The Relationship between Atmospheric Rivers and the MJO

Farnaz Hosseinpour[*1], and David J. Raymond[2]

[1]*Desert Research Institute, University of Nevada-Reno, Reno, Nevada*
[2]*New Mexico Tech, Departments of Physics, Socorro, New Mexico*
*corresponding author email address: farnaz@dri.edu

Abstract

The goal of this study is to better understand the dynamics of atmospheric rivers (ARs) impinging on the west coast of North America. ARs have important roles in both local weather and global climate. The NCEP reanalysis data sets were used to diagnose several cases of ARs in recent decades. Diagnostic analyses indicate that strong meridional transport of moisture from tropical region to the mid-latitudes occurs through AR events causing remarkable precipitation. ARs are high frequency transient eddies with time-scales of around 5 days which lead to significant cores of eddy kinetic energy (EKE) in the downstream of storm track. Analyzing tropical low frequency phenomena and their feedback to the mid-latitudes gives us further insight into the mechanism of ARs. A strong correlation exists between west coast ARs and the phase of the Madden-Julian Oscillation (MJO). In particular, these atmospheric rivers tend to occur when the active phase of the MJO is in the central to western Pacific. From energetic and momentum perspectives, remarkable meridional moisture transport of ARs occurs in the regions where ageostrophic fluxes converge, and dissipates where eddy energy diverges. ARs amplifying downstream of storm tracks are associated with Rossby wave breaking.