

## ***Interactive comment on “Implications of the permanent El Niño teleconnection “blueprint” for past global and North American hydroclimatology” by A. Goldner et al.***

### **Anonymous Referee #1**

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#### General Comments:

This study aims to reconcile the difference between the proxy data and future predictions for North America using a global climate model and high-resolution nested model, focusing on the hydroclimatology of this region. The authors attribute the changes in precipitation to the low SST gradient recorded in the Early Pliocene and resulting teleconnection patterns.

Overall, the paper is well written, with a thorough and interesting results section. I believe the scientific questions addressed in the paper are relevant and the methods used represent a new approach to studying teleconnection patterns in the Pliocene.

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#### Specific Comments

1) I found it difficult to determine the time period used in the study as 'Miocene, previous to early Pliocene, Pliocene and pre-quaternary' are used interchangeably.

2) The term 'Permanent El Nino-like mean state' does not necessarily mean a permanent El Nino existed and proxy data from the pre-quaternary is unable to capture interannual variability. I would be careful with the terminology used in the introduction. It would be better to highlight that for this study, the assumption that a permanent El Nino state characterized pre-quaternary climates is used.

3) It would be useful to have some references for the proxy data mentioned from the western USA that suggests drier conditions (page 1, lines 18-21).

4) Although a permanent El Nino state may be a 'good explanation' for the patterns observed, it may not be the only one. Bonham et al., have shown an alternative hypothesis for the patterns identified in Molnar and Cane 2002, which should be addressed (reference missing page 202, last paragraph).

Bonham, S., Haywood, A., Lunt, D., Collins, M., and Salzmann, U. El Nino-Southern Oscillation, Pliocene climate and equifinality. *Philosophical Transactions of the Royal Society A.*, 367(1886):127, 2009. DOI: 10.1098/rsta.2008.0212.

5) Modern boundary conditions are used (sea ice, orography and land cover etc) and it is implied that these would not affect the teleconnection patterns recorded. However previous work has shown that the majority of the temperature and precipitation patterns recorded in the proxy data for the Pliocene can be reproduced through boundary condition changes alone without a permanent El Nino-like state (Bonham et al.). Although the patterns recorded over North America in this study may be forced by a permanent El Nino (page 205, line 5) I think it should at least be noted that they may also be caused by other mechanisms.

6) In the methods section, it was unclear whether SSTs are fixed, or simply fluctuate at

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a frequency greater than 3 years. Also, with the description 'anomalies are constant in all months' does this mean for one year or the whole of the timeseries?

Technical corrections:

Page 201, line 1: Reference needed for statement regarding global temperature and precipitation for the Miocene and Pliocene.

Page 202, Line 6: space missing between 'change, there..'

Page 202, line 10: terminology: the proxy data suggests a permanent El Nino-like state not permanent El Nino.

Page 203, line 4: spelling 'Emphasize'.

Page 203, lines 9-11: this sentence appears to be repeating what was previously said in lines 4-6.

Page 205, line 27: acronym US needs to be defined.

Page 206, line 24: missing brackets around reference.

Page 207 line 23: capital 'A' on annual-mean.

Page 211, Equation 1: define sigma as growth rate for easier reading and units for all other variables.

Page 213, line 8: figure 12 appears to be mentioned before figure 11; you might want to double check this and swap the figures around.

Some of the figures aren't labelled with a-e.

Figure 3: green contours in (a) difficult to read, equation for (d): variables need to be defined and missing units for (f).

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Interactive comment on Clim. Past Discuss., 7, 199, 2011.