Geophysical Research Abstracts
Vol. 18, EGU2016-421, 2016
EGU General Assembly 2016
© Author(s) 2015. CC Attribution 3.0 License.

Detection, dynamics and climatology of Rossby wave initiation on the extratropical waveguide

Matthias Röthlisberger (1), Olivia Martius (1,2), and Heini Wernli (3)

(1) Oeschger Centre for Climate Change Research and Institute of Geography, University of Bern, Switzerland, (2) Mobiliar Lab for Natural Risks, University of Bern, Switzerland, (3) Institute for Atmospheric and Climate Science, ETH Zurich, Switzerland

Synoptic-scale Rossby waves are ubiquitous in the extratropical flow and, together with jets and vortices, they form the building blocks of extratropical dynamics. In this study a novel method is presented that automatically identifies the initiation of synoptic-scale Rossby waves (RWIs) on tropopause-level waveguides. RWIs are identified based on geometry changes of the 2 Potential Vorticity Units (PVU) contours on isentropic levels. The 2 PVU contours are hereby regarded as proxies for the position and shape of the extratropical waveguide. A RWI is recorded in a zonally aligned (i.e. wave-free) longitudinal contour segment if the segment becomes wavy over time and, additionally, the respective 2 PVU contour is wave-free upstream of the segment.

The algorithm is applied to the ERA-Interim data set to compile a Northern Hemisphere climatology of RWIs (1979-2013) on tropopuase-level waveguides. To further illustrate the potential of the method, an example RWI is presented in which a wave is initiated by a mesoscale lower stratospheric high-PV anomaly interacting with the extratropical jet and with surface baroclinicity. Next, the spatial distribution and seasonal cycle of RWIs is discussed. The majority of the RWIs occur over the Northwestern Pacific and a secondary initiation region is located over the North Atlantic. Especially the initiation region over the North Pacific undergoes a strong seasonal cycle, both in its location and in the number of RWIs occurring. Finally, we present a composite view on RWIs occurring over the North Pacific and highlight key aspects of the dynamics of the first stage in the life cycle of synotic-scale Rossby waves.