# Visually Comparing Weather Features in Forecasts

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Summary by Willy Markuske

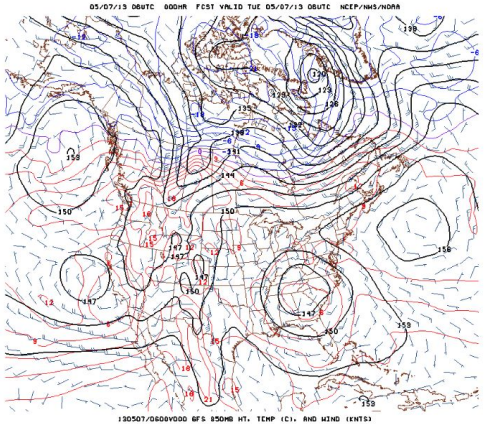
# What and Why of Meteorological Visuals

Meteorological visualizations are used by meteorologists to make predictions of weather events across geographic regions. There are many different meteorological visualizations for a wide range of variables measured/predicted for use in weather forecasting. These data are both scalar and vector geospatial data types that represent a discrete points in time. Derived data is generated based on meteorological principles and multiple predictions are needed to make informed decisions through ensemble modeling.

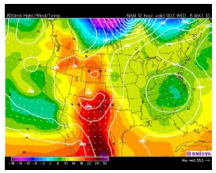
The authors of the paper looked to improve meteorological visuals by focusing on specific key tasks: Can weather visuals be made to use consistent, effective visual encodings to improve prediction accuracy? How can ensemble predictions be visualized coherently?

# Standard Meteorological Visualizations

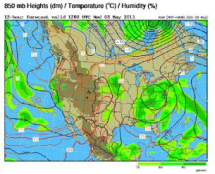
- Visually cluttered
- Multiple variable encoding choices combine problematically
- Static snapshots of overlayed encodings
- Colormaps use hues for magnitude data
- Ensemble models shown using spaghetti plots which are cluttered and use poor color encoding to separate model predictions



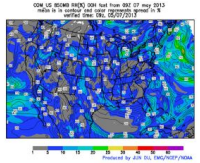
(a) temperature, geopotential heights, and wind



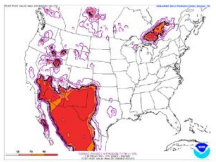
(b) temperature, geopotential heights, and wind



(c) relative humidity, temperature, and geopotential heights



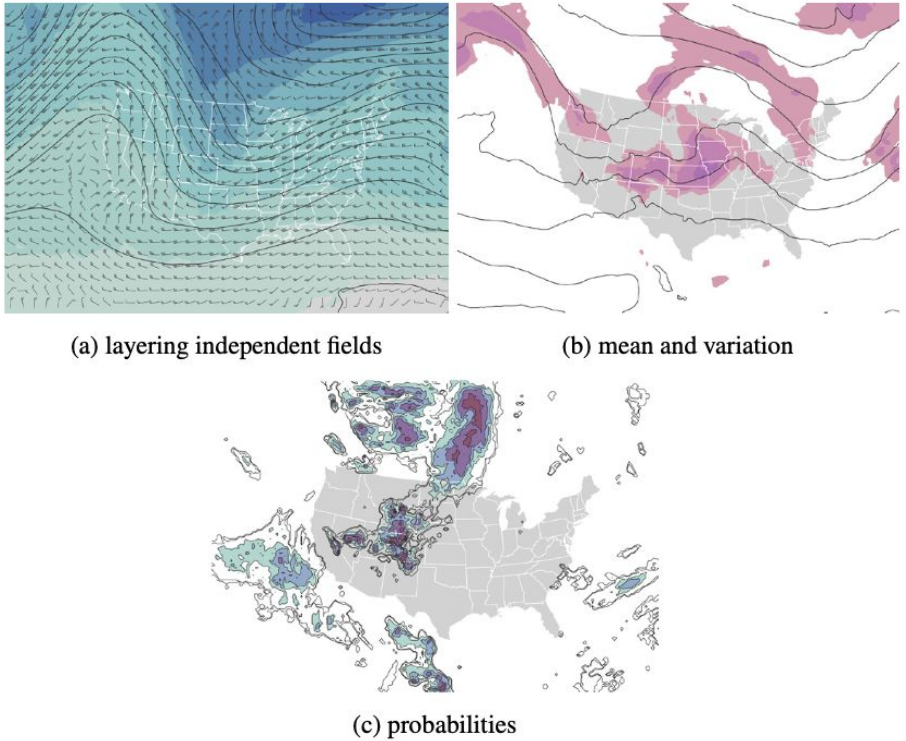
(d) mean and spread



(e) probability

# WeaVER

- Limit simultaneous displays to three encodings: base color, set of contours, glyphs
- Continue to use standard meteorological symbols (i.e. wind barbs) and data binning (contour levels)
- Changes color encoding colormaps to use consistent encodings based on most used variables and improve readability through uniform luminance steps



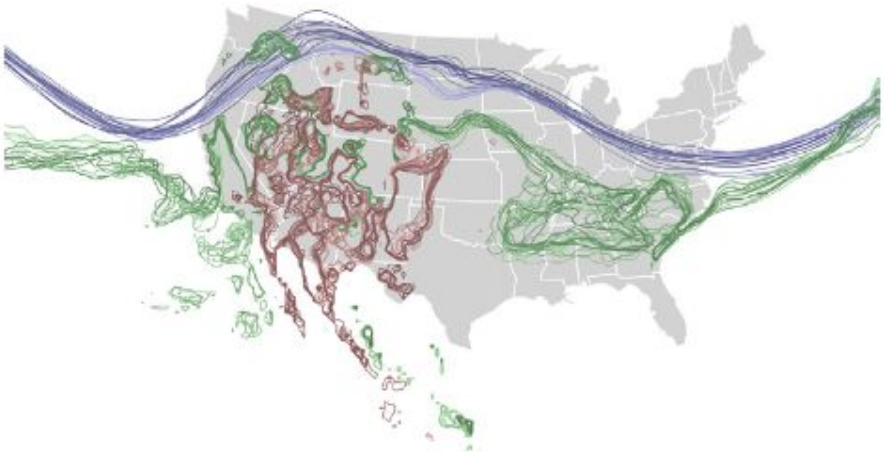
(a) layering independent fields

(b) mean and variation

(c) probabilities

# WeaVER

- Interactive spaghetti plots for ensemble viewing
- User interactivity to see contours from different ensemble models to better view how models differ



# WeaVER Analysis

| Idiom | WeaVER |
| --- | --- |
| What: Data | Geospatial scalar and vector meteorological variables |
| What: Derived | Probabilities of predicted geospatial values |
| Why: Tasks | Improve clarity of static meteorological maps for prediction; allow for direct viewing of ensemble predictions |
| How: Encode | Consistent/visually performant color mapping; contours of same valued geospatial grid points; meteorological glyphs |
| How: Manipulate | Interactive spaghetti plotting to highlight ensemble models |
| Scale | Tens of variables over hundreds of geospatial grid locations |