

WFO Huntsville Quick Event Review

Date/Time of Event: May 6, 2003/~6am to noon
Forecaster(s) performing review: Priscilla Bridenstine
Type (and significance) of event: Extremely heavy rainfall/flash flooding

Brief overview of event:

Extremely heavy rain fell across the County Warning Area in the early morning hours of May 6, 2003. Rainfall of nearly 4.20 inches was recorded in the Huntsville area in a 40-minute time period, with a 5-minute rainfall rate of 0.96 inches. Intense flash flooding occurred across the forecast area with 4 to 6 inches falling in approximately 6 hours. This flood event was responsible for millions of dollars in property damage. Widespread river flooding occurred with a 15 foot rise on the Flint River at Chase in 24 hours.

Thing(s) that went well (and why):

A Flood Watch was issued approximately 6 hours before flooding occurred in the Huntsville area. Satellite Precipitation Estimates issued by HPC helped key in on the threat from an MCS approaching northern Alabama. Concerns for heavy rainfall on this day were mentioned in AFD as early as the afternoon package on May 1st. Flood Watch was strongly considered on afternoon shift prior to event and was mentioned as potential in afternoon Forecast Discussion.

Most noteworthy from the forecast the day before was how well the 12Z MM5 model picked up on the heavy precipitation (~2.5 inch/3 hour). This model showed a widespread QPF bullseye of 2 inches from Decatur to Jackson county between 09Z-12Z. Twelve-hour precipitation amounts from 03Z-15Z ranged from 4.50 to 5.00 inches from Madison County AL to Chattanooga TN. The MM5 forecasted a 340K Theta-E ridge extending from approximately Jackson MS to Huntsville at 12Z. This lines up well with what was observed and forecasted by the RUC data up to 18 hours prior to the event.

At 19Z, the RUC analyzed a Theta-E ridge across central Arkansas. Thunderstorms were beginning to develop along and south of this ridge across southern Arkansas during this time. The RUC forecasted this ridge to shift just north of the CWA by 06z, which would put northern

Alabama in prime territory for thunderstorm activity if current trends continued. Subsequent runs from the RUC continued to show this ridge slightly north of the CWA with thunderstorm activity displaced just to the south.

Thing(s) that didn't go so well (and why):

A Flood Watch was not issued for this event with a significant amount of lead time. The main warm front was located across the Ohio Valley with a secondary front approaching from the south. When analyzing model data from 12Z the day before, neither the Mesoeta nor Eta picked up on an additional boundary approaching from central Alabama. Model QPF all showed the heaviest rain would fall along the surface front located farther to the north, rather than on the southernmost boundary. The Eta models did show a significant amount of moisture and convergence, however this was displaced into middle Tennessee, with lesser impact across northern Alabama.

The high risk of severe weather on the day prior to heavy rainfall led to only one person working both short and long-term desks. Most of the forecaster's attention was focused on the ongoing severe weather/tornado threat for the nighttime period, rather than on the 24 to 36 hour period. More time spent on the longer term forecast may have led to further analysis of developing storms across southern Arkansas and their impact on northern Alabama. The use of RUC data may have proved invaluable in identifying the threat for MCS activity and heavy rainfall.

Specific weakness of a model, computer algorithm, office system or procedure that needs to be addressed:

The Eta models did not pick up on the southernmost warm frontal boundary and, therefore, was focusing most of heavier QPF along main warm front located across the Ohio Valley. Models continued to show deep layer moisture and strong convergence, however this was also misplaced across middle Tennessee rather than northern Alabama.

The AVN model continually suffers from convective feedback, therefore high QPF amounts from this model are occasionally cut back when preparing forecast. It is very hard to determine when the AVN is showing convective feedback versus when it has a good handle on QPF amounts.

The MM5 did a great job pinpointing the location of the MCS and its subsequent QPF. A better idea of how the MM5 handles convective precipitation may have helped in forecasting the event, however QPF amounts seemed way overdone at the time.

