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# GIS Mapping and Analysis of Lake-Effect Snowfall Patterns in Indiana and SW Michigan

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## **GIS Mapping and Analysis of Lake-Effect Snowfall Patterns in Indiana and SW Michigan**

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Using a multi-decade climatology of lake-effect snowfall events in northern Indiana and adjacent southwest Michigan, a Geographic Information System (GIS) analysis has been developed to explore the spatial patterns of snowfall, as well as the relationship between snowfall and upstream sounding parameters. Using a minimum peak snowfall threshold of five cm reported at one of the available locations with long-term snow reports, there are ~250 cases in the data set. While there are numerous additional reports available for more recent events, particularly with CoCoRAHs data, only the stations available for the entire period were used for the analysis. While reducing the number of reports, this allows a more direct comparison of events. The most common pattern shows a snowfall peak in southwestern Michigan and adjacent north-central Indiana, consistent with the common northwest flow during lake-effect snow events. However, there are other obvious patterns as well, with a group of events centered in northwest Indiana and another grouping with much more diffused regional snowfall. We will show a subjective classification of events, based on careful evaluation of the maps, and an objective classification based on K Means clustering. Correlation maps of snowfall and upstream parameters from the Green Bay, Wisconsin sounding highlight the effect of wind direction in northwest Indiana; the correlation is relatively strong for stations in northwest Indiana, yet there is almost no correlation of wind direction and snowfall in southwest Michigan (with the caveat that null cases are not included in the data set). The sensitivity of snowfall to lower-tropospheric temperature is rather modest, but is somewhat higher in southwest Michigan. The patterns of snowfall sensitivity to upstream relative humidity, inversion characteristics, and wind shear will also be shown.

### *Information about the Authors:*

Matthew Christy is a senior and a double major in meteorology and geography. Lake-effect snow has interested him most of his life since he grew up in this lake-effect snow area. He was excited about this opportunity to study how factors like temperature and wind direction affect lake-effect snow amounts in the region. GIS is another skill that he was able to utilize in this project, which was valuable in allowing all the snowfall maps to be made. Matthew liked using GIS to map meteorological phenomena, and he wants to continue researching in the future. Holly A. Boney is a sophomore meteorology major with a double minor in math and GIS. Holly moved to Indiana from Washington state to study every facet of the weather. Lake-effect snow was something completely unfamiliar to Holly, so she wanted to explore the mechanisms behind it. In the future, Holly hopes to continue her research and possibly expand her work to different lakes.

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