# On the Roles of Upper- versus Lower-level Thermal Forcing in Shifting the Eddy-Driven Jet

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The warming of the troposphere in response to greenhouse gas forcing is not uniform, exhibiting two hot spots, with one centered in the tropical upper troposphere and a second concentrated near the surface in the Arctic. These two maxima have opposite impacts on the baroclinicity (meridional temperature gradient) and midlatitude circulation. In this study, the relative roles of such upper- and lower-level thermal forcing in shifting the eddy-driven jet are investigated using a multi-level quasi-geostrophic model.

Our study shows that, in all the sensitivity experiments, the upper-level thermal forcing is more efficient in shifting the eddy-driven jet. We argue that the dominance of the upper-level thermal forcing over the lower-level thermal forcing can be attributed to their different mechanisms that drive the jet shift. The upper-level thermal forcing changes the eddy momentum flux by affecting the baroclinic growth of eddies. However, the lower-level thermal forcing influences the eddy momentum flux mainly by affecting the wave breaking and dissipation in the upper troposphere. The former mechanism turns out to be more efficient in shifting the eddy-driven jet.

Key words: Eddy-Driven Jet, Thermal Forcing, Climate Change