CICS Science Conference
November 29, 30 & December 1, 2016
College Park, MD, USA

Abstract: **Storm Tracks and their Influence on High Impact Weather in the Southern Hemisphere Winter**

Katherine Lukens

The behavior of Southern Hemisphere (SH) winter storm tracks and their influence on high impact weather are diagnostically studied using data from the Climate Forecast System Reanalysis (CFSR) and the Global Precipitation Climatology Project (GPCP). Storm tracks are described by isentropic potential vorticity (IPV) anomalies within a Lagrangian framework and are found to correspond with those described in previous studies: the mid-latitude storm track spans all longitudes with a secondary track south of Australia toward the Ross Sea. The cyclogenesis pattern highlights this secondary storm track and shows that cyclones generally develop along the tracks. The cyclolysis pattern reveals that most cyclones dissipate in the oceans east of Australia, New Zealand, and South America. Across the SH, the diabatic heating increases where the storm tracks are present, with the larger heating gradients corresponding to high track density regions, i.e., where the majority of storms tend to propagate.

In this study high impact weather is represented by strong low-level winds and intense precipitation. Low-level winds are found to be strongest in the entrance region of the storm track intensity maximum in the southern Indian Ocean where many storms tend to develop. Toward the continents, low-level winds weaken due to a larger negative land-sea temperature gradient and high orography; the winds intensify as they flow away from land over the warmer oceans. Strong low-level winds are found associated with the storm tracks. The storm-related wind magnitudes are 20-30% higher than normal over the oceans and about 50% higher along the eastern coasts of Australia, New Zealand, and South America. The SH storm tracks identified from IPV are primarily associated with deep convection. These deep core storms produce 40-50% of the total winter precipitation within the storm track regions throughout the mid-latitudes. Storm precipitation intensity is largest in regions where the diabatic heating is strongest, e.g., near the southern coast of Australia where 60-70% of the total precipitation is generated by storms, and in regions of high orography, e.g., over the Andes Mountains

and New Zealand where storms produce 50% and 60-70% of the total precipitation, respectively.