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Poleward migration of eddy-driven jets

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The slow poleward migration of temporal anomalies of zonal winds in the upper troposphere was shown in several observational studies. We show that a similar poleward migration of the eddy-driven jets themselves occurs in the extratropics when the subtropical and eddy-driven jets are clearly separated, as achieved by simulations at high rotation rates. The poleward migration of these eddy driven baroclinic jets over time is consistent with variation of baroclinicity across the width of the jet. We demonstrate this using a high resolution idealized GCM where we systematically examine the eddy driven jets over a wide range of rotation rates. We propose that the poleward migration of the jets may be caused because baroclinicity, estimated through measures such as Eady growth rate and supercriticality, has a poleward bias due to the variation of the Coriolis parameter across the jet. This is found to be consistent with poleward biased eddy momentum flux convergence relative to the mean jet, which overtime deflects the jet poleward. As the rotation rate is increased, and more (narrower) jets emerge the migration rate becomes smaller due to less eddy momentum flux convergence over the narrower baroclinic zones. We find a linear relation between the migration rate of the jets and the eddy momentum flux convergence across the jets. Moreover, the jet migration allows analyzing the latitudinal dependence of jet width and energy cascades.