Supplementary materials
Figure S1-S6, Table S3

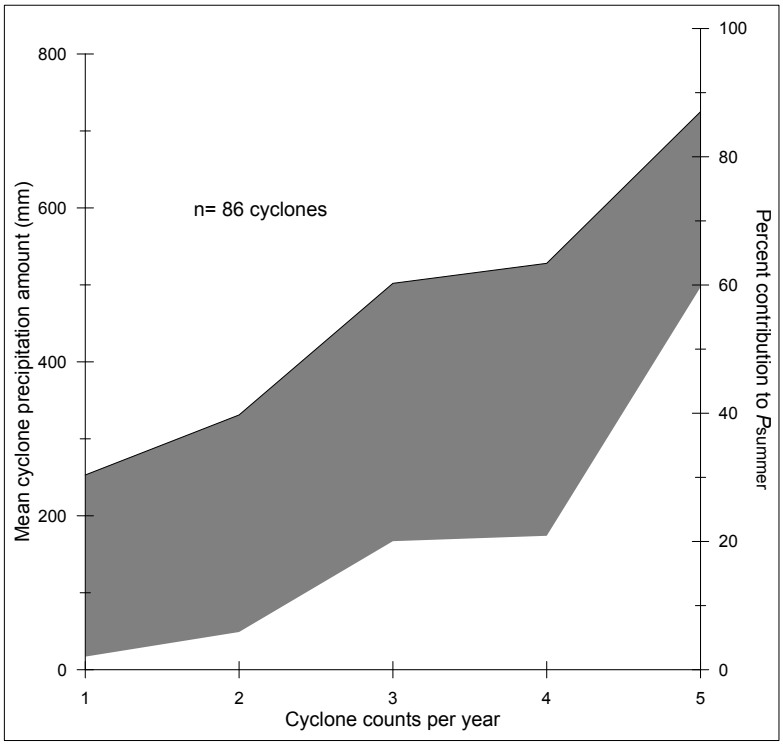

Figure S1. Yucatan Peninsula precipitation amounts associated with tropical cyclone landfalls between 1942 and 2012 based on the observational data presented in Supplementary materials Table S1 (total of 86 cyclones). Shading represents the full range of observed precipitation amounts associated with 1 to 5 cyclones per year (left Y axis). The relative contribution of these cyclones to the total amount of precipitation occurring during their specific summer seasons is also indicated (right Y axis). Note for example that the maximum number of cyclones observed in a year between 1942-2012 was five. In addition, the represented range of precipitation amount associated with five cyclones per year was 60-87% of the total precipitation falling in the summer during their specific seasons".

