Supplementary Information for: Spatial and temporal variability of Terminal Classic Period droughts from multiple proxy records on the Yucatan Peninsula, Mexico.

S1 Available proxy data

Proxy records and the corresponding age model information used in this study are available from previous studies on the Yucatan Peninsula (Table S1). These twenty-three records are thought to represent changes in the climate, although each proxy type is likely affected by different climate variables.

The 23 records were collected from six sites on the Yucatan Peninsula and one site (Barranca de Amealco) in Central Mexico (see Figure 1 in main text). Of these records, 18 are oxygen isotope ($\delta^{18}O$) type proxies (fossil shells and speleothems), three are a calcite-encrusted algae proxy, three are mineralogical proxies, and one is a tree ring reconstruction.

12 **Table S1. Proxy data collected from the Yucatan Peninsula. One record (Barranca de Amealco) is from Central Mexico.**

Site	Location (Latitude, Longitude)	Elevation (masl)	Type of Proxy	Proxy name	Sample resolution	Dating method	Source
Aguada X'Caamal*	20.60°N, 89.70°W	-	Ostracod $\delta^{18}O$	*D. stevensoni (3 samples)*	3-10 years	Radiocarbon	Hodell et al. (2005a)
Aguada X'Caamal	20.60°N, 89.70°W	-	$\delta^{18}O$ of calcite encrusted algae	Chara (3 samples)	3-10 years	Radiocarbon	Hodell et al. (2005a)
Aguada X'Caamal	20.60°N, 89.70°W	-	Gastropod $\delta^{18}O$	*P. coronatus (3 samples)*	3-10 years	Radiocarbon	Hodell et al. (2005a)
Chichancanab*	19.89°N, 88.78°W	4	Ostracod $\delta^{18}O$	*Cyprinotus sp.*	17-21 years	Radiocarbon	Hodell et al. (1995)
Chichancanab*	19.89°N, 88.78°W	4	Gastropod $\delta^{18}O$	*Pyrgophorus sp.*	17-21 years	Radiocarbon	Hodell et al. (1995)
Chichancanab*	19.89°N, 88.78°W	4	Ostracod $\delta^{18}O$	*Physocypria sp.*	17-21 years	Radiocarbon	Hodell et al. (1995)
Lake Petén-Itzá (Guatemala)*	16.92°N, 89.83°W	80	Ostracod $\delta^{18}O$	*Cytheridella ilosvayi*	10-28 years	Radiocarbon and ^{210}Pb	Curtis et al. (1998)
Lake Petén-Itzá (Guatemala)*	16.92°N, 89.83°W	80	Gastropod $\delta^{18}O$	*Pyrgophorus sp.*	10-52 years	Radiocarbon and ^{210}Pb	Curtis et al. (1998)
Punta Laguna*	20.63°N, 87.5°W	18	Gastropod $\delta^{18}O$	*Pyrgophorus coronatus*	5-24 years	Radiocarbon	Curtis and Hodell (1996)
Punta Laguna*	20.63°N, 87.5°W	18	Ostracod $\delta^{18}O$	*Cytheridella ilosvayi*	5-24 years	Radiocarbon	Curtis and Hodell (1996)
Chichancanab	19.89°N, 88.78°W	4	Mineralogical proxy	Calcite (%$CaCO_3$)	16-21 years	Radiocarbon	Hodell et al. (1995)

Site	Location (Latitude, Longitude)	Elevation (masl)	Type of Proxy	Proxy name	Sample resolution	Dating method	Source
Chichancanab*	19.89°N, 88.78°W	4	Mineralogical proxy	Sediment density	2-6 years	Radiocarbon	Hodell et al. (2005b)
Lake Peten-Itza (Guatemala)*	17.00°N, 89.78°W	80	Mineralogical proxy	Magnetic Susceptibility	5 years	Radiocarbon	Escobar (2010)
Tzabnah Cave, Tecoh	20.74°N, 89.48°W	20	Speleothem $\delta^{18}O$	Speleothem (Chaac)	1-8 years	U-Th dating	Medina-Elizalde et al. (2010)
Barranca de Amealco (Central Mexico)	19.79°N, 91.03°W	2,605	Tree Ring Reconstruction	Palmer Drought Severity Index (PDSI) reconstruction	1 year	Dendro-chronology	Stahle et al. (2011)
Macal Chasm, Belize	16.883°N, 89.108°W	530	Speleothem $\delta^{18}O$	Macal Speleothem	1-10 years	U-Th dating	Akers et al. (2016)
Yok Balum Cave, Belize	16.208°N, 89.074°W	366	Speleothem $\delta^{18}O$	Yok Balum Speleothem	1 year	U-Th dating	Kennett et al. (2012)

