Motivation

- Ensemble forecasting is used to help quantify and communicate uncertainty (spread).
- Tools such as the ensemble situational awareness table help communicate the magnitude of anomalies in reference to a model climatology (M-Climate), but there isn’t a method to communicate magnitude of uncertainty.
- Can we use ensemble mean and spread M-Climate to determine how anomalous the spread may be in reference to events of similar magnitude?

Methods

- Ens mean M-Climate consisting of 30 years (Nov 1985-Mar 2015) and forecast hours 0-168 is used to subset a new spread M-Climate based on ens mean standardized anomaly.
- Standardized spread anomaly, $F - C_{sm}$

\[ \frac{F - C_{sm}}{\sigma_{sm}} \]

where $F$ is forecast spread, $C_{sm}$ is modified spread climatology, and $\sigma_{sm}$ is standard deviation of the climatology, shows where the spread lies with respect to the mean of the modified climatology.
- Return intervals are created based on the number of spread cases in the distribution of equal or greater magnitude, then divided by the record length (30 years).

Load in Data

M-Climate ensemble mean and spread from Nov 25, 1985-Mar 2015 and modified used to determine new spread M-Climate

 Subset new M-Climate

F-M Climate ensemble mean standardized anomaly; $F - C_{sm}$ is of forecast, $C_{sm}$ is modified spread climatology (M-Climate); $\sigma_{sm}$ is standard deviation of climatology, shows where the spread lies with respect to the mean of the modified climatology

Output Plots

- Standardized spread anomaly plot determines departure from climatological mean
- Return interval plot relates the forecast spread to the rate of equal or greater magnitude spread values

Discussion

- Spread is inherently a non-normal distribution due to extreme events. Methods such as using percentiles can provide a more detailed context for a forecaster.
- An analysis of dprog/dt, or how the model uncertainty changes over time, can be performed using this method (must be wary of underdispersion, clustering the ensemble mean).
- The tool is not intended to provide a conclusive analysis of uncertainty (only as good as the model performs).
- Other variables have been tested (surface temperature and 500 heights).

Summary/Future Work

- The tool can be used to help assess the uncertainty (or confidence) of an event relative to events of similar anomaly.
- More variables (PWAT, 700 RH, 850 winds, 850 temp) will be added and analyzed.
- More robust quantitative and statistical analysis of methods will be performed.
- A webpage with real time updates and maps is on the way.
- More questions? Send an email to taylor.mandelbaum@stonybrook.edu

References

1. Ensemble Situational Awareness Table, [http://rad挽.aroch.is/cstable/](http://rad挽.aroch.is/cstable/)

Using Model Climatology to Develop a Confidence Metric for Operational Forecasting

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