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THE SPATIAL AND TEMPORAL VARIABILITY OF GREAT LAKES HIGH WAVE EVENTS IN RELATION TO EL NIÑO-SOUTHERN OSCILLATION INFLUENCES ON MID-LATITUDE CYCLONE TRACKS

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The Great Lakes region of North America is impacted throughout every fall and winter season by large low-pressure weather systems. Known as mid-latitude or extra-tropical cyclones, these storms can bring high winds and precipitation to large parts of the continent while on the Great Lakes, long-duration high winds blowing across large expanses of open water frequently lead to high-wave events that result in erosion along vulnerable coastlines. While these wave events can only be predicted with accuracy a few days in advance of the storm, current understanding of the El Niño-Southern Oscillation (ENSO) influences on weather patterns in North America indicates a connection to spatial and temporal patterns in mid-latitude cyclone activity in the eastern part of North America. This calls into question whether patterns in location and frequency of high wave events can also be predicted in advance of a winter as they are associated with mid-latitude cyclones. Few prior studies have attempted to connect the frequency and location of high wave events with ENSO-influenced cyclone paths. The objectives of this study are to document past high wave events at certain locations on the Great Lakes using hindcast wave models, create an atlas of associated mid-latitude cyclone tracks from climate reanalysis data, and determine the relation of these cyclone patterns to prior research on ENSO-influenced storm tracks. Finally, this study will attempt to place the results within the context of global climate change and how ENSO, and thus mid-latitude cyclones and high wave events, may look in a future climate.