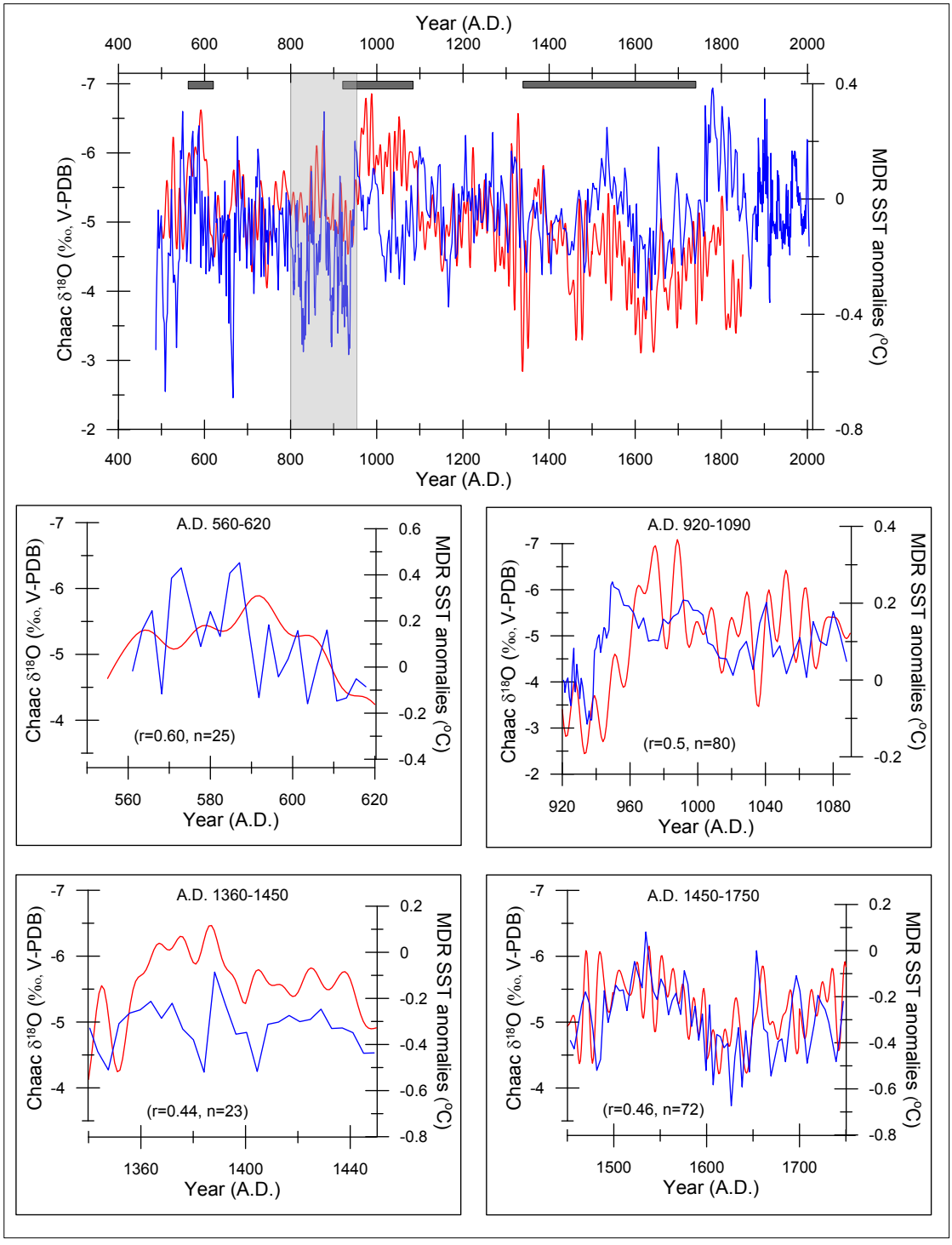

Figure S2. Comparison between the stalagmite Chaac precipitation record (Medina-Elizalde et al., 2010) (blue line) and the MDR SST reconstruction (Mann et al., 2009)

(red line) over time windows when these records show significant statistical correlation (CI 95%). These specific time windows are indicated on the complete time series (Top, gray bars). Correlation analyses results are shown (correlation coefficient, r) and are significant at $p<0.05$ (Paillard et al., 1996). Comparisons are based on linearly detrended data and MDR SST data interpolated to the average time resolution of the stalagmite record.

