Reliability of 3-Hour Probability of Precipitation Forecasts Produced by the National Weather Service Office in Miami, Florida

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Motivation

- In early 2013, the Miami National Weather Service (NWS) began to issue short term 3-hour Probability of Precipitation (PoP) forecasts
- The forecasts provided the general public with more frequent updates for South Florida where short-term isolated showers often occur
- Analysis of the reliability of the new 3-hour PoP forecast is completed to provide feedback to forecasters

Methods

Data

- NWS archived PoP values
- Archived Radar Images via the National Climate Data Center (NCDC)

Analysis

- Four locations: Naples (APF), West Palm Beach (PBI), Miami (MIA) and Fort Lauderdale (FLL)
- Precipitation was recorded if reflectivity values exceeded 15 dBz at each location
- Reliability plots were generated by separating the data into 11 categories based on the PoP value
- Forecasted PoPs were calculated by taking the average PoP value of that category
- Observed PoPs were found by calculating the percentage of time that precipitation occurred in that category
- The black line represents a perfect forecast
- High impact events were analyzed and compared to reliability plots

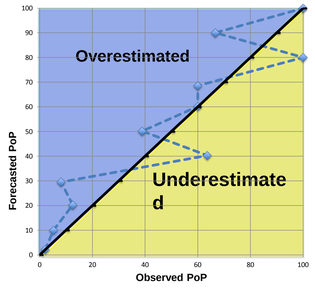
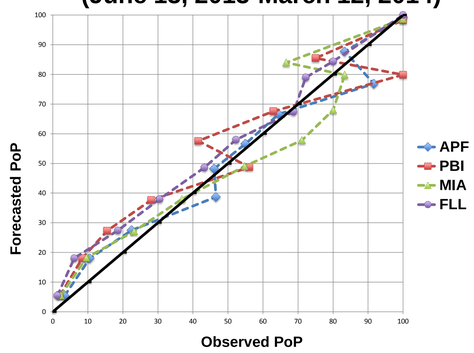


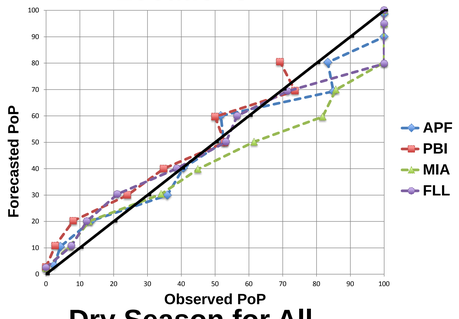
Figure 1. A reliability plot with the blue area representing overestimated forecasts and the yellow representing underestimated forecasts.

Results

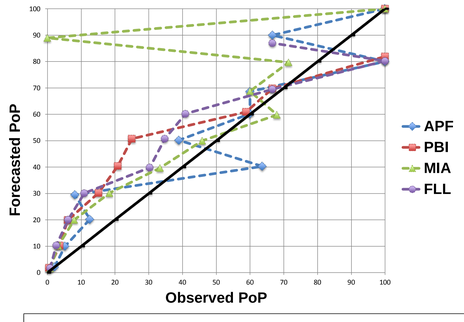
Comparison of All Locations (June 13, 2013-March 12, 2014)



Wet Season for All Locations



Dry Season for All Locations



- Overall, each reliability plot showed relatively accurate forecasts
- Low PoP values were overestimated
- PoP values around 80% were the most commonly underestimated forecast
- There were less precipitation events in the dry season, meaning less data for higher PoP values
- Values above 70% were less frequently forecasted leading to a smaller sampling size
- Data was not available for each category (such as categories above 80% for PBI in the wet season)

	Results
All Seasons (June 13, 2013 – March 12, 2014)	• Values less than 30% overestimated, suggesting a wet bias • Majority of forecasts are overestimated except for 80%
Wet Season (June 13, 2013 – September 31, 2013)	• More reliable compared to dry season • 50%, 70% and 80% PoP values are underestimated for most locations • Values less than 20% overestimated
Dry Season (October 1, 2013 - March 12, 2014)	• Overestimated for most PoP values • Values under 30% overestimated • Underestimated for three locations at 80%

High Impact Events

5 days in which the precipitation was especially significant were chosen as high impact events. PoP values commonly showed an increasing trend as forecasters saw increasing precipitation on radar. The high impact events agreed with several underestimates found in reliability plots. For example, precipitation often occurred for PoP values around 80%, agreeing with the underestimate found in the reliability plots.

Conclusions

- The new short-term 3-hour PoP forecasts were proven to be mostly reliable but also showed room for improvements
- The most consistent bias was an overestimate of low PoP values
- This overestimate is likely due to forecasters using slightly higher PoP values. Most forecasters are hesitant to issue a PoP forecast less than 10% unless they are completely certain
- Forecasters also rarely issue PoP values higher than 80% which is likely the cause of the underestimates at these values
- High impact events showed relatively accurate PoP forecasts
- Results found in the reliability plots were often seen in the high impact events as well

Future Work

- Investigate possible reasons for biases
- Analyze training and forecasting methods
- Reexamine a larger data set that extends over 1 year
- Compare 3-hour PoPs to 12-hour PoPs
- Compare PoP forecasts before and after feedback

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