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S2 Changepoint analysis graphs

The results of the changepoint analysis are shown in graphical form below to illustrate where significant changes in the mean and variance occur. In each graph, the TCP is highlighted in orange. Note that due to the inability of the changepoint package in R to include missing values, the TCP appears to be of a different length in each graph; however, the orange highlighted section represents the relative number of observations in each proxy record that fall within the TCP. Therefore, the x-axis on these graphs does not represent true time; rather it is an index that represents the position of each observation in the time series. An index of zero represents the measurement closest to the present day, with an increasing index indicating measurements further into the past.

In Figure S1, the mean of the entire time series is shown in blue on the mean changepoint graphs. Changepoints in the mean are indicated by a break in the horizontal red line. For all records, a segment of the record with a mean below the blue line indicates decreased moisture availability, while a segment with the mean above the blue line indicates a period of increased moisture availability. The shaded blue area indicates a 20% change in the mean.

In Figure S2, changes in the variance are shown by vertical red lines at the location where the changepoint occurs.

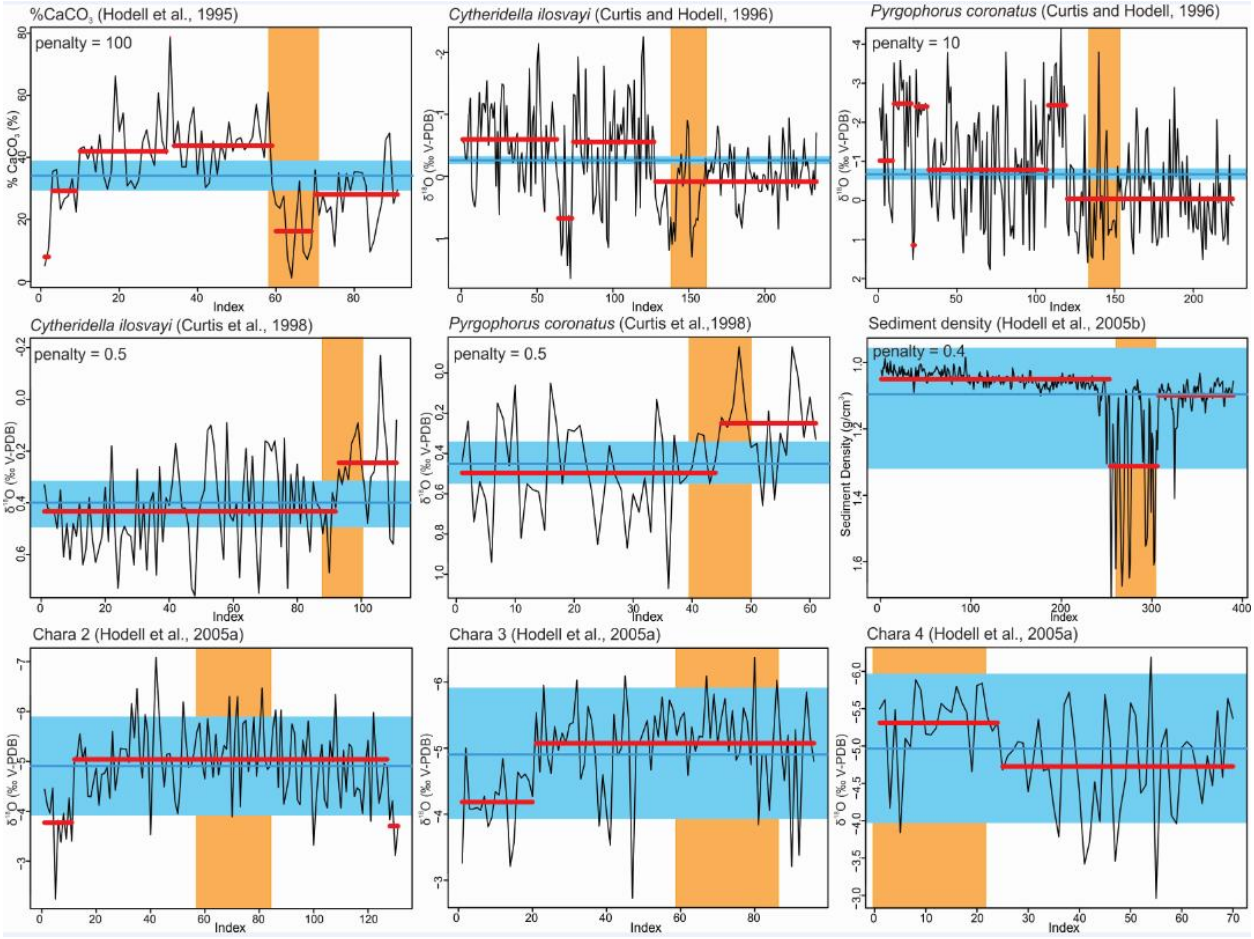

Figure S1 Results of the changepoint analysis for 23 proxy records from the Yucatan Peninsula. Horizontal red lines indicate where changepoints in the mean value of the proxy record occur. The blue horizontal line shows the mean of the entire time series, while the blue shaded area represents a 20% change in that mean. The orange shaded area highlights the TCP in each record. An index of zero represents the measurement closest to the present day, with an increasing index indicating measurements further into the past.

