Tropopause Polar Vortices, or TPVs, are long-lived, coherent vortices located primarily on the tropopause over polar regions. These upper level features have been identified as important dynamical predecessors to surface cyclogenesis for some time, yet only in the past decade have been recognized as a long-lived traceable feature, with lifetimes sometimes exceeding 2 months. With such long lifetimes, these features could have important implications for model predictability. Additionally, these features have been identified as playing a large role in many extreme weather events in the mid-latitudes. While past studies have focused on the structure and evolution of TPVs in polar regions, no studies have closely examined interactions at the mid-latitudes. As such, it would be useful to be able to examine TPVs in a climatological sense to better understand the conditions which may more commonly bring about mid-latitude interactions. We hypothesize that these interactions will have a seasonal dependence, as well as a dependence on teleconnections which have a direct effect on the jet stream.

Results of a water-shed based tracking algorithm of TPVs on the 2 PVU surface in the ERA-Interim dataset from 1979 to 2014 show TPVs are found most frequently within the region west of Greenland just north of Baffin Bay in agreement with previous studies. Two primary exit pathways out of the Arctic for TPVs will be discussed, which have potentially important implications for mid-latitude cyclogenesis. These exit regions display seasonality, with increased numbers of TPVs exiting during the winter. A close investigation of the atmospheric effects of the Arctic Oscillation (AO), North Atlantic Oscillation (NAO), and the Pacific North American (PNA) pattern on TPVs reveal different overall numbers and average strengths, as well as different movement patterns in and out of the Arctic, hinting at a possible link between these atmospheric patterns and TPVs, including how they affect the mid-latitudes, via jet stream interactions. Yearly averages of TPVs characteristics, such as radius, speed, and total number, display trends over time which could be attributable to climate change, though further research is necessary to confirm this hypothesis.