1. **How do eddies impact the mean velocity field?**

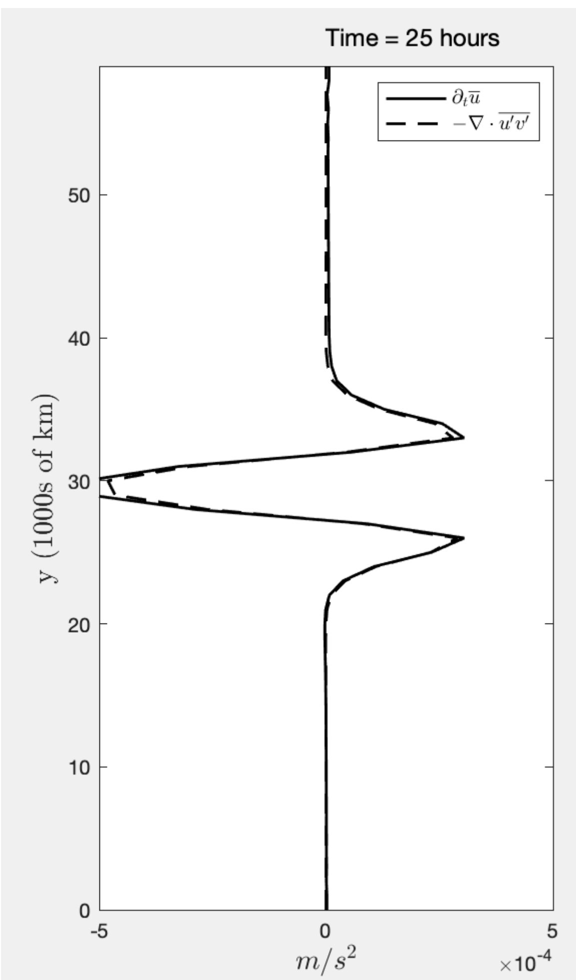
Neglecting the frictional effect and using quasi-geostrophic scaling, the governing equation for the zonally-averaged zonal momentum can be written as

$$\frac{\partial \overline{u}}{\partial t} = f\,\overline{v} - \nabla \cdot \overline{u'v'}.$$

Since the Coriolis term is much smaller than the divergence term in our case, the increase of the zonally-averaged zonal velocity is mainly due to the convergence of eddy momentum flux

$$\frac{\partial \overline{u}}{\partial t} = -\nabla \cdot \overline{u'v'}.$$

The plot below confirms this relation.



The eddy momentum flux, $\overline{u'v'}$, also called Reynolds stress, is capable of transferring momentum meridionally. Its convergence characterizes the local net effect of the momentum transfer by eddies. Divergence in the jet core and convergence in the flanks indicate eddies are carrying momentum from core to flanks region, resulting in a weaker and wider westerly.

2. How is eddy flux related to the mean field?

To close the eddy-mean-flow interaction problem, one must somehow relate the unknown eddy fluxes to the background state. The most straightforward approach is to use a down-gradient diffusive closure for the eddy momentum flux, such that

$\overline{u'v'} = -K\dfrac{\partial \overline{u}}{\partial y}$, where K is eddy diffusivity.

The figure below shows that the eddy flux and meridional gradient terms have similar latitudinal pattern. The resultant eddy diffusivity indicates the eddy momentum transfer is suppressed in the jet core but is strengthened in the flank region