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Classifying Tornadic Storms in the Tennessee Valley

Project Description:

There are many different types of weather events that can produce a tornado, such as squall lines, different kinds of supercells, and outer rain bands of hurricanes. It is important to know when a tornado is possible based on the type of incoming storm. The Tennessee Valley is known for having unusual tornadic event circumstances more often than the rest of the continental United States. An example of this is that a high percentage of tornadoes in the region occur in the late evening and night. This project aims to classify types of storms producing tornadoes from the past ten years (2010-2019) within a 120-mile radius of the ARMOR Radar located at UAH. An online database will be created to categorize these tornadoes, and statistics will be generated in order to analyze possible trends in the data. These generated statistics will include (but are not limited to) environmental parameters such as potential energy, wind shear, and rotation as well as time of day and time of year/season. Better understanding of the circumstances/environments in which tornadoes form will contribute to improved forecasting of tornadic events, which in turn will increase safety for residents of the Tennessee Valley.

Data and Analysis Tools:

Data for each tornado in the past ten years in the specified area will be pulled from UAH ARMOR Radar data, as well as supplemental data from the National Weather Service's Hytop, AL radar. Data from the NWS Storm Prediction Center's Mesoanalysis Database and from NWS and UAH UPSTORM upper-air soundings (weather balloons) will also be used. Different software programs/tools will be utilized to analyze the data, such as GR2Analyst, Py-ART, SHARPpy, and RAOB. GR2Analyst is used for visualizing storms in three dimensions, which will be helpful for distinguishing different storm structures. Py-ART is a Python module used to analyze radar data. SHARPpy is a Python program which is used to analyze sounding data, and will be helpful for comparing the different environments that storms form in. RAOB is used for more in-depth sounding analysis.

Training and Execution:

This project will take place between Tuesday, May 26, and Friday, August 7, 2020. The first two weeks will include attending the UAH NSF REU data tools boot camp which will be held at the NSSTC and SWIRLL buildings on the UAH campus. Valuable skills will be learned at this boot camp in order to be able to complete the best research possible. A computer in the SWIRLL Ops Center will be provided for the duration of the project. Training will be given by SWIRLL faculty, staff, and students on the different types of software mentioned. The software will then be used to analyze the data and determine the categories for the database.