

## ***Interactive comment on “Technical Note: Multi-centennial scale analysis and synthesis of an ensemble mean response of ENSO to solar and volcanic forcings” by J. Sánchez-Sesma***

**Anonymous Referee #2**

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Mann et al. (2005) used Zebiak-Cane model to suggest that changes in the mean state and interannual variability in El Niño in past centuries could be largely explained as the response of tropical Pacific coupled ocean–atmosphere system to past volcanic radiative forcing. In the current paper, the author uses a combination of (linear) harmonic function and (non-linear) self-similarity component in an attempt to construct a statistical model for the simulated El Niño over the last 1000 years produced by Mann et al. (2005). The highlight of the paper is the future projection that the La Nina-like condition may prevail in the tropical Pacific throughout the 21st century. The paper is written logically. The methodology is clearly explained. Therefore, this paper is potentially publishable. However, I have some major concerns about the methodology that

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the author needs to consider.

Major comments:

1) What are the processes that support the 908-year period oscillation, which is the largest signal according to Figure 2 and Figure 3?

2) How can one make a prediction that 908-year cycle be repeated in the future, when the original data is only 1000yrs long? As described in Enfield and Cid-Serrano (2006), a much long-term data is needed for a statistically significant projection. I suggest that the author carefully review Enfield and Cid-Serrano (2006) to improve the statistical modeling used in this paper.

Enfield, D.B., and L. Cid-Serrano. Projecting the risk of future climate shifts. *International Journal of Climatology*, 27(6):885-895 2006

3) What is the statistical significance of the projected change shown in Figure 3c?

4) The volcanic activity of the 21st century is unknown. With that uncertainty, how does the Zebiak-Cane model projects the El Niño of the 21st century?

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