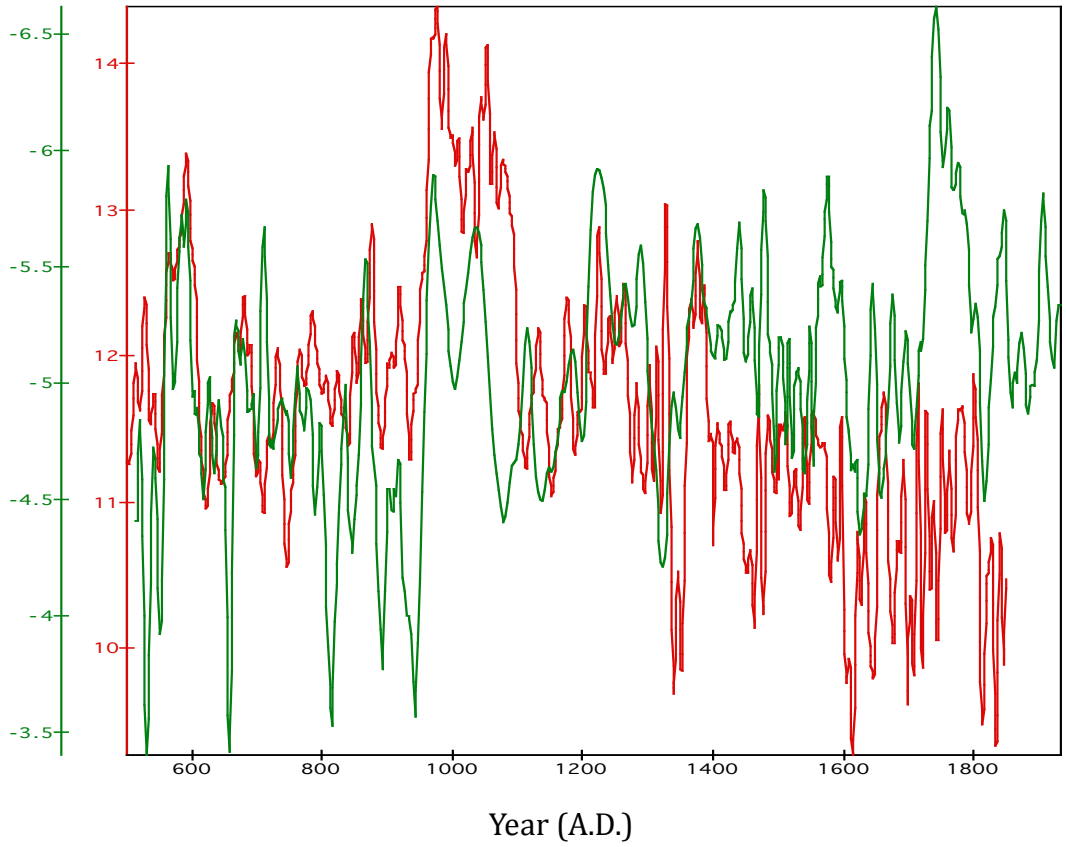

Figure S3. Stalagmite Chaac $\delta^{18}O$ (Green, per mil, V-PDB) and TC count records (Red) (Mann et al., 2009) superimposed on each other. The Stalagmite Chaac $\delta^{18}O$ chronology is based on visual alignment using the TC count record as the reference series. Graphic

tuning is based on 12 tuning points (Table S1, below). Average age adjustment of the original Chaac chronology was 20 years, which is well within its U-Th chronological uncertainties (±38-112 years) (Medina-Elizalde et al., 2010). The correlation between these records is significant (r=-0.42, p<0.01) (See below).

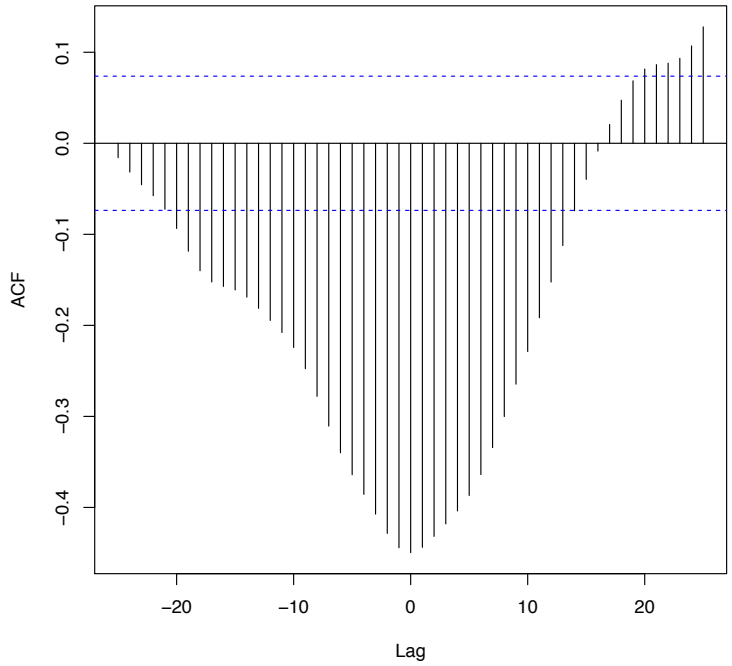

Figure S4. Cross-correlation analysis of the TC counts record (Mann et al., 2009) and the Stalagmite Chaac $\delta^{18}O$ record (tuned) shown in Figure S1. The correlation is statistically significant (r= -0.42, p<0.01).

