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The variability of baroclinicity in the extratropical troposphere

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The baroclinicity is one of the most important properties of the extratropical mean flow, modulating the strength and location of the midlatitude stormtracks. Yet although the maintenance of the climatological baroclinicity is relatively well understood, its mechanisms of internal variability have received much less attention. This may seem surprising given the impact of baroclinicity on the extratropical stormtracks. Baroclinicity may also be important for enhancing the persistence of the annular modes through a positive baroclinic feedback mechanism, in which a preexisting barotropic anomaly is reinforced through a cycle of anomalous baroclinicity, eddy generation and eddy-driven zonal acceleration. In this work we study the variability of baroclinicity in both extratropical hemispheres

First, we study the internal variability of zonal-mean baroclinicity over the more symmetric Southern Hemisphere (SH). It is found that the dominant mode of baroclinicity variability represents a meridional shift at all time scales, but the dynamics of this shift depends on the frequency range. At high frequency, the zonal-mean baroclinicity simple responds to the fast eddy heat flux forcing. At low frequency, the baroclinicity shift is forced by the eddy momentum flux through an eddy driven mean meridional circulation and damped diabatically. We then extend the study to the Northern Hemisphere (NH) winter. In this hemisphere, the analysis is a bit more complicated because of the presence of a strong stationary wave and the lack of clear separation between the subtropical and eddy-driven jets. Finally, we perform localized diagnostics over the Atlantic and Pacific basins.