

Characterizing Atmospheric Rivers associated with Persistent Flow Regimes

Persistent flow regimes (PFRs) regimes are a useful framework for identifying and describing low-frequency variability in the extratropics. Focusing on the low-frequency variability of PFRs also offers a potential increase in forecasting skill on the lower end of the subseasonal-to-seasonal (~2–4 week) timescale. In general, weather regime identification is based around mid- to upper-tropospheric geopotential patterns and not explicitly linked to observed surface weather conditions. Assessing the characteristics of atmospheric rivers (ARs) during PFRs allows us to better connect forecasts of the large-scale flow to the observed weather occurring before, during, and after those regimes.

PFRs will be identified as periods of widespread persistent anomalies as defined by Dole and Gordon (1983) and further modified by Miller et al. (2020) using CFSR reanalysis data for DJF from 1979–2022. PFRs will be grouped using k-means clustering on the 500-hPa geopotential height data at the start of each PFR. Five clusters are chosen for the k-means analysis based off of synoptic intuition after inconclusive optimization testing. To compare these PFRs with ARs, AR events will be taken from the Guan and Waliser AR Reanalysis Database version 3. Composites of AR events that are and are not associated with PFRs will form the bulk of the analysis. The aforementioned composites are intended to document potential differences in AR characteristics during these regimes. In addition, dynamical metrics (e.g., integrated moisture flux convergence) will be calculated in order to assess the potential impacts of latent heat release in the vicinity of ARs on the development of PFRs.