

P-E decomposition

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Decomposition

- See e.g. Seager et al (2010) for full details: <https://doi.org/10.1175/2010JCLI3655.1>
- $P - E = - \nabla \cdot [\mathbf{u}q]$, where $\nabla \cdot ()$ is the geospatial divergence operator, $[\]$ indicates a mass-weighted vertical integral through the atmosphere, \mathbf{u} is the 2D horizontal wind vector, and q is the specific humidity
- $\delta(P - E)_{dynamic} = - \nabla \cdot [\delta(\mathbf{u})q]$, where δ indicates a change between climate states
- So the dynamic component of $\delta(P - E)$ is that due to changes in winds only; specific humidity stays constant in calculation
- Practicalities: requires 3D wind and specific humidity data. Assuming only monthly data are available, the dynamic component will be an estimate of how changes in the “mean” circulation affect P-E (transient eddies can also contribute but require e.g. daily data to estimate reliably)