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Energetics of a warmer climate: eddy kinetic energy responses to different warming patterns

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We estimate the energetics response of the global atmosphere in a warmer climate through changes in the Lorenz Energy Cycle, using the coupled ECHAM5/MPI-OM atmosphere-ocean model. Our previous analysis with a 1xCO2 control run and an equilibrium 2xCO2 run shows that the strong tropical upper-troposphere warming causes a strengthening of the cycle in the upper troposphere, while the high latitude, low-level warming and the increase in the global mean static stability tend to weaken the cycle in the lower and middle troposphere. Globally, the weakening response dominates.

Here we focus on the response of the eddy kinetic energy and its conversion rates, separating the stationary and transient contributions. This provides us with a fundamental view about the possible behavior of extra-tropical storms in a warmer climate. Additionally, we carry out coupled runs nudged to different idealized zonal-mean warming patterns. This allows us to attribute certain energetics responses of the atmosphere to specific warming patterns.