Supplementary material

Figures S1a and b show the evolution of energetics for the different cut-off experiments described in Section 4, Figures S1c and d show the corresponding anomalies from experiment T. The experiments shown in Figure S1 do not use surface friction. In both diagnostics, ΔMKE and EKE, the experiments of both, Set 1 (initial conditions with weak winds in the lower stratosphere) and Set 2 (initial conditions with strong winds in the lower stratosphere), show characteristics similar to the other experiments in the respective sets, while the energetic evolutions of the two sets differ in various ways from each other.

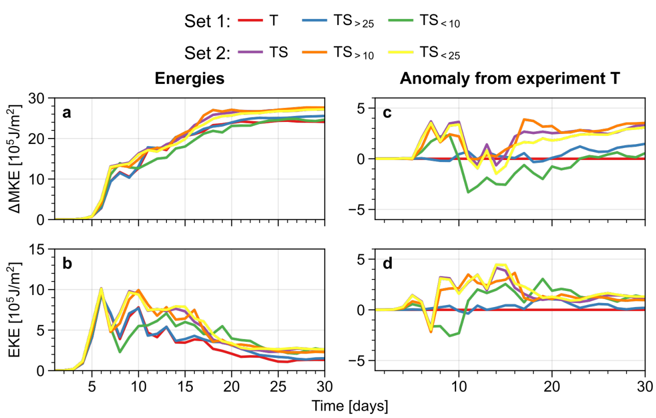

Figure S1. Evolution of mean kinetic energy change (top) and eddy kinetic energy (bottom) for different experiments. The left column shows the full energies, the right column shows the anomalies from experiments T. The experiments displayed here do not include surface friction. Energies are displayed as vertically integrated and horizontally averaged energy densities.

A prominent difference is the increased value of ΔMKE in the final state of Set 2, compared to Set 1. This difference in ΔMKE is, as also explained for Figure 3 in Subsection 3.2, associated with the meridional shift of the tropospheric jet.

Note that the energetics of experiment $TS_{<10}$ seems to share characteristics with experiments of both sets, although its final state ΔMKE is clearly most similar to the other members of Set 1. Recall that in terms of final state zonal mean zonal wind (Figure 10) experiment $TS_{<10}$ showed consistent signs of a jet shift signature, although a relatively weak one. As also discussed in Section 4 this could potentially be explained by the finite transition depth of the transition function $\eta(z)$ in Equation A3, or the partial projection of the stratospheric jet onto various tropospheric characteristics, like vertical shear or tropopause height.

Figure S2 shows the same diagnostics as Figure S1, displaying experiments with the same initial conditions, but with the additional inclusion of surface friction (see Section 2). The use of surface friction leads to various difficulties when trying to interpret the corresponding energy time series. Most importantly does the constant energy dissipation near the surface lead to a constant drop in MKE throughout the lice cycle (recall that here the anomaly from the initial state is displayed). Hence the system does not reach a steady ’final state’. Since both, the energy dissipation and the MKE, increases with increasing wind speeds the experiments showing a jet-shift structure (and correspondingly stronger or weaker jet) do not show a clear difference in MKE when surface friction is active, compared to when it is not active.

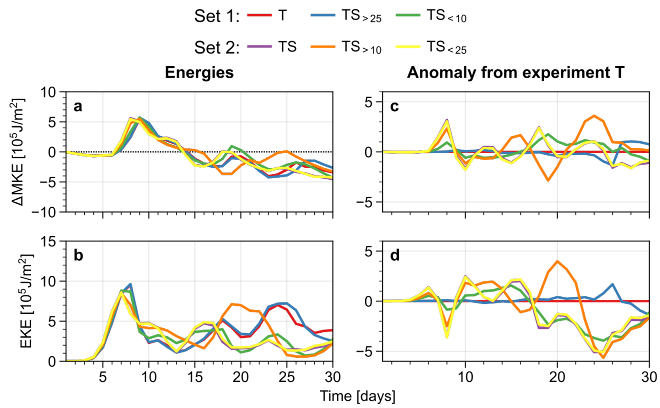

Figure S2. As Figure S1, but for experiments with surface friction.