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# Kinematics of eddy-mean-flow interaction in an idealized atmospheric model

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The authors analyze atmospheric variability simulated in a two-layer baroclinic beta-channel quasi-geostrophic model by combining Eulerian and feature-tracking analysis approaches. The leading mode of the model's low-frequency variability (LFV) is associated with the irregular shifts of the zonal-mean jet to the north and south of its climatological position accompanied by simultaneous intensification of the jet, while the deviations from the zonal-mean fields are dominated by propagating anomalies with wavenumbers 3–5. The model's variability is shown to stem from the life cycles of cyclones and anticyclones. In particular, synthetic streamfunction fields constructed by launching idealized composite-mean eddies along the actual full-model simulated cyclone/anticyclone tracks reproduce nearly perfectly not only the dominant propagating waves, but also the jet-shifting LFV. The composite eddy tracks conditioned on the phase of the jet-shifting variability migrate north or south along with the zonal-mean jet. The synoptic-eddy lifecycles in the states with poleward/equatorward zonal-jet shift exhibit longer-than-climatological lifetimes; this is caused, arguably, by a barotropic feedback associated with preferred anticyclonic/cyclonic wave breaking in these respective states. Lagged correlation and cross-spectrum analyses of zonal-mean jet position time series and the time series representing mean latitudinal location of the eddies at a given time demonstrate that jet latitude leads the storm-track latitude at low frequencies. This indicates that the LFV associated with the jet-shifting mode here is more dynamically involved than being a mere consequence of the random variations in the distribution of the synoptic systems.