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The Development of an Automated and Gridded Synoptic Classification for Surface Weather Types

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Advancements in computing power and climatological modeling have allowed for dramatic improvements in the spatial and temporal resolution of historic weather data via reanalysis data sets. Synoptic climatologists undertaking circulation pattern classifications (CPCs) over the last decade have taken full advantage of these data sets and successfully produced a variety of different climatologies that are becoming increasingly important in applied climatological research, with continuing usage in climate change literature as well. However, the potential advancements that these reanalysis data sets may offer broad scale point-based surface weather-type classifications (WTCs) remain unexplored. Overall, this research aims to take advantage of the gridded nature and fine-scale resolution of reanalysis data sets to develop a surface weather-typing classification methodology for use in the mid-latitudes. The specific study herein uses the North American Regional Reanalysis data set to produce a calendar of daily weather types for over 2,000 grid points throughout the continental United States for 1979 to 2010, thus allowing a broad range of point-based, regional, and/or continental-scale applications – especially those in human health. Additional developments upon similar existing WTCs include the characterization of transitional sub-types, improved spatial resolution, a transportable automated methodology, and a unique spatial smoothing process. The classification is also assessed in regards to how well it compares to other WTCs, its skill in partitioning the natural climatic variability of each location, and for the spatial and temporal cohesiveness of the resultant types.