



# Overview of the September 2009 Southeast U.S. Flood Event



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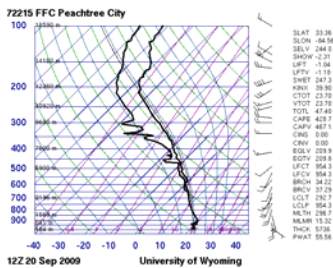
## 1. Introduction

During September 19-22, 2009 a widespread 5-10" of rain fell over northern Georgia and northwestern South Carolina with local maximum amounts near 20". 12 deaths were attributed to the flash flooding. The synoptic environment was characterized by weak forcing aloft and at the surface but within a very moist lower atmosphere. While the larger-scale numerical guidance underforecast the large amounts, the higher resolution models captured the higher precipitation amounts. However, placement of the heavy precipitation was not always accurate.

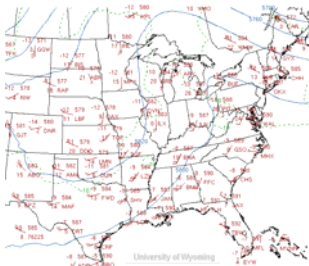


Interstates 75/85 in downtown Atlanta, GA.

## 2. Atmospheric Conditions



- Weak forcing: upper shortwave, warm air advection, orographic enhancement
- Precipitable water value (55.56mm or 2.19in) was more than two standard deviations above normal



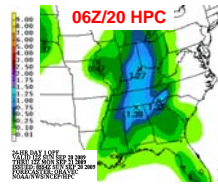
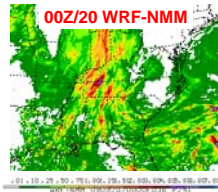
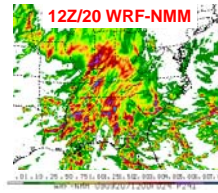
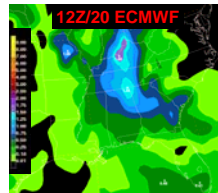
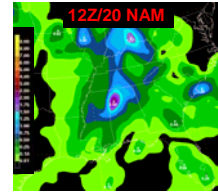
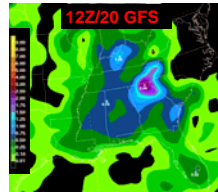
500 hPa Analysis  
12Z 20 September



HPC Surface Analysis  
12Z 20 September

## 3. Model Evaluation

- GFS, NAM, and ECMWF showed little skill right up to their 24-hr forecast on 20 September
- Higher resolution (4-km) WRF-NMM runs showed higher amounts but not necessarily in the right place
- Considerable precipitation was forecast by the higher resolution models in some areas where none was observed



24-hr precipitation forecasts ending 12Z 21 September

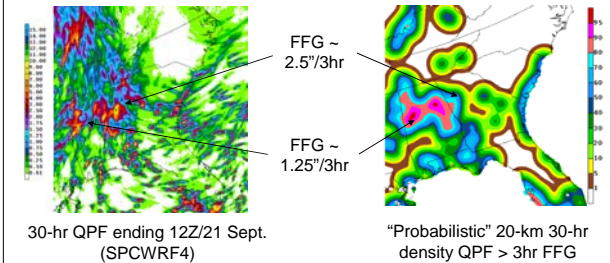


Stage IV 24-hr precipitation estimate ending  
12Z 21 September, 2009 ([www.nmq.ou.edu](http://www.nmq.ou.edu))

## 4. HPC Excessive Rainfall Tools

### Spatial Density

- Uses neighborhood approach (e.g., Schwartz et al. 2009) to give credit for the correct event/phenomenon, even if the placement is not perfect
- Event defined as QPF > flash flood guidance (FFG) within 40 km of a point (uncalibrated probability)



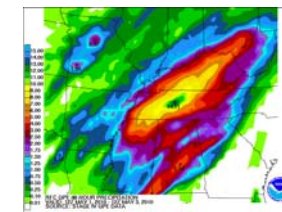
30-hr QPF ending 12Z/21 Sept.  
(SPCWRF4)

"Probabilistic" 20-km 30-hr  
density QPF > 3hr FFG

### Probabilistic QPF (PQPF)

[www.hpc.ncep.noaa.gov/pqpf\\_6hr/conus\\_hpc\\_pqpf\\_6hr.php](http://www.hpc.ncep.noaa.gov/pqpf_6hr/conus_hpc_pqpf_6hr.php)

- Example from Tennessee Flood (May 1-2, 2010)
- HPC QPF serves as mode of ensemble distribution



48-hr HPC QPF



48-hr QPE (verification)

- 95<sup>th</sup> Percentile (right) can be considered a reasonable "worst case" scenario



95<sup>th</sup> Percentile PQPF

## 5. Conclusions

- Global/regional models performed poorly
- High-resolution models showed at least some skill in forecasting higher precipitation totals, but not always placement
- HPC experimenting with probabilistic QPF via high resolution models to improve our Excessive Rainfall Outlook product and raise situational awareness of heavy rainfall threats

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