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Tropical cyclones rotating storms that form over tropical waters in the Atlantic, Pacific and Indian Oceans with a low pressure. They can cause strong winds, heavy rainfall, storm surge and flooding. As a result of climate change, these types of storms are occurring more often at a greater intensity due to the increasing sea surface temperatures.

Model Background

Ensemble models are a set of models that contain forecasts that differ due to slight variations in initial conditions. These often give forecasters a general idea of what may occur. In our project, we analyzed the Ensemble Prediction System (EPS), which contains all ensembles for the European Model.

Project Goals

We decided to focus on the rate of error in these models and how this affected forecast uncertainty for the European Model. To analyze this, we chose to study the 2020 Atlantic Hurricane Season, as it was the most active hurricane season on record, with some storms that were known to have deviated from the forecasted track and intensity. In particular, we analyzed three storms of meteorological significance: Tropical Cyclones Cristobal, Delta and Laura.

Storm Background (I was thinking this could potentially go before the data analysis for each storm)

Tropical Cyclone Cristobal formed from the remnants of Tropical Cyclone Amanda, a storm that formed in the Eastern Pacific Ocean. It traveled in a loop as a result of the Central American Gyre, an area of large ocean water currents near Central America. This storm made landfall in Alasta, Mexico and then in Plaquemines Parish, Louisiana. Cristobal moved faster than many of the models predicted, leading to a much shorter time than usual between when warnings were issued and when the storm made landfall.

Tropical Cyclone Delta formed on October 4th and dissipated on October 12th. It was actually the fastest intensifying storm in the Atlantic Basin, going from a tropical storm to a category 4 hurricane in a little over 24 hours. Delta first made landfall in the Yucatan Peninsula in Mexico, and then made landfall later in Louisiana. Many models expected Delta to go north and east of its actual track, one model even forecasting Delta to make landfall in Cuba.

Tropical Cyclone Laura formed on August 20th and dissipated on August 29th. This storm had a very similar track and peak strength to Delta, making landfall in Louisiana within 50 miles of where Delta made landfall. Earlier on in the storm's life, the models expected the storm to go west of its actual path. We wanted to particularly compare the data from Tropical Cyclones Laura and Delta because of how similar the storms were.