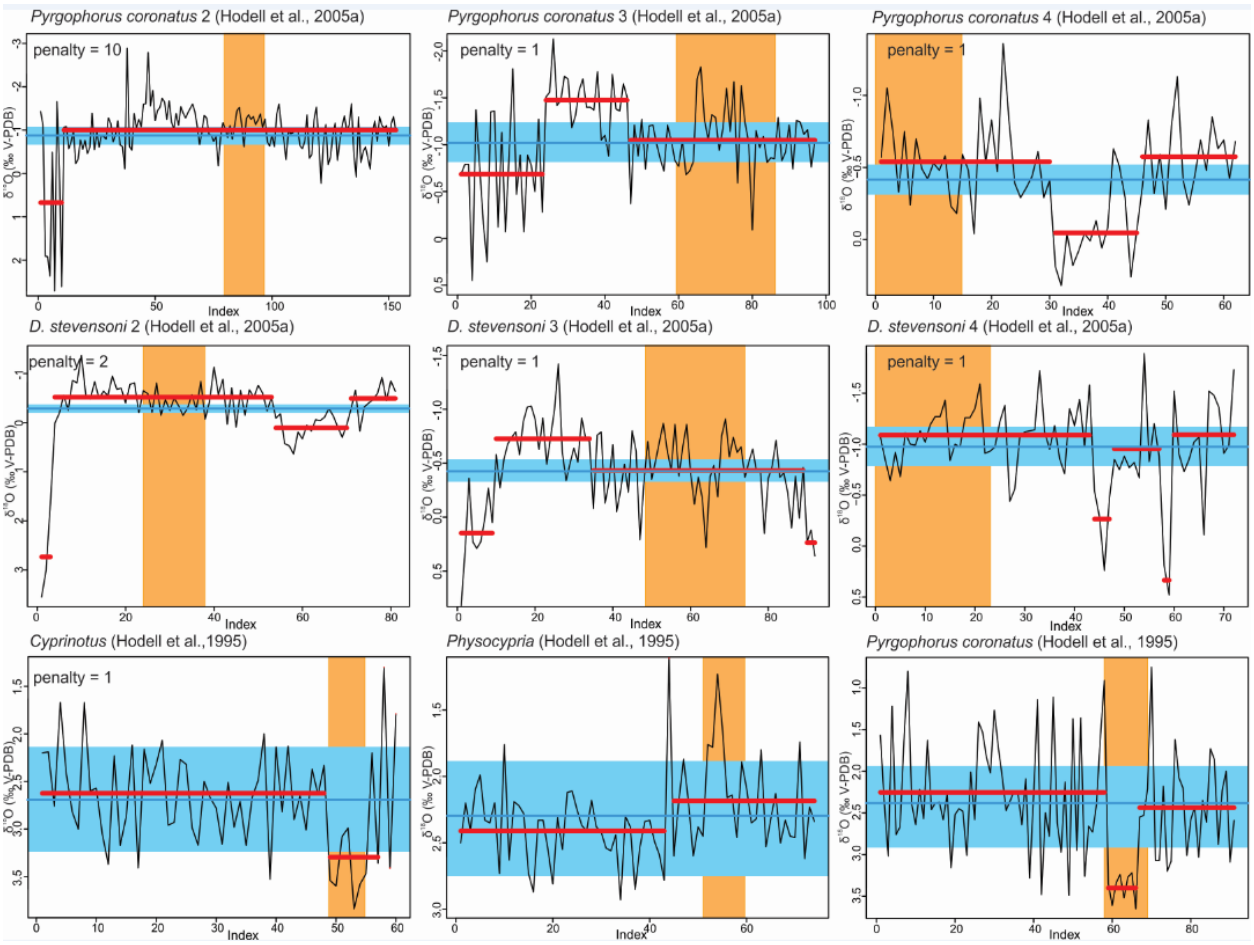

Figure S1 Continued: Results of the changepoint analysis for 23 proxy records from the Yucatan Peninsula. Horizontal red lines indicate where changepoints in the mean value of the proxy record occur. The blue horizontal line shows the mean of the entire time series, while the blue shaded area represents a 20% change in that mean. The orange shaded area highlights the TCP in each record. An index of zero represents the measurement closest to the present day, with an increasing index indicating measurements further into the past

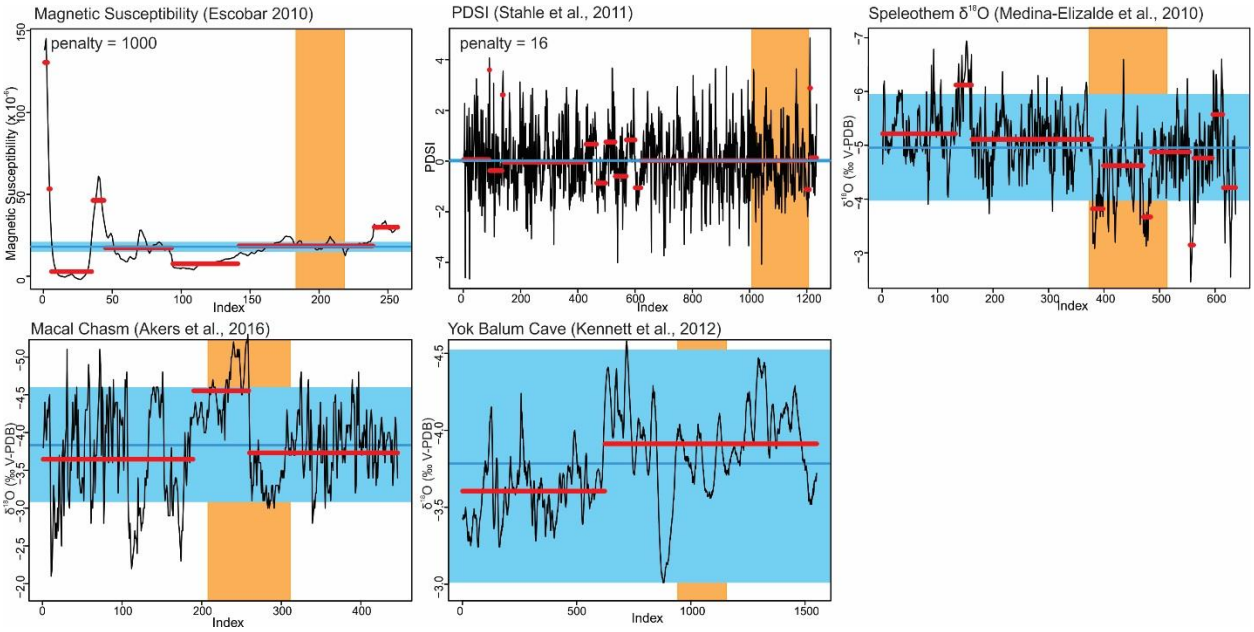

Figure S1 Continued: Results of the changepoint analysis for 23 proxy records from the Yucatan Peninsula. Horizontal red lines indicate where changepoints in the mean value of the proxy record occur. The blue horizontal line shows the mean of the entire time series, while the blue shaded area represents a 20% change in that mean. The orange shaded area highlights the TCP in each record. An index of zero represents the measurement closest to the present day, with an increasing index indicating measurements further into the past.

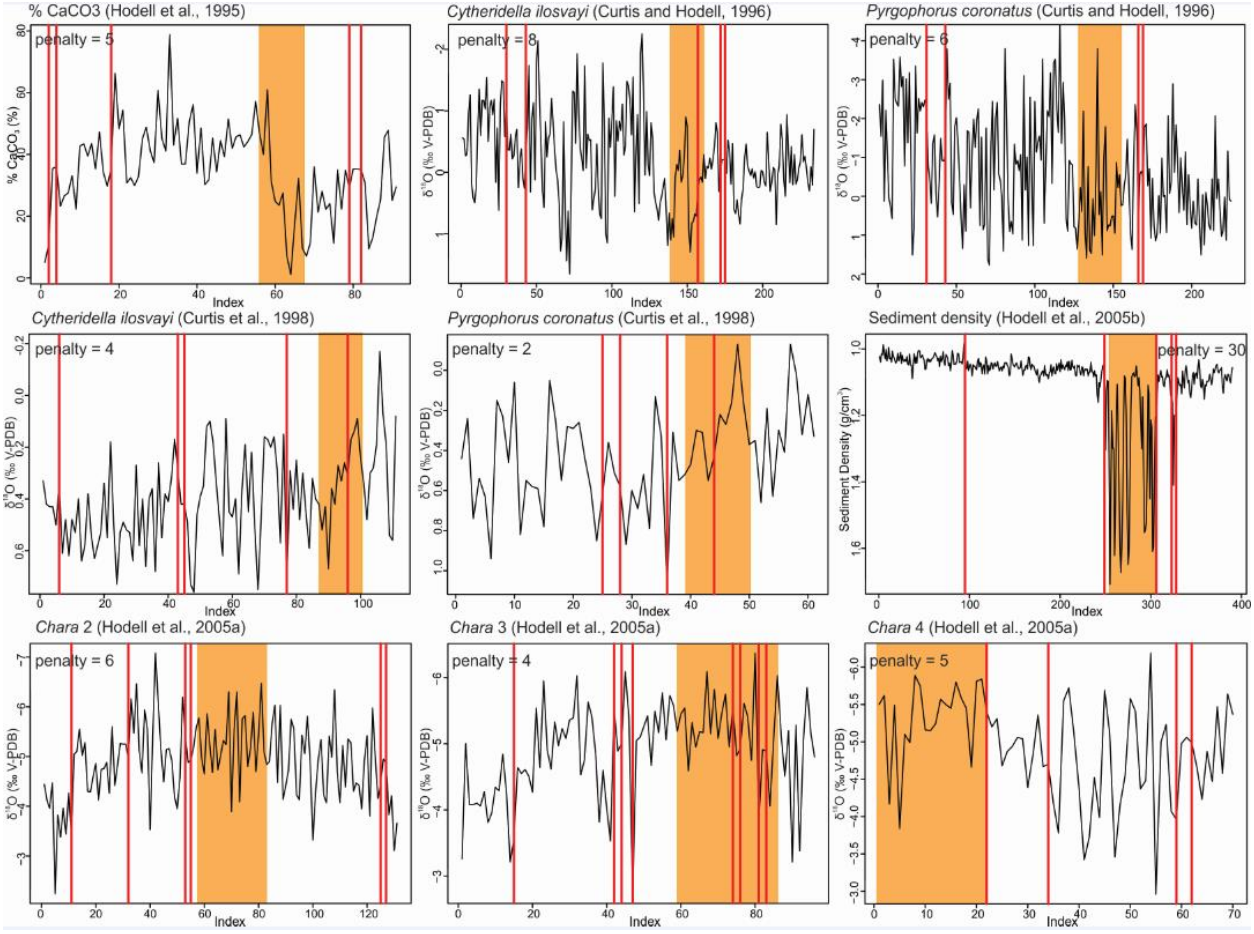

Figure S2 Results of the changepoint analysis for 23 proxy records from the Yucatan Peninsula. Vertical red lines indicate where changepoints in the variance of the proxy record occur. The orange shaded area highlights the TCP in each record. An index of zero represents the measurement closest to the present day, with an increasing index indicating measurements further into the past.

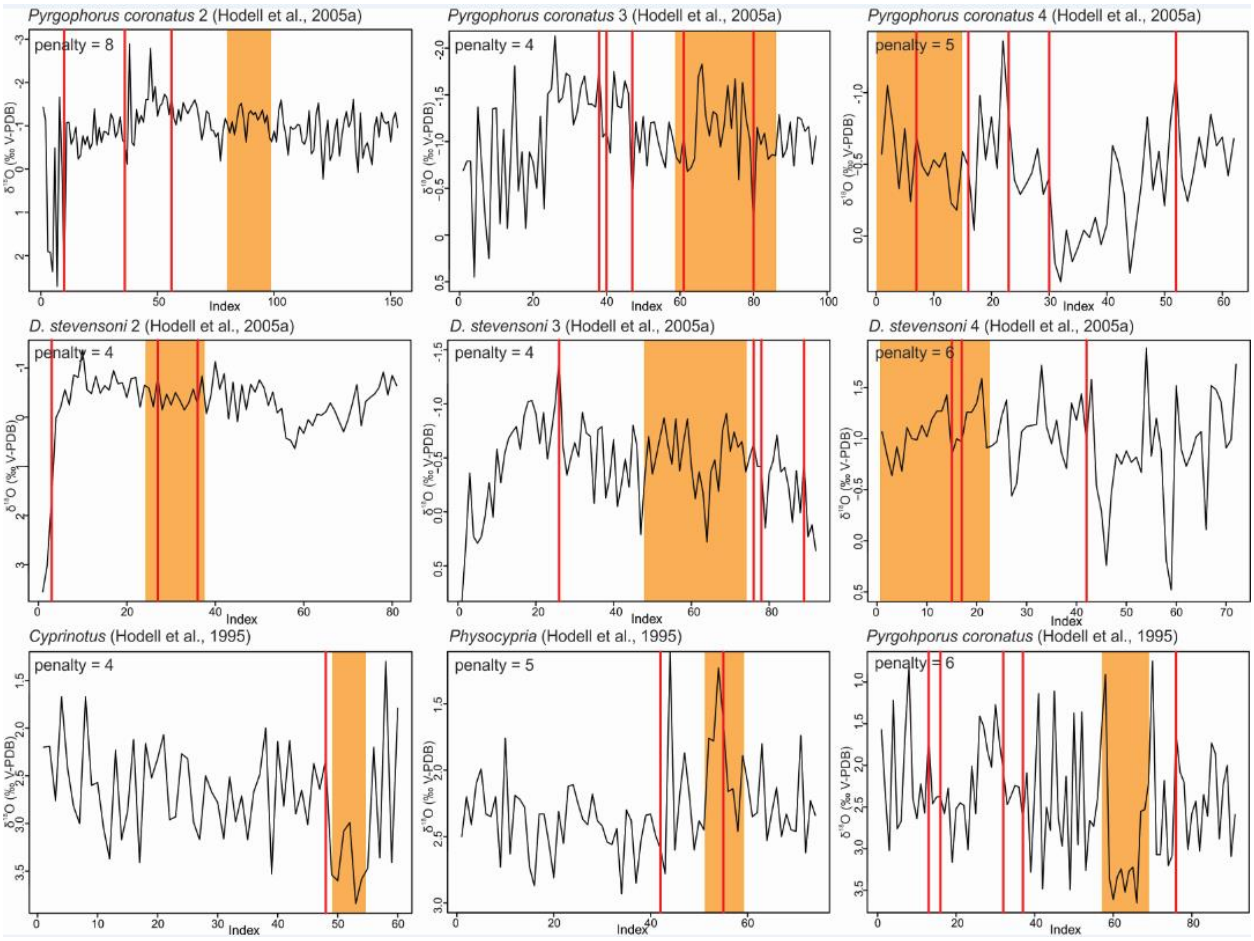

Figure S2 Continued: Results of the changepoint analysis for 23 proxy records from the Yucatan Peninsula. Vertical red lines indicate where changepoints in the variance of the proxy record occur. The orange shaded area highlights the TCP in each record. An index of zero represents the measurement closest to the present day, with an increasing index indicating measurements further into the past.

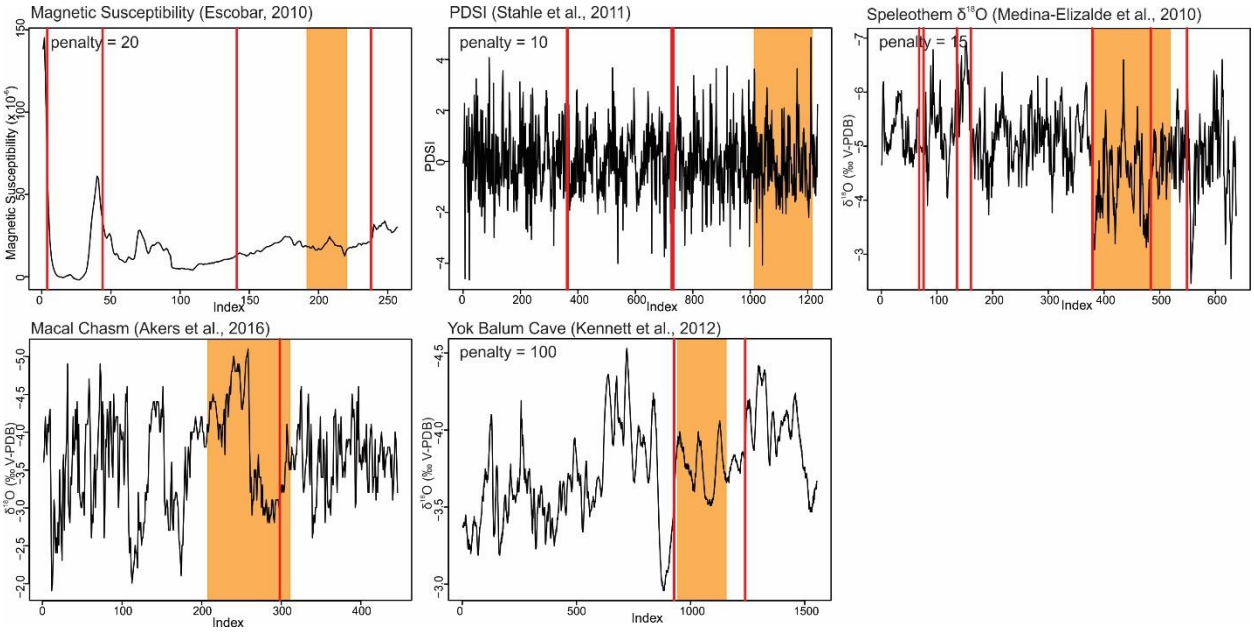

Figure S2 Continued: Results of the changepoint analysis for 23 proxy records from the Yucatan Peninsula. Vertical red lines indicate where changepoints in the variance of the proxy record occur. The orange shaded area highlights the TCP in each record. An index of zero represents the measurement closest to the present day, with an increasing index indicating measurements further into the past.