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Interactive comment on "Ground surface temperatures indicate the presence of permafrost in North Africa (Djebel Toubkal, High Atlas, Morocco)" *by* Gonçalo Vieira et al.

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Reply to Reviewer 1

Dear Prof Enrique Serrano,

Thank you very much for the review and interest in manuscript. Your comments indicate a small number of formal edits, which we will apply in the final form of the manuscript, as well as two points which are weakest in the manuscript :

Comment by E. Serrano : Âń The comparison with the climatic conditions presents strong limitations, as the soil temperatures are compared with extrapolations. This is the weakest point, although with the above limitations, the work and the results are

useful to compare the estimated environmental conditions with the soil records. Âż

Reply by the authors : We agree with your comments. However, given the scarce data available for the highest reaches of the High Atlas, we think that this was the best approach that could be done. In particular, our goal was to evaluate if the data from the year 2015-16 is representative of the climate of the area and how it fits with the interannual climate variability. The comparison with data from the lowlands in the north (Menara) shows statistically significant correlations and we use it to frame the study period in a longer period, but accounting only for the regional climatic scale. Surely, this approach has limitations, but such limitations are also clear for the reader, allowing for a straightforward evaluation of the quality and problems with our assumptions.

Comment by Prof. E. Serrano : Âń The analysis of landforms is poor. A mapping of significant active periglacial landforms can support very good information, joint the snow permanence. Some active landforms are good indicators of permafrost or seasonal ice and have been used by numerous authors. In the text differences between lobate deposits and transverse ridges and furrows have been established. A greater accuracy on existing periglacial active landforms can allow the localization of frozen soils. Âż

Reply by the authors : Your are correct. However, the focus of this manuscript has been on ground surface temperatures and we have decided only to briefly mention the geomorphological phenomena across the section which we have analysed. The periglacial landforms are very limited spatially in this area, relatively monotonous (dominated by scree slopes) and the added value of a small-scale topographical map would not change our conclusions. Such an approach would also require much more field work and a different scope. This study was essentially prospective and given the results we have obtained, a future larger project is envisaged for the area. This project only benefited from funding for travel expenses for a few days. This is also the reason for the incipient monitoring approach.

We hope you accept our replies and we will improve the manuscript by including the

errata indicated. We will follow your comments and clarify the above-mentioned issues in the text.

Thank you ver much and our best wishes,

Gonçalo Vieira

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