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Interactive comment on “The energetics response to a warmer climate: relative contributions from the transient and stationary eddies” by D. Hernández-Deckers and J.-S. von Storch

Anonymous Referee #2

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I have reviewed the paper by Hernandez-Deckers and von Storch on the Lorenz energy cycle in a doubled CO₂ simulation. The paper is well-written and does a thorough job of analyzing the salient features of the energetics; I recommend its publication.

I would like to raise two points for discussion. First, while analysis of energetics can reveal some important features of a climate simulation, it can also yield a misleading picture depending on applications. It is important to remember that energy is not Galilean invariant and one consequence of this is that the magnitude of some terms depends not only on the underlying wave activity, but also the strength of the mean circulation. For example, the boundary terms that include $[\omega^* z^*]$ can be shown to be proportional

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to the product of the zonal mean wind [u] and the component of the Eliassen-Palm flux $f[v^*\theta^*]/S$ (see, for example, Eliassen and Palm, 1961). So in the context of contrasting two climate states, care must be paid to analyzing not only how the underlying wave activity changes but also the intensity of the mean flow. For the perturbations to the present climate, the changes to the mean state may be small enough that they don't fundamentally alter the discussion, but applications to paleoclimate state further removed from today's world would have to be aware of these factors.

Second, the findings about changes in the mean static stability (page 369) are interesting. The authors may wish to compare their evidence with the theoretical developments made in recent years by Paul O'Gorman and others.

Interactive comment on *Earth Syst. Dynam. Discuss.*, 2, 355, 2011.

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