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Geoscientific Model Development Discussions

Interactive comment on "PatCC1: an Efficient Parallel Triangulation Algorithm for Spherical and Planar Grids with Commonality and Parallel Consistency" *by* Haoyu Yang et al.

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We thank Reviewer #2 for the comments and suggestions very much. We have modified the manuscript accordingly. In the following, we will reply them one by one.

1. The paper is comparing PatCC1 (MPI+OpenMP algorithm) with Jacobsen's (MPI only) in Table 3. Please clarify how many OpenMP threads per MPI process were used by PatCC1.

Response: For a fair comparison with Jacobsen's algorithm, PatCC1 only uses one OpenMP thread per MPI process. The manuscript has been modified accordingly.

Please refer to the title of Table 3 (P29).

2. Obtaining a complete triangulation can be challenging, which is one of the difficulties encountered in the previous algorithms (e.g. stitching, invalid or repeated triangles). The paper would be strengthened by addressing the step or providing a potential parallel approach.

Response: To obtain a complete triangulation, the root computing resource unit will gather all triangles within or across any boundary of each kernel sub-grid domain from all active computing resource units, and then prune repeated triangles (after passing the parallel consistency check, any pair of triangles with overlapping area are the same). The manuscript has been modified accordingly. Please refer to P10L315∼P10L319.

3. Given that the algorithm utilizes MPI+OpenMP it would be interesting to scale it to a larger number of nodes to truly observe the impact of internode communication

Response: The evaluation in Section 5.3.2 has tried to use more computing nodes. Each computing node contributes 10 processor cores (each computing node has 20 processor cores) when there are 20 computing resource units or more. For example, when there are 800 computing resource units, 80 computing nodes are used. Regarding the internode communication, we can make the following observations from Tables 8, S7, and S8 (in the supplement): 1) The cost of the second step of increases with the number of computing resource units especially the number of processes, because this step introduces collective communications among all computing resource units; 2) The cost of parallel consistency check increases with the increment of computing nodes, and decreases when more OpenMP threads are used under the same number of computing resource units. This is because the parallel consistency check will introduce MPI communications among processes and the overhead of communications generally increases/decreases with the increment/decrement of processes. The manuscript has been revised accordingly. Please refer to P15L456∼P15L457, P15L462∼P15L463,

P15L468∼P15L471.

4. A more detailed description of the implementation of the computing resource manager would be welcomed. The current description favors optimal parallel performance at the cost of leaving resources idle. Perhaps publishing the source code will help clarify this mechanism.

Response: Parallel efficiency should be a primary goal of a parallel algorithm such as PatCC1. We think that, it will be no additional cost to leave resources idle when more resources used will result in performance degradation. The source code of PatCC1 will be publicly available with the final version of the manuscript.

5. The paper states that the source code will be available in June 2019. It would be good for the link to be included in the ïňĄnal version.

Response: The source code of PatCC1 will be publicly available with the final version of the manuscript.

6. Recommend showing the scaling results using a ïňĄgure rather than a table

Response: Thanks a lot for this suggestion. In fact, we have tried figures but finally preferred the tables although we know tables are rarely used for showing the scaling results. This is because there will be a lot of figures and it is difficult to observe the comparison of execution time between different steps of PatCC1 at the same parallel setting. We therefore still keep these tables in this revised manuscript and will change them to figures in the next revised version if required.

7. "Tables 8, S7, S8" -> what does "S7 and S8" refer to? Response: "S7 and S8" mean the corresponding to tables in the supplement.

8. Grammatical mistakes Response: All grammatical mistakes listed out have been fixed. Thanks a lot.

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