A WRF Model Simulation of Changes in the Characteristics of Tropopause Polar Vortices Due to Sea Ice Loss

Dylan Lusk and Steven M. Cavallo, University of Oklahoma School of Meteorology, Norman, OK

Substantial reductions of Arctic sea ice during the summer are leaving increasingly large areas of open water during the autumn and early winter. Greater amounts of heat and moisture have the potential to alter the unique conditions that enable Tropopause Polar Vortices (TPVs) to be maintained over the Arctic by reducing their radiative intensification mechanism. Since TPVs are important dynamical predecessors to surface cyclones, changes in their characteristics due to changing sea ice may be a key to understanding changes to surface low locations and intensity in the future. Here, we present two high-resolution numerically simulated climatologies to examine the impact of reducing sea ice on TPV characteristics and the resulting effects on surface lows. We seek to better understand the relationship between changes in surface weather patterns with changes in the characteristics of TPVs.

Preliminary results show that overall TPV tracks during this time period are changing. This result is consistent with what is known about the typical habitats of TPVs. TPVs are usually found over very cold regions unless moved by the flow. In addition to this, the traditional areas of cyclogenesis and cyclolysis are shifted between the two runs. Sea level pressures show significant changes that indicate a shift in overall storm tracks farther north, as well as potentially fewer storms. The upper level flow is affected by persistent ridging that develops over the North Atlantic and North Pacific.