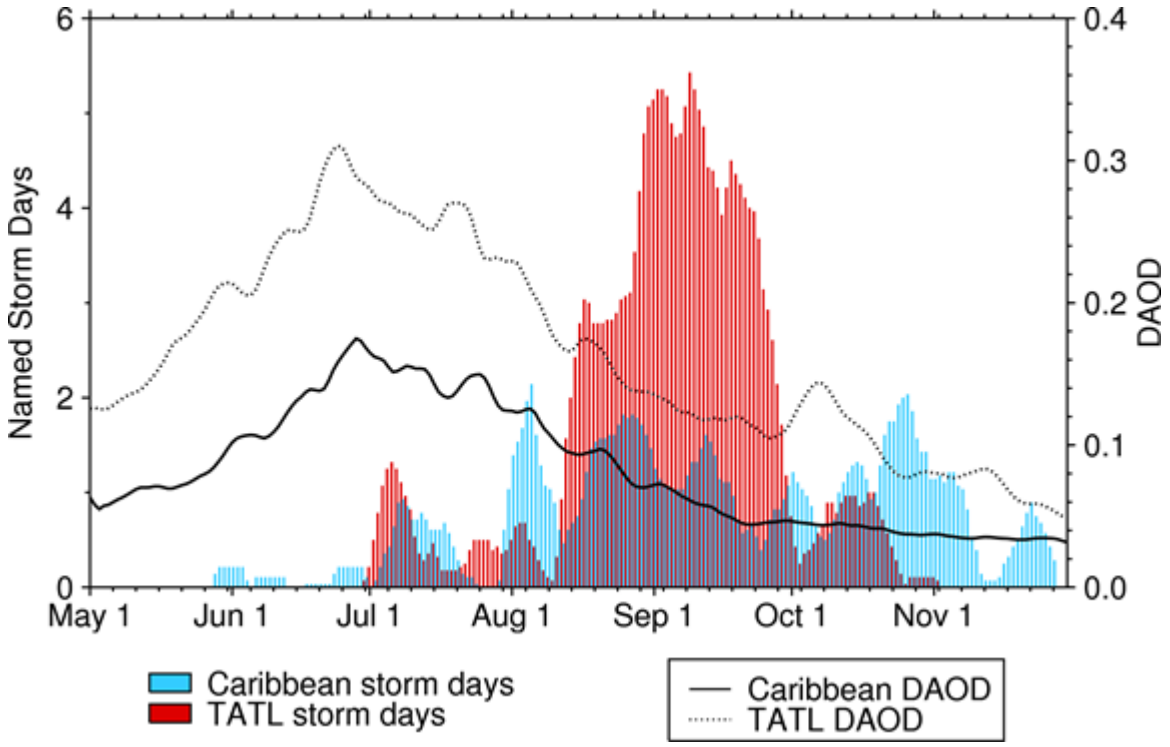

Figure S1. Climatological (averaged over 2003-2018) 7-day-smoothed daily regional-average DAOD from NAAPS-RA and regional storm days for the Caribbean and the tropical North Atlantic (TATL) from May-November.