The 05Z RUC from the morning of May 6th did show an approaching frontal boundary, observable via the temperature and dewpoint fields, extending from TUP to BHM to ANB. It brings it north of the CWA at 12Z with the nose of an 850mb jet approaching the KY/TN/NC border at 12Z. The model brings a 15 unit vorticity max across NW AL to middle TN at 12Z

with the highest QPF over extreme northwest Alabama. It moved the vorticity max to the northeast with the strongest 700MB omega, moisture flux convergence and Theta-e convergence located across middle Tennessee. The RUC was indicating approximately 1.75 inch PWATs over CWA at 12Z with the highest amounts (nearly 2.00 inches) over Jackson TN. Even though the event was only 8 hours from this RUC run, the model still had trouble picking up the greatest threat area for heavy rainfall with regard to its QPF field. However, derived fields continued to show a Theta-E ridge just north of northern Alabama.

Other lessons we can apply to future events:

The forecaster should not get bogged down in QPF amounts shown by models. The best practice is to concentrate on moisture convergence, lift, upper-level dynamics and other factors rather than the exact location of QPF. Rather than focusing on precipitation amounts, intense analysis of the data to pick up hints of surface and/or upper-level boundaries will point to the greater threat for heavy rainfall.

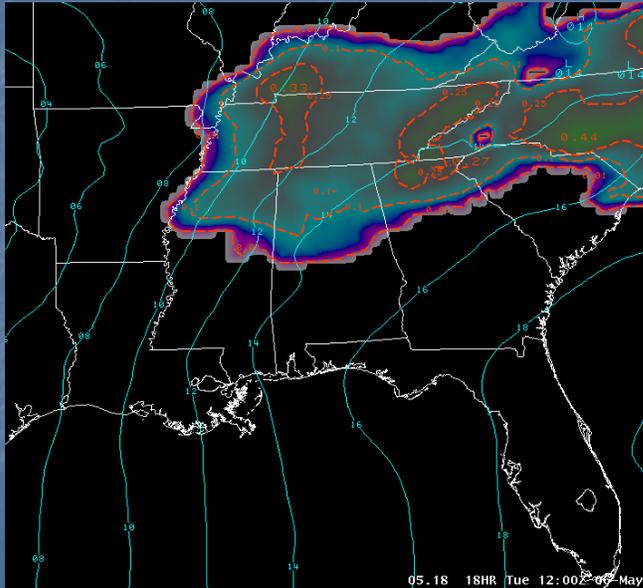
Frequent use of RUC and MSAS data may give a better idea of the prime location for MCS development, rather than looking at longer-range models. However, the forecaster should determine how well the short-term models have a handle on the current situation before applying it. The slightest deviation from current conditions may make a difference hours down the road.

If time and weather permits, solicit input from other forecasters. Two heads are always better than one. If this is not possible and if there is a threat for heavy rainfall but it does not look widespread, there is no penalty for mentioning heavy rain in the ZFP.

Additional Material (Attached):

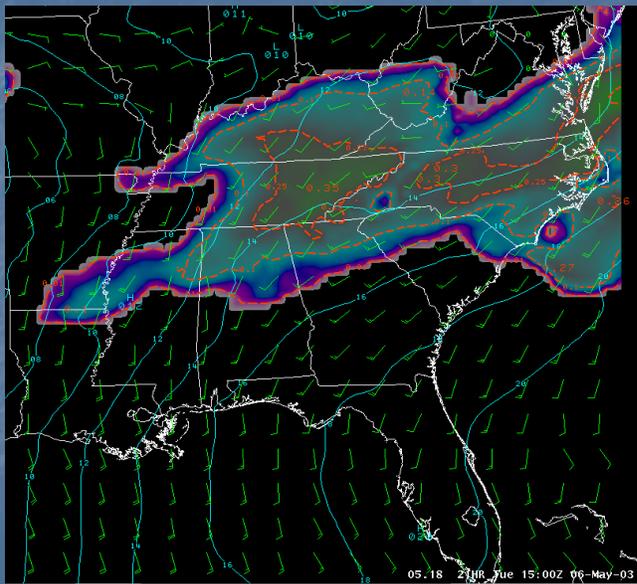
Eta run from 12Z the previous day, valid at 12Z & 18Z Tuesday, May 6th.
AVN run from 12Z the previous day, valid at 12Z & 18Z Tuesday, May 6th.
Mesoeta run from 18Z the previous day, valid at 12Z & 15Z Tuesday, May 6th.
IR imagery, RUC 850mb Theta-E and wind valid at 19Z.
RUC run from 05Z morning, valid at 12Z & 15Z Tuesday, May 6th.
AFD issued from I-shift on Tuesday, May 5th.
FFG issued on May 5th.

