

Interactive comment on “The Half-order Energy Balance Equation, Part 2: The inhomogeneous HEBE and 2D energy balance models” by Shaun Lovejoy

Anonymous Referee #2

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This second part reviewed here extends the approach of Part 1 to higher spatial dimension and inhomogeneous thermal models of the earth’s response to radiative forcing. There is an appropriate summary of Part 1 that puts the new contribution into context. The full model considered here includes varying horizontal and vertical thermal diffusivities, thermal capacities, sensitivities and spatio-temporal forcing. By a heuristic method of Babenko, the author expands the inhomogeneous operator to give 2D energy balance equations that will be useful for studying spatio-temporal responses to forcing. The manuscript includes a number of appendices that examine horizontal structures, cross-correlations, space-time factorization of quantities such as autocorrelation and that extends the results from flat space to the sphere. The analysis seems

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to be carefully done, and care is taken to distinguish cases where there may not be a rigorous justification. I would be interested to see a bit more discussion of the “bottom boundary condition” $T=0$ at $z=-\infty$. I think it would also be useful to include some discussion of how atmosphere/ocean convection is/is not represented in the model.

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