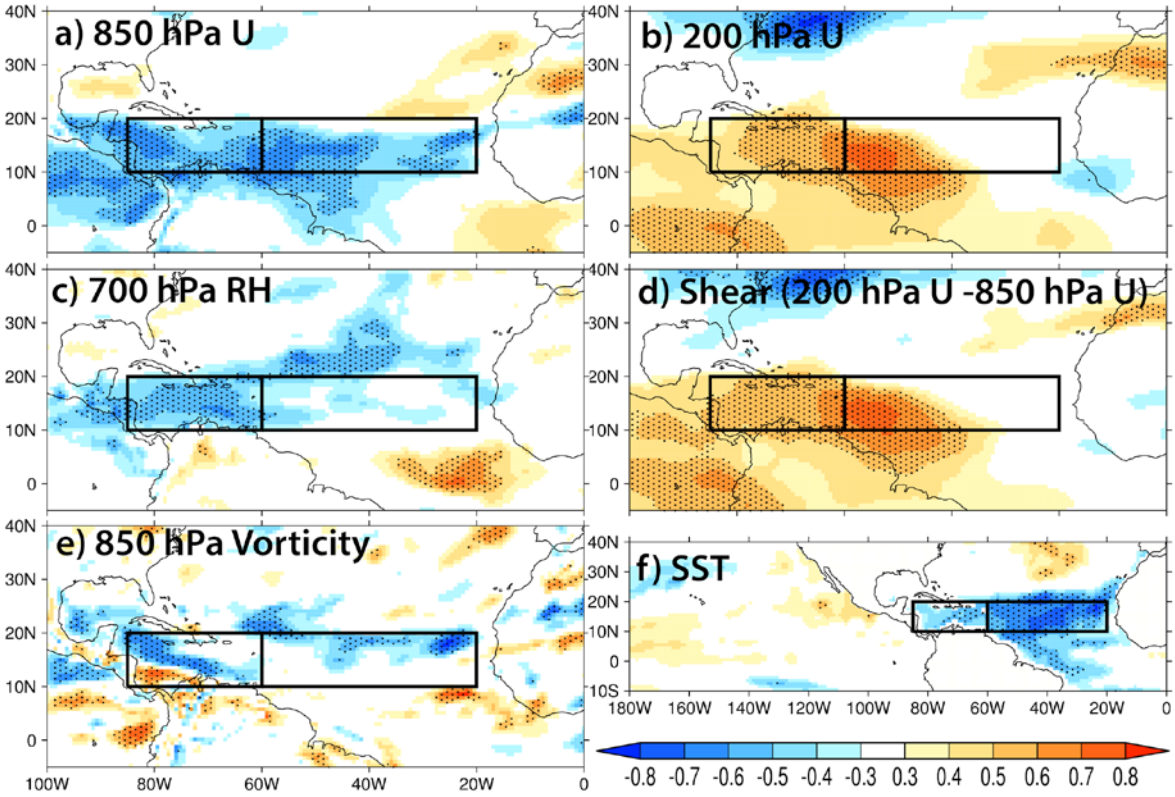

Figure S2. As in Figure 8, but with tropical North Atlantic DAOD. Correlation between MRE JJA regionally-averaged DAOD in the tropical North Atlantic and JJA (a) 850 hPa U, (b) 200 hPa U, (c) 700 hPa RH, (d) zonal wind shear, (e) 850 hPa vorticity and (f) SST. Correlations over the black dotted areas are statistically significant.