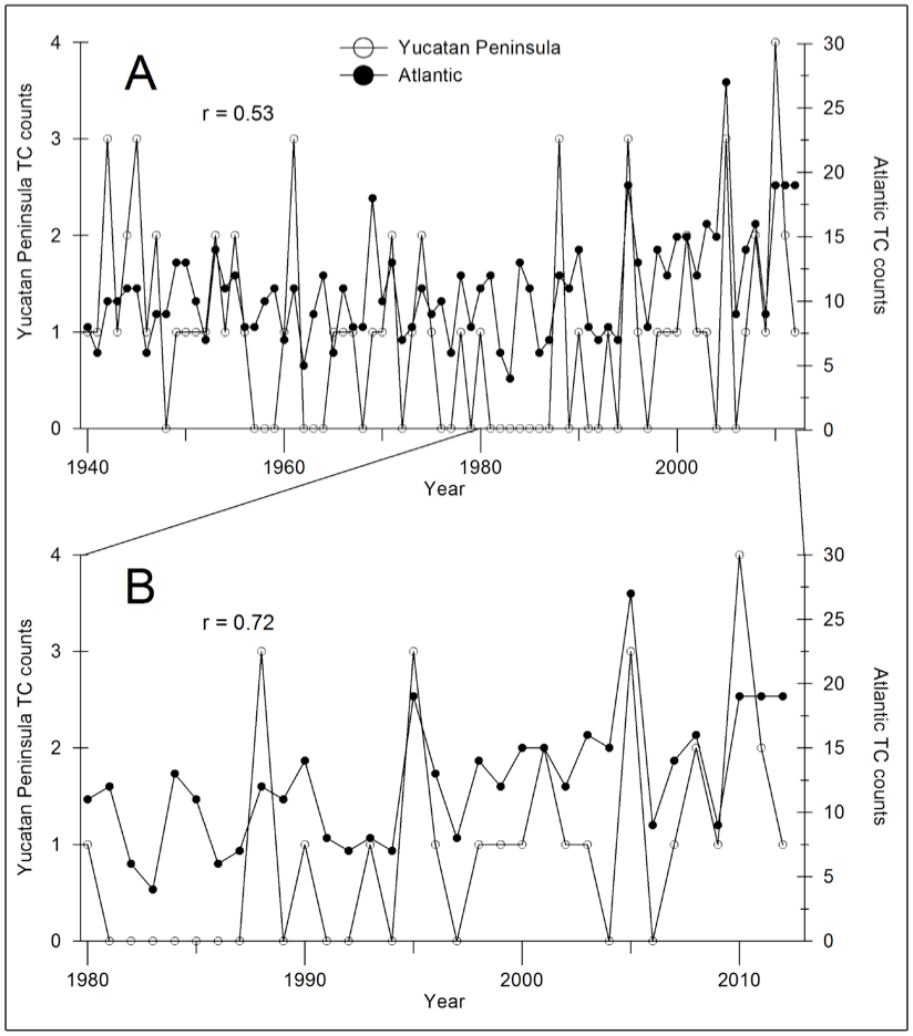

Figure S5. (A) Comparison between instrumental records of named tropical storms and hurricanes in the Atlantic and that made landfall or passed within 100 Km from the Yucatan Peninsula (1940 and 2012). (B) Blow up of (A) showing the interval from 1980 to 2012. Cyclone position data is based on the best track data (NHC/NOAA). Cross-correlation analyses results (correlation coefficient, r) are shown (Paillard et al., 1996).