18Z Mesoeta Run valid at 12Z Tuesday, May 6th



- Mesoeta showing QPF amounts of between 0.10 and 0.25 inch would fall between 09Z and 12Z.

18Z MesoEta run valid at 15Z Tuesday, May 6th

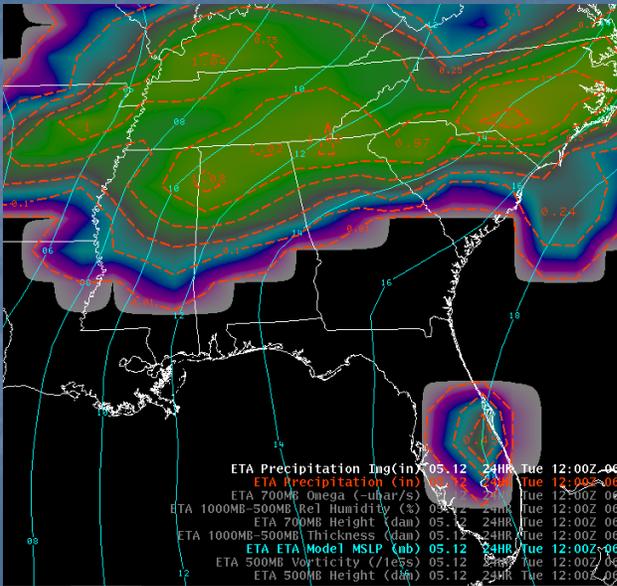


- Mesoeta run indicates 0.10 to 0.25 inch amounts across Northern Alabama between 12 and 15Z.

Mesoeta QPF Forecast

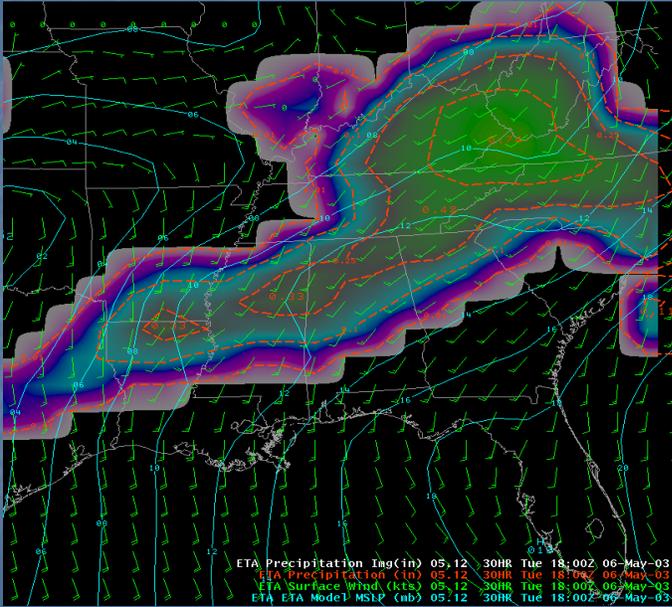
- 6 hour QPF amounts from 09Z-15Z indicates 0.25 to 0.50 inch would fall across Northern Alabama. This is in stark contrast to the 4 to 6 inch rainfall that did occur over the area.
- The 6-hour FFG values of ~2.5 inches issued at 10:30 am on May 5, were well above the forecasted amounts.

12Z Eta Run valid at 12Z Tuesday, May 6



•The ETA run gives 6 hour QPF amounts of approximately one inch from 06-12Z.

12Z ETA Run valid at 18Z Tuesday, May 6th