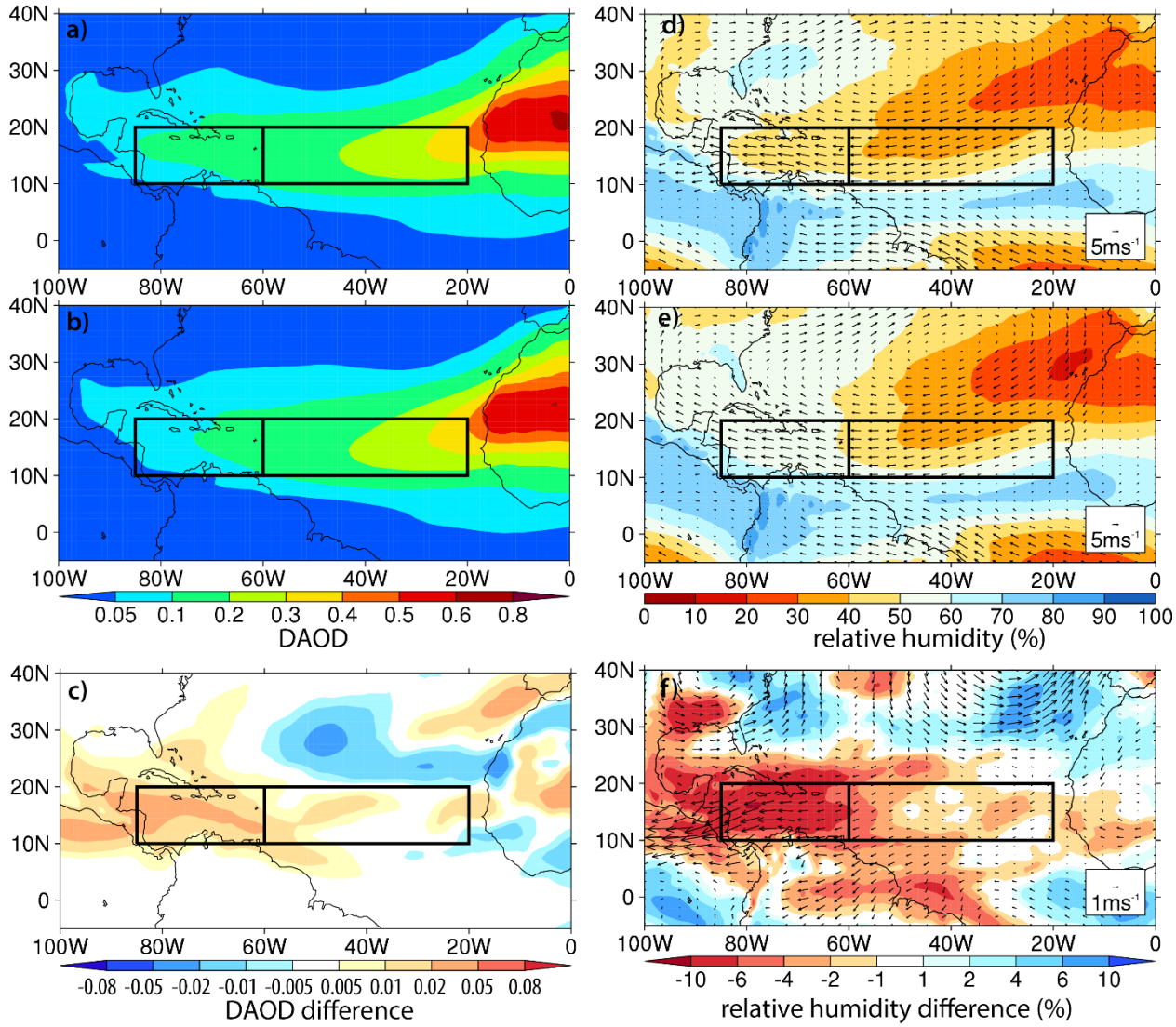

Figure S3. As in Figure 6, but for the top three El Niño versus the top three La Niña years from 2003-2018. Left: MRC JJA composite of DAOD with the (a) three warmest JJA ONI (2004, 2009 and 2015), (b) the three coldest JJA ONI (2007, 2010, 2011), and (c) the difference between the two (three warmest minus three coldest). Right: The corresponding JJA composite of 850 hPa wind (vectors) and 700 hPa RH (color shading).

Table S1. As in Table 3, but with the longitudinal boundary for the tropical North Atlantic and the Caribbean being shifted eastward to 52.5°W to give each region an equal areal extent. Correlation matrix between MRE JJA tropical North Atlantic/Caribbean DAOD and 850 hPa U, 200 hPa U, 200 hPa minus 850 hPa U, 700 hPa RH, SST, Maximum Potential Intensity (MPI) and Genesis Potential Index (GPI) during JJA and ASO, respectively. Correlations that are statistically significant at the 90% level are highlighted in bold and those with asterisks are statistically significant at the 95% level. 850 hPa relative vorticity is not shown as none of these correlations were statistically significant.

Environmental Field	JJA tropical North Atlantic / JJA Caribbean (equal area)	ASO tropical North Atlantic / ASO Caribbean (equal area)
850 hPa U	**-0.59* / -0.76***	0.07 / **-0.58***
200 hPa U	0.19 **/ 0.79***	0.13 / **0.83***
200 minus 850 hPa U	0.30 **/ 0.81***	0.08 / **0.78***
700 hPa RH	-0.35 **/ -0.76***	-0.25 / **-0.54***
SST	**-0.70* / -0.75***	**-0.44** / **-0.74***
MPI	**-0.73* / -0.69***	**-0.50 / -0.60***
GPI	**-0.75* / -0.73***	**-0.50 / -0.70***

Table S2. As in Table 3 for the tropical North Atlantic and Caribbean, but with the northern boundary expanded 5° in latitude farther north (e.g., to 25°N).

Environmental Field	JJA tropical North Atlantic / JJA Caribbean (5° north expansion)	ASO tropical North Atlantic / ASO Caribbean (5° north expansion)
850 hPa U	-0.40 / **-0.63***	**0.56*** / **-0.50**
200 hPa U	0.14 / **0.75***	-0.08 / **0.88***
200 minus 850 hPa U	0.19 / **0.76***	-0.09 / **0.82***
700 hPa RH	-0.42 / **-0.70***	-0.35 / **-0.54***
SST	**-0.63*** / **-0.67***	-0.24 / **-0.63***
MPI	**-0.62*** / **-0.56***	-0.25 / **-0.55***
GPI	**-0.61*** / **-0.70***	**-0.48** / **-0.64***

Table S3. Correlations between annual Atlantic basin-wide ACE and region-averaged DAOD from MRE with different area definitions of the Caribbean and the tropical North Atlantic (TATL), and for June-August (JJA) and June-July (JJ) with the default area definition.

JJA Caribbean DAOD			JJA TATL DAOD		
default	Equal area	5° north exp.	default	Equal area	5° north exp.
-0.61	-0.59	-0.58	-0.41	-0.38	-0.43
JJ Caribbean DAOD			JJ TATL DAOD		
-0.58	-	-	-0.37	-	-

Table S4. As in Table 2, but for annually-averaged Atlantic TC activity in the two, three and four seasons with the highest JJA Caribbean DAOD (2018, 2015, 2014, and 2013) in sequence from highest DAOD to 4th highest DAOD) and the two, three and four seasons with the lowest JJA Caribbean DAOD (2005, 2011, 2017 and 2016) in sequence from lowest DAOD to 4th lowest DAOD) based on MRE. Ratios between the low and the high DAOD seasons are also provided. The results based on the three highest/lowest seasons are also included here (already listed in Table 2) for easy comparison.

	Tropical Depressions and Named Storms	Named Storms	Hurricanes	Major Hurricanes	Accumulated Cyclone Energy
2|3|4 highest JJA Caribbean DAOD	12.5|12.3|13.0	11.5|11.3|12.0	7.0|6.0|5.0	2.0|2.0|1.5	98|86|74
2|3|4 lowest JJA Caribbean DAOD	25.5|23.0|21.3	23.5|21.3|19.8	11.0|10.7|9.8	5.5|5.7|5.3	186|199|184
Ratio	2.0|1.9|1.6	2.0|1.9|1.6	1.6|1.8|2.0	2.8|2.8|3.5	1.9|2.3|2.5