Geoscientific
Model Development
Discussions

Interactive comment on "Improving data transfer for model coupling" *by* C. Zhang et al.

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We thank the reviewer very much for the comments and suggestions. We'd like to reply them as follows.

1. They show a good understanding of the current state-of-the-art in climate models but are missing some of the history of butterfly networks in parallel computer design. Consider for example: "Packaging and multiplexing of hierarchical scalable expanders" F. Chong, E. Brewer, F. Leighton, T. Knight Jr., Parallel Computer Routing and Communication, Volume 853 of the series Lecture Notes in Computer Science pp 200-214, 1994. Ian Foster's book on "Designing and Building Parallel Programs" also covers butterfly algorithms in Chapter 2.4. These and similar work must be referenced.

Response: Some related works about the butterfly networks and algorithms are introduced in section 3 of the revised version (P6 L6 – L13).

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2. In their performance testing, the results can also be affected by the decomposition strategy (decomposing the domain by lat-lon blocks or by latitude stripes). It's not clear if the two land and atmosphere domains have different decomposition strategies which would impact performance. Please clarify.

Response: Parallel decompositions of component models can affect the performance of data transfer. For example, GAMIL and CLM3 has different parallel decompositions, so data transfer between them has big communication depth, and the adaptive data transfer library can significantly improve the performance of data transfer (please refer to P13 L25 – P14 L3); For the data rearrangement in parallel interpolation, the source parallel decomposition is similar to the target parallel decomposition, so the communication depth is small and the performance of data transfer will not be improved because the adaptive data transfer library will switch to the P2P implementation in this case (please refer to P14 L4 – L16). As component models have different computation characteristics, their parallel decompositions are usually different.

3. Overall this algorithm appears to be most useful on medium-sized grids and modest processor counts. That's ok but these limitations should be mentioned or data for larger cases presented. Response: The performance of data transfer between high-resolution toy models has been evaluated, where each model employs about one thousand processor cores (please refer to P12 L29 – P13 L9 and Fig. 19).

Specific Comments

4. The decrease in time at the end of the graph in Figure 1 should be remarked upon. Will it continue to go down?

Response: Figure 1 is measured from the benchmark derived from GAMIL2-CLM3. The component models AMIL2 and CLM3 can only scale to 128 processor cores, so we did not measure the time for more cores.

5. It's not clear what generated the data in Figure 2. Is that a P2P test program from

an MPI distribution? And was it on the same machine?

Response: Please refer to Fig. 2.

6. The initialization overhead for the adaptive library could become to expensive at 1K and larger processor counts even if its only run once. It might be better to run it offline and read in the results when the climate model starts. Again a large case would help.

Response: Thanks a lot for this suggestion. It will be our future work. Please refer to P15 L13 – L16.

7. For Figure 15, are the "P2P" results from the unaltered CPL7 coupler or from the P2P option in their library? Please clarify.

Response: The P2P results are measured from the adaptive data transfer library which switches to the P2P implementation. Please refer to Fig. 20.

8. Technical Corrections: "network contention" is the preferred phrase instead of "jam of network communication" or "jams in communication".

Response: "jam of network communication" and "jams in communication" has been replaced with "network contention" in the revised version (P1 L20, P5 L28, P6 L4, and P7 L30).

9. There is more odd English phrasing throughout.

Response: We carefully improved the grammar and syntax in the revised version.

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