The Relationship Between Severe Storms and Weather Regimes Over the US

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What is a weather regime?

- Weather regimes are wind flow patterns that cover a large region approximately the size of the continental United States, and they change over days and weeks as the wind flow patterns fluctuate.
- Examples of a weather regime are pictured to the right.

Goal of Research

- To investigate whether certain cluster transitions can be associated with severe weather outbreaks.

Method

Acquired two different data sets from databases, which are both combined later in the study.

From the Physical Sciences Laboratory in NOAA, we received data on the altitude at which the atmospheric pressure of 500 millibars (mb) occurs spread out over varying points in the continental United States.

From the Storm Prediction Center, a database by NOAA and the National Weather Service, we received data identifying dates of severe weather outbreaks from January 1, 2000 to November 5, 2019.

Using the location of the height at which 500 mb occurs, we created maps of wind flow patterns of the weather regime.

To determine how widespread the severe weather was, we calculated the percentile of states affected by the weather events for each day.

We used a statistical method called cluster analysis, which groups wind flow patterns into similar categories. The analysis allowed us to group days with a similar wind flow patterns.

A bootstrap analysis will determine if there is a statistical significance of severe weather events during each cluster transition.

Colors of the graphs

- Represent the altitude at which the air has a pressure of 500 millibars (mb)
- The blue means the altitude of 500 mb is lower and the red means that the 500 mb level is higher
- The blue area is air that is denser and colder than the red area
- The gray area between the two colors is where the air flow is the fastest

Current and future state of the project

- Currently writing a computer program for the bootstrap analysis
- Will analyze a distribution graph to determine if there are any cluster transitions associated with severe weather

Resources: