OBJECTIVE

Increase accuracy and lead time of Flash Flood Warnings via using GFE
- As a diagnostic tool to assess model information
- To identify areas where moisture content is high relative to 1-hour FFG
- To identify high flood threat potential areas as intersection of atmospheric forcing and high moisture content during the next 6 hours

Use model Information to
- Determine the highest potential for intense rainfall and its location
- Determine whether and where such areas persist over several hours
- Excessive rainfall is most likely where intense rain potential exists for three hours or more, particularly where moisture content is high relative to 1-hour FFG

TECHNIQUE

Dynamics Index

Assess hourly forecast data from locally-run near term models (wrf, RUC, HRRR)
Compute a Dynamics Index to identifies areas of forcing for lift
- Upper Level forcing
  - Divergence
  - Advection of negative divergence
- Mid level forcing
  - Lift (result of forcing as output by model)
- Low level forcing
  - Convergence
  - Advection of negative divergence
- Moisture flux convergence

Dynamics Index is a basically a middle ground value based on the upper, mid and lower level forcing, with enhancement option for light flow. Forcing in each level based on strongest factor in that level. *Catch shuntwise forcing.

Moisture Index

Use either precipitable water or precipitation efficiency as a moisture parameter
- Precipitable water: absolute measure of moisture content in the column
- Precipitation efficiency: degree of saturation
Use FFG as a threshold for the moisture parameter
- Moisture index is highest where moisture parameter is highest relative to 1-hour FFG
- Moisture index is low or none where moisture parameter is low relative to 1-hour FFG

FLOOD THREAT INDEX (“Instantaneous”)

Combine Dynamics and Moisture Indices
- Anticipate the potential for flooding where both indices are high
- Lowest of the two
- More sensitive overall
- Divide the product of the two by 5
- Most sensitive to the very highest threat areas

PERSISTENT FLOOD THREAT INDEX

This is a function of the Flood Threat Index
- current hour
- 2 previous hours
- most recent weighed more heavily

RESULTS

- Decent support in the west
- High FFG values in the west
- Flood threat and persistent flood threat non-existent
- Flood threat is high in VA, east of CWA, where Ohio Valley RFC domain ends
- FFG was better integrated into the Persistent Flood Index
- Low moisture content in relation to FFG wipes out flood potential even in areas of favorable dynamics – is this a good idea or should it be tapered back some?

TO DO

- Use additional cases to calibrate Persistent Flood Threat Index to actual flooding/flood flooding
- Enhance dynamics parameter via use of additional forcing variables
- Combine with Flood Basin Index to identify enhanced flash flood threat based on basin characteristics:
  - Static – slope, use of land, vegetation
  - Dynamic – Snow cover, antecedent precipitation, burn areas, seasonal vegetation state, Persistent Flood Threat (this project)

REFERENCES

2. Noel, Jim, Ohio River Forecast Center, 2009: Use of Precipitation Efficiency in Forecasting Heavy Rain Potential. NWA.