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Responses to Reviewer #2

- 228: PK trees are not clear. Is Acros a coupling infrastructure? Some more details would be helpful.

  Response: Relevant information has been added for clarification.

- 234: Perhaps I missed it, what is MPC?

  Response: Multiprocess Coordinator manages the coupling among process kernels. Relevant information has been added.

- 240: How is the information/simulation data passed between process kernels?

  Response: Ethan??

- 255: Is that limiting the representation of heterogeneity?

  Response: Scott??

- 290: Provide time step information. How sensitive are the results to the time step size?

Response: Simulations have been performed with several maximum time-steps (less than 1 day) and no significant changes have been observed.

- 309: Is there a way to perform a dimensional analysis and thus generalize the results perhaps?

  Response: Scott??

- Figure 9: Look like it has been stretched!

  Response: Corrected!

- Figure 11: Wouldn't the thaw depth error accumulate from season to season?

  Response: The annual thaw depth is mainly determined by the variations in temperature during the summer and in our experience the previous year history has less effect on the annual thaw depth.

- Figure 13: Is it possible to juxtapose maps of fully 3D simulations to interrogate differences in the patterns?

  Response: Given the complexity of the permafrost regions, 3D simulations on such a domain are very computational demanding.

- Figure 15: Perhaps the overall problem size is too small for the strong scaling study? It would be nice to understand where the time is spend/lost? Is it in Arcos or the overland flow solution?

  Response: On smaller domains (such as 75 polygons) we should

not expect a good scaling mainly due to the overhead surface system. Discussed in the Speedup study section; page 21, line 350.