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Interactive comment on "A high-fidelity multiresolution DEM model for Earth systems" *by* Xinqiao Duan et al.

Anonymous Referee #2

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This research presents a method for generating high quality DEMs at various resolutions, using a method that provides improved accuracy relative to commonly used heuristic methods, while retaining a relative computational advantage over smooth fitting approaches such as Kriging. The article is well written and the arguments appear to be well supported with references to literature in the field. The rational for developing a new method is clearly defined, and the topic area will be of interest to a wide audience.

My main concern with this manuscript is that it may be difficult for a general audience to follow due to the very technical language used, as well as the assumption of knowledge on behalf of the reader. For instance, section 1.3 is the first instance in which the reader is given an overview of the proposed method. In this section centroidal Voronoi tessellation, field control points, ground checking points, and clipping-based

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energy estimation are mentioned, assuming the reader knows what they are. Similarly sentences such as 'CVT is driven by a robust discrete curvature as density function, based on the curvature's ability on shape characteristics capturing and shape evolution' are difficult for a non-expert to understand. In order to be accessible to the full geoscience audience, the authors may wish to add a few paragraphs throughout that are written in a less technical manner in which key principles are explained assuming no prior experience in the field.

The manuscript may also be improved by adding some additional validation. As the title highlights the method is a 'high-fidelity multiresolution DEM model' it would be nice to show how the error statistics relative to other methods change over more resolutions and DEM point densities. Also, the authors highlight that there are many approaches one might use when generating a DEM. The validation is conducted against a classic heuristic approach which is defined in the introduction as sub-optimal but computationally efficient. It is interesting that the new method is more accurate, however, it would also be interesting to know how it performs against a wider range of methods. If it is feasible to add this extra analysis it would be a good addition to the manuscript.

Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2016-52, 2016.

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