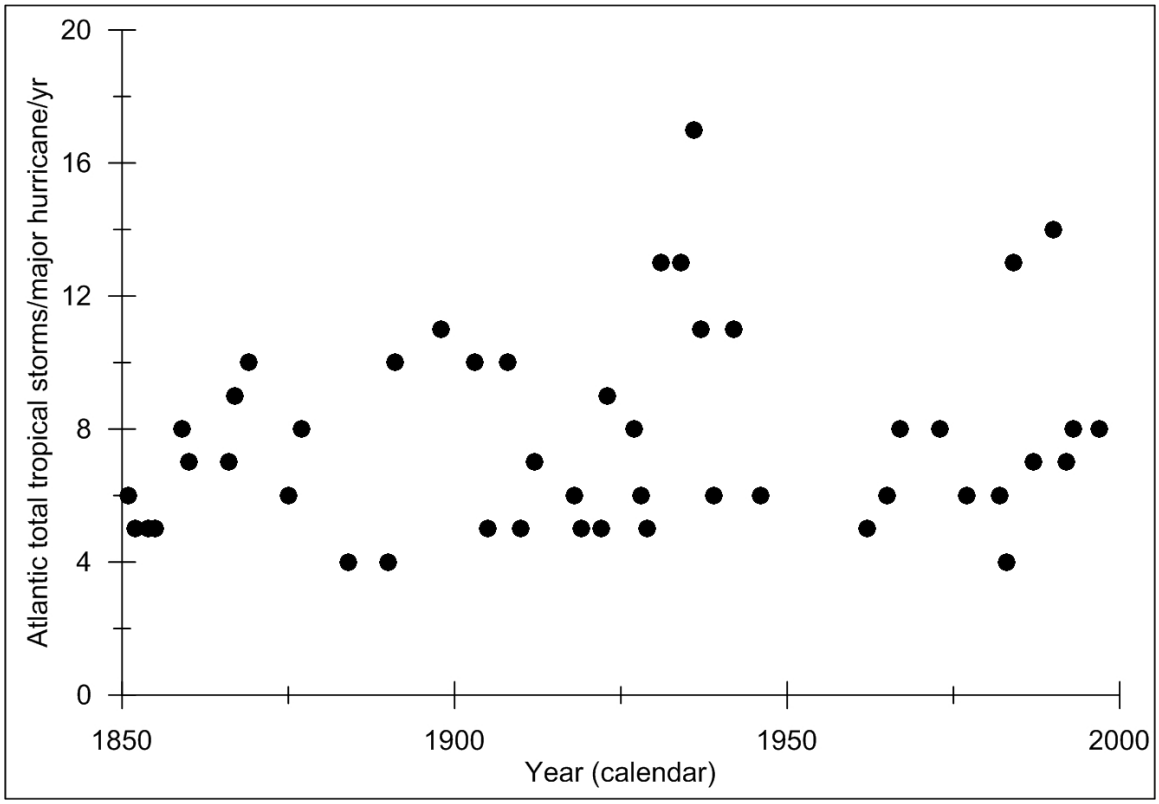

Figure S6. Total Atlantic basin named storms (tropical storms and hurricanes) during years when only one major hurricane (Saffir-Simpson hurricane scale 3, 4 or 5) formed in the Atlantic (n=47 years) (1852-2012). Years when more than one major hurricane formed in the Atlantic basin were therefore excluded from this plot (n=115 years). Data based on the Atlantic hurricane database (NOAA-HURDAT). Because tropical storms and hurricanes spend much of their lifetime over the open ocean, some never making landfall, many storm systems were not recorded during the late 19th and early 20th Centuries (Vecchi and Knutson, 2008). This image illustrates that the maximum number of storms associated with one major hurricane was seventeen and the minimum four. The

formation of only one major hurricane in the Atlantic basin, therefore, does not unequivocally signal an active hurricane season.

Table S3. Tuning points from visual alignment between the Stalagmite $d^{18}O$ record (distorted series) and the TC count record (reference series) (Mann et al. 2009). The average age difference between the original and tuned chronology of the Chaac $\delta^{18}O$ record is 20 years, within the U-Th-date uncertainties of the stalagmite record (Medina-Elizalde et al., 2010)

Original time scale (Year C.E.)	Tuned time scale (Years C.E.)	Age difference (original vs tuned)
541.3	557.0	15.7
670.5	652.8	17.8
773.2	753.9	19.3
888.7	884.3	4.4
942.2	955.0	12.8
1006.2	1095.5	89.3
1338.7	1335.1	3.6
1459.8	1465.6	5.8
1490.8	1481.0	9.8
1592.5	1601.2	8.8
1759.3	1747.2	12.2
1856.7	1807.9	48.8

References

Mann, M. E., Woodruff, D. J., Donnelly, P. J., and Zhang, Z., 2009. Atlantic hurricanes and climate over the last 1,500 years: Nature, v. 460, p. 880-885.

Mann, M. E., Zhang, Z., Rutherford, S., Bradley, R. S., Hughes, M. K., Shindell, D., Ammann, C., Fluvegi, G., and Ni, F., 2009, Global Signatures and Dynamical Origins of the Little Ice Age and Medieval Climate Anomaly: Science, v. 326, p. 1256-1260.

Medina-Elizalde, M., Burns, S. J., Lea, D. W., Asmerom, Y., von Gunten, L., Polyak, V., Vuille, M., and Karmalkar, A., 2010, High resolution stalagmite climate record from the Yucatan Peninsula spanning the Maya terminal classic period: Earth and Planetary Science Letters, v. 298, no. 1-2, p. 255-262.

Paillard, D., L. , Labeyrie, L., and Yiou, P., 1996, Macintosh program performs time-series analysis: EOS Trans. AGU, v. 77, p. 379.

Vecchi, G. A., and Knutson, T. R., 2008, On Estimates of Historical North Atlantic Tropical Cyclones Activity: Journal of Climate, v. 21, p. 3580-3600.