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Interactive comment on "Locally-orthogonal unstructured grid-generation for general circulation modelling on the sphere*" *by* Darren Engwirda

Anonymous Referee #1

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I thank the author for his answers. The author clearly answered to my previous questions. I only have a few issues left.

1 Yes you are right about Voronoi-Delaunay grid staggering. I was too fast and apologize. I indeed was refering to what you call well-centered.

2 My main concern is still about the novelty of the method. You say:

In the current work, it's shown that a combination of Frontal-Delaunay refinement and hill-climbing optimisation is an effective strategy âĂŤ able to produce very high-quality well-centred Voronoi-Delaunay grids even when complex, highly non-uniform grid sizing constraints are imposed. I believe this to be a new result of benefit to the unstruc-

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tured oceanic/atmospheric modelling communities. Public availability of the associated JIGSAW-GEO grid-generator is also thought to be a further benefit to the community.

and:

I do not believe that the methods presented in the present work are preexisting. The hybrid Frontal-Delaunay surface meshing technique described here, able to guarantee worst-case bounds on element quality and sizing conformance are, in my view, new. I am not aware of another algorithm with the same properties âĂŤ able to produce smoothly varying Voronoi-Delaunay grids with very high mean element quality (similar to advancing front type schemes), while also guaranteeing worst-case bounds on element angles and conformance (a'la standard Delaunay-refinement techniques). Existing methods for unstructured oceanic/atmospheric modelling appear to either lack provable worst-case bounds [Jacobsen et al., 2013], or generally produce grids with somewhat lower overall quality [Lambrechts et al., 2008]. The combination of the Frontal-Delaunay scheme with a coupled hill-climbing optimisation strategy to generate 'well-centred' grids is also, in my view, new.

EVERY mesh generator (edge, face, volume) has a main engine (Delaunay, Frontal, Octree, coupled) and an optimization phase that follows [1], so there is nothing new to that. The facts that you apply it to oceanic/atmospheric communities or that it is publicly available do not make these techniques new. I have added a list of references on high quality surface mesh generation that present the same high quality based on the same techniques [2,3,4,5] on top of the coupled Delaunay advancing front variants which are not fully referenced. Feel free to include them or not.

Nevertheless, I completely agree with the fact that the application of these techniques to the oceanic/atmospheric communities is new and interesting and therefore, the paper should be published.

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