Toth and Aronson Response to Reviewer #3

Summary: This is a discussion paper, rather than a paper in which new data are presented. This discussion paper summarizes the authors' research on the impacts of El-Nino Southern Oscillation variability on the coral reefs of Pacific Panama. The Pacific coast of Panama is a particularly suitable location to study this question, because it hosts coral reefs in settings that are affected by upwelling (Gulf of Panama) and not affected (Gulf of Chiriqui). The summary of those impacts allows the authors to propose that tropical, rather than high-latitude, climatic shifts may have been responsible for triggering the climate shift at 4.2 ka that marks the transition from the middle to the late Holocene. The authors summarize the oceanography, ecology, and paleoceanography of Tropical Eastern Pacific coral reefs en route to proposing a tropical driver for this event.

Evaluation: The authors' arguments are based upon well-supported data in their region, and seem to make sense from the perspective of Pacific Panama. What the manuscript lacks is a broader geographic perspective on paleoecological changes in tropical coral reefs around the 4.2 ka event. The authors present maps of sea surface temperature anomalies during two El-Nino and two La-Nina events between 1988 and 2011, showing the distribution of thermal anomalies in relation to the distribution of coral reefs. The authors also present a table listing other regions with reported perturbations to coral reef systems (broadly) around 4.2 ka., but do not discuss these at great length. The next step, perhaps too ambitious for a discussion paper like this one, is to compare these changes, and also to compile examples of Pacific and Indian Ocean tropical coral reefs that were not affected by climatic changes at that time, to help decipher the global climatic changes affecting tropical coral reefs at 4.2 ka. While some of these data have already been compiled (see for example chronologies of Holocene reef growth in Montaggioni 2005, and Montaggioni & Braithwaite 2009), they still need to be compared to make a global analysis of synchronous climatic impacts on coral reefs at that time. For example, many of the changes to Holocene reef growth rates can be modulated by sea level and accommodation space, rather than by climatic change. Other explanations in particular cases relate to wave climate, apparently tied to ENSO (Roomey et al 2004, cited by the authors). Hence, the paper largely serves its purpose, to stimulate discussion and point to new research directions, but it does not conclusively demonstrate a tropical, specifically ENSO-related, driver to the 4.2ka shift in climate.
We thank Evan for his positive view of the manuscript. His comment about sea level and other drivers of reef accretion echoes suggestions in the other reviews, and we agree. Accordingly, we have added language to Section 5 pointing out that the hiatus, putatively driven by ENSO variability, could have been modulated by other factors such as variations in relative sea level.

References:
Montaggioni, L., 2005. History of Indo-Pacific coral reef systems since the last glaciation: development patterns and controlling factors. Earth Science Reviews 71: 1-75.
Montaggioni, LF., Braithwaite, CJR, Quaternary coral reef systems: development processes and controlling factors. Developments in Marine Geology 5.