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Poleward migration of eddy driven jets

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There are observational evidence for a poleward migration of temporal anomalies of zonal winds in the upper troposphere. We show that such poleward migration can be due to poleward migration of eddy-driven jets; In fact, any eddy driven baroclinic jet should propagate poleward over time due to the variation of baroclinicity across the jet due to the sphericity of the planet. We demonstrate this using a high resolution idealized GCM where we examine the eddy driven jets over a wide range of rotation rates (up to 24 times the rotation rate of Earth). Unlike Earth-like rotation rates, where the eddy driven jet and the subtropical jet usually merge, at higher rotation rates the eddy driven jets are clearly separated from the subtropical jet and migrate poleward, while the subtropical jets remain in a constant latitude over time. The poleward drift is caused because measures of baroclinicity, such as Eady growth rate and supercriticality have a poleward bias due to the variation of the Coriolis parameter across the jet. This results in a poleward biased eddy momentum flux convergence relative to the mean jet, which overtime deflects the jet poleward. This is demonstrated systematically over the series of numerical simulations we present. As the rotation rate increases, and more (narrower) jets emerge the migration rate becomes smaller due to less eddy momentum flux convergence over the narrower baroclinic zones. This mechanism is consistent with eddy life cycle studies, which show the effects of sphericity on eddy propagation. In addition, we suggest scaling for the meridional scale of the jets and their spacing as function of the planetary rotation rate and latitude.