Geophysical Research Abstracts
Vol. 20, EGU2018-6332-1, 2018
EGU General Assembly 2018

Quantification of Ridge/Trough amplitude evolution within Rossby Wave Packets: A composite Study

Franziska Teubler and Michael Riemer
Institute for Atmospheric Physics, Johannes Gutenberg-University Mainz, Germany (f.teubler@uni-mainz.de)

Rossby wave packets (RWPs) are a fundamental ingredient of midlatitude dynamics and may constitute precursors to high-impact weather events. It is often expected that RWPs, as large-scale flow features obeying balanced dynamics, exhibit a large degree of predictability. Recent work, however, has shown that there is increased forecast uncertainty, in particular associated with the impact of moist processes, which may compromise medium-range predictability in the downstream region.

As a contribution to an improved understanding of these inherent uncertainties, we employ a quantitative potential vorticity (PV) – potential temperature framework to quantify different processes governing the evolution of troughs and ridges. This PV framework allows to fully separate the dynamics into four processes, namely the group propagation of Rossby waves, baroclinic growth, the impact of upper-tropospheric divergent flow, and direct diabatic PV modification.

Troughs and ridges are examined from a composite perspective, which is based on the maximal strength of the individual anomalies. Additional to baroclinic downstream development, the composite analysis reveals a first-order impact of upper-level divergent flow for the amplification of ridges and the decay of troughs.
We interpret divergent outflow as an indirect diabatic process associated with latent heat release below. Based on these results, we suggest extending the prevailing paradigm of downstream baroclinic development to include the systematic impact of moist processes.