

## ***Interactive comment on “Borehole temperatures reveal a changed energy budget at Mill Island, East Antarctica over recent decades” by J. L. Roberts et al.***

**Anonymous Referee #1**

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General impression. Manuscript presents new borehole temperature data and its paleoclimatic interpretation. The new data and outputs are placed in the context of spatial and temporal climate change in the region where instrumental data are lacking. The technique (inverse models) applied for the research is proven valid for the borehole temperature data interpretation. The paper is well structured and provides almost sufficient number of illustrations. Paper will be greatly improved by referring to and comparing recently published results of similar work carried on in Antarctica. Presentation of the new results and analyses data of nearest meteorological stations (Mirny, Casey), coastal borehole paleoclimatic proxy data and inland borehole temperatures (Muto et al, 2011) could extend and make more certain conclusions made in the paper. The article

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will of interest for the Earth science researchers, it is definitely in the scope of The Cryosphere journal and can be recommended for publication with minor revisions.

2576, L 5. “. . . break in gradient between 49 and 69 m depth” A graph of the observed data versus depth would be helpful to illustrate that change in gradient.

2576, L7. The warming of 0.37°C per decade reported in the manuscript is smaller than 0.8 °C over the last two decades determined in West Antarctic (Orsi, A.J. and others, 2012) under significantly lower present surface temperatures. The difference could be briefly touched in the Discussion.

2578, L16. At the borehole temperatures reported in the manuscript one may expect surface melting that could be manifested in ice layers/lenses in the ice core. A short sentence on the ice core stratigraphy (thickness and concentration of ice layers/m versus depth) could clarify mechanism (melting, wet deposition, change of albedo, . . .) of the surface temperature rise. 2580, L13. Inverse models. A short message on how LSQR and PSO models differ or are similar to models used by MacAyeal, Cuffey, Clow and others would allow for the comparison between interpretations presented in the manuscript and reconstructions published previously.

2581, L13; 2582, L5, L7, L8, L9.” Effective Nye depth” – not sure it is a common term.

2583, L5. A bit confusing statement. Measured data presented versus depth, while Fig. 4 shows reconstructed temperature versus time.

2583, L23. 0.37 K decade<sup>-1</sup> ??? - see above comment 2576, L7.

2584, L6. Conclusions of the manuscript would be more robust if Discussion section will include data analyses of two coastal weather stations (Mirny and Casey).

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Interactive comment on The Cryosphere Discuss., 6, 2575, 2012.

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