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Climate of the Past Discussions

Interactive comment on "Recent climate variations in Chile: constraints from borehole temperature profiles" *by* Carolyne Pickler et al.

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Response to comments by Anonymous Reviewer #1

We thank the reviewer for his/her thoughtful and constructive comments. We do agree with several points that he/she has made and we shall include his/her suggestions in the revised manuscript.

1. *The introduction section is rather long. The text could be tightened at a number of places, highlighting the shortcomings of previous work and how this paper addresses those shortcomings. Key references to similar studies from other regions (Europe, North America, Canada, India, etc.) may be cited.*

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The introduction will be revised to focus on key references, shortcomings of previous studies and how we address those.

2. *Other aspects that could be elaborated and/or investigated include, for example, (i) the choice of the lowermost 100 m for the linear regression*

   The bottom 100 m of the borehole approaches the steady state for the time scale of 300-500 years that we are considering. We have also inverted the temperature profiles for the GSTH as well as the reference surface temperature and gradient and found no difference with the inversion of the reduced profiles.

3. *...(ii) thermal conductivity contrasts in a borehole column*

   Unfortunately, rock samples were not available to measure thermal conductivity contrasts. These holes were not continuously cored and only a few cuttings had been recovered by the companies. Even the cuttings were no longer available because the storage facility in La Serena was damaged by a strong earthquake.

4. *...(iii) the choice of small time interval of 20 years for parameterization of the time before present*

   Tests were run with different time intervals and no significant differences were noted.

5. *The rock formations met with in the boreholes are not provided in the manuscript.*

   Lithological logs were only provided for borehole RC370. Sandstone makes up the majority of the lithology of this borehole. There are no obvious lithological changes which could be related to thermal conductivity variations. This information will be added to the manuscript as well as a summary description of boreholes sampled in 1994 outlined in Springer (1997) and Springer and Förster (1998).

6. *The authors may want to explore other meteorological station records in the region.*

   Unfortunately, very few weather stations have operated in the region. Their data have been include in the CRUTEM4 compilation (Jones et al., 2012) and we have used them for the Michilla and Inca de Oro gridpoints. In Figures 1 and 2, a decrease in temperature ($\sim$1-2 K) can be seen in the early-mid 1990s, consistent with meteorological data from Copiapó.

7. *Also, the recent warming could be discussed along with the information on land use changes in the region during the past few decades.*

   The sites are located in the Atacama Desert, an arid region with little to no vegetation. There has been no exploitation of the land at all and no changes that could could have played a significant role in the inferred recent warming.

8. *Minor comments: Tables 1, 2 and 3 could be combined into one table. If space is limited, this table could go as electronic supplement. Table 1: Qualify the last column header. Figure 1: Add a few place names for reference. Table 5: To values may be shown up to one decimal place. Fig. 14 may be deleted or included as electronic supplement.*

   These will be addressed in the revised manuscript.

References

Jones, P., Lister, D., Osborn, T., Harpham, C., Salmon, M., and Morice, C.: Hemispheric and large-scale land-surface air temperature variations: An extensive revision and an update to 2010, Journal of Geophysical Research: Atmospheres, 117, doi:10.1029/2011JD017139, 2012.

Springer, M.: Die regionale Oberflachenwarmeflussdichte-Verteilung in den zentralen Anden und daraus abgeleitete Temperaturmodelle der Lithosphare, Ph.D. thesis, Friene Universität Berlin, 1997.
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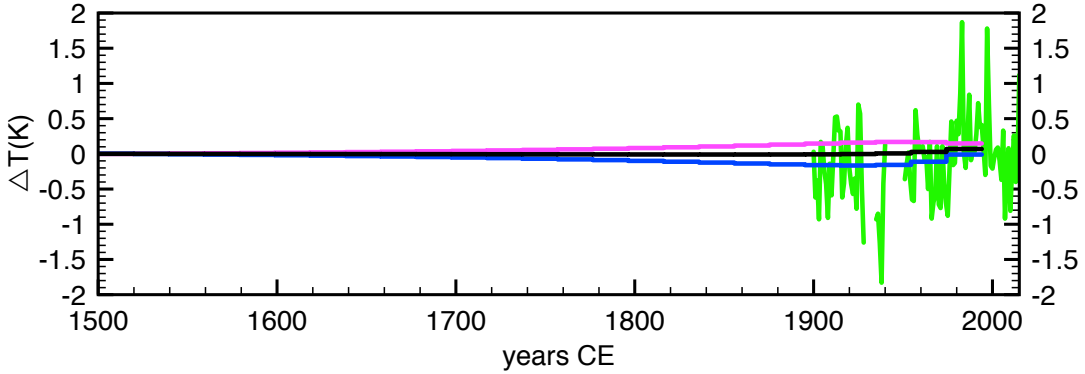

Fig. 1. GST history and meteorological data from the CRUTEM4 for northern coastal Chile (Michilla), presented with respect to the 1961-1990 mean.

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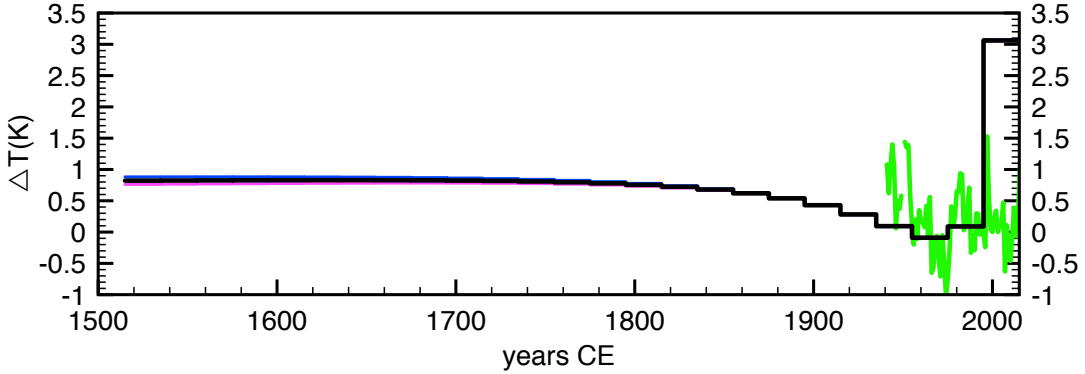

Fig. 2. GST history and meteorological data from the CRUTEM4 for Inca de Oro, presented with respect to the 1961-1990 mean

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