The influence of latent heat release in extratropical cyclones has been quantified in past studies via potential vorticity techniques. For cyclones that are accompanied by heavy precipitation, the diabatic contribution to the cyclonic circulation can be up to 50%. Additionally, latent heat release contributes to the strength of the low-level jet (LLJ) often found near the border of the cyclonic warm sector. The LLJ contributes significantly to poleward moisture transport and can be associated with straight-line windstorms.

Future climate projections consistently reveal increased precipitation, a consequence of enhanced vapor content. What are the dynamical consequences of potentially heavier precipitation on extratropical cyclones? How are the precipitation increases distributed within the cyclone? We hypothesize that heavier rainfall leads to increased diabatic PV generation and a stronger LLJ, which could in turn increase the potential for severe straight-line winds, and alter energy transports.

Two avenues of research are underway; storm-track simulations are used to quantify the diabatic contribution to eddy transports in a bulk sense. For more specific analysis of possible changes, historical cyclone cases are recreated using projected climate change signals in order to elucidate changes in PV structure resulting from heavier precipitation. The workshop presentation will focus on the future replication of historical storms.