EGU2020-12992, updated on 28 Oct 2020
https://doi.org/10.5194/egusphere-egu2020-12992
EGU General Assembly 2020

Investigating quasi-resonant Rossby waves with an idealized general circulation model

Todd Mooring[1] and Marianna Linz[1,2]
[1]Harvard University, Department of Earth and Planetary Sciences, Cambridge, United States of America
(tmooring@fas.harvard.edu)
[2]Harvard University, School of Engineering and Applied Sciences, Cambridge, United States of America

Petoukhov et al.'s (2013, PNAS) hypothesis of quasi-resonant Rossby waves as a mechanism for destructive weather extremes—both heat- and rain-related, observed and projected—has received a great deal of attention in recent years. Most notably, it has been used for diagnostic studies of reanalysis products and full-physics atmospheric or coupled general circulation models. However, studies of this sort essentially assume (rather than test) the validity of the underlying theory.

Since the quasi-resonance theoretical arguments do not explicitly involve the full complexity of atmospheric physics, it ought to be possible to test them within the much simpler framework of an idealized general circulation model. By carefully constructing the forcing fields for such a model, we will achieve control of its zonal mean state and thus the waveguide properties of the zonal jet. We will explore the properties of the quasi-stationary Rossby waves in such simulations to test whether they have the properties predicted by Petoukhov et al. By testing this dynamical mechanism in a simplified model, we can better understand its applicability and limitations for investigations of future climate.