Clim. Past Discuss., 6, C400–C402, 2010
www.clim-past-discuss.net/6/C400/2010/

Climate of the Past Discussions

Interactive comment on "Climate change and the demise of Minoan civilization" *by* A. A. Tsonis et al.

K. Anchukaitis

kja@ldeo.columbia.edu

Received and published: 7 July 2010

There is considerable interest in identifying potential linkages between societal events and past climate variability. This manuscript, 'Climate change and the demise of Minoan civilization', seeks to do this for the case of the Minoan civilization by establishing a possible connection between the ENSO system and climate at the time of the collapse of that civilization.

Unfortunately, however, the manuscript has problematic gaps that make it difficult to adequately relate the trajectory of Minoan civilization to the paleoclimate history of El Nino in a robust way:

1. Correlation fields between reconstructed ENSO and European-Mediterranean win-

ter precipitation (described by the authors on Page 805, Lines 2-17): As noted by the authors themselves, the correlations between the reconstruction and the historical climate field are quite weak. The authors go on to state that 'While correlations may be weak the spatial structure is nevertheless non-random', but in fact this behavior would also be expected of even a random time series evaluated against a climate field with spatial autocorrelation (see, for instance, Livezey and Chen 1983 or Wang and Shen 1999). Therefore, the appearance of a weak but nonrandom (coherent) spatial correlation pattern cannot alone be evidence of a real mechanistic relationship (linear or otherwise) between the time series and the field.

It would also be ideal to supplement the paleoclimate correlations in Figure 2 by looking at the correlation using instrumental observational data and historical gridded data. Better not to rely here only on the proxy paleoclimate data with its additional uncertainties.

Note that Bronnimann 2007 Figure 4 suggests wetter conditions after some El Ninos and dry conditions following both El Nino and La Nina events over the Mediterranean). The El Nino signal – if it exists – is clearly very complicated both spatially and temporally over this broad region, and neither paleoclimate nor observational data would seem to provide any conclusive support for a robust remote influence of the tropical Pacific on the climate of Crete itself. Would not local broad-scale modes (e.g. NAO) be a more likely, more robust influence on Crete-local climate?

2. El Nino reconstructions (Page 806, Line 5 onward, Figure 4): The authors here consider one ENSO proxy from the tropical Pacific spanning the time period of interest, but since the study by Moy et al. (2002) there have been several other attempts to understand the long-term (Holocene) history of El Nino that include the time period of interest here (for instance, see Conroy et al. 2008, their Figure 8), and the evidence for a period of increased or exceptional ENSO strength or frequency is not uniform amongst them. Evidence suggesting an increase in ENSO frequency or magnitude since the mid Holocene is not of direct relevance to the question of the later Minoan

civilization's demise vis a vis ENSO variability.

3. Local evidence for drought: Although much of the paper is based on a theoretical association between ENSO and precipitation over Crete (one that emerges in a model but not robustly from observational and paleoclimate data), the authors also cite two local paleoecological records to support the idea of El Nino-driven drought during the time of the Minoan collapse. However, the citation to Magill is an AGU Fall Meeting abstract – delivered as a talk or poster in 2005 but as-yet unpublished, and the citation to Moody 2005 is not in the manuscript's reference list (a quick Web of Science search found no apparent matching journal paper). It is therefore not possible at this moment to evaluate the extent to which these two records might or might not support the existence of localized drought at the time of the collapse. For instance, some species of Tilia are actually quite drought tolerant, and its disappearance from a pollen record might very well reflect the fact that pollen evidence from sediment includes a (sometimes strong) human influence on the landscape.

4. Figure 5 It is difficult to tell what is being compared here. Presumably the Mann et al. time series in blue is the reconstruction used in Figure 2, but what is the line identified as 'coral data'? The only other mention of coral data in the text is to Figure 4, which shows the Moy et al. lake sediment record. Also, how is the frequency of events calculated here from these two records? The labeling 'Years Before 1980' is also non-standard and confusing.

While it remains an interesting hypothesis, neither the evidence for a remote teleconnection nor a coincident local drought is sufficient here thus far to support the main idea of the paper that ENSO-mediated drought in Crete caused the collapse of the Minoan civilization.

Interactive comment on Clim. Past Discuss., 6, 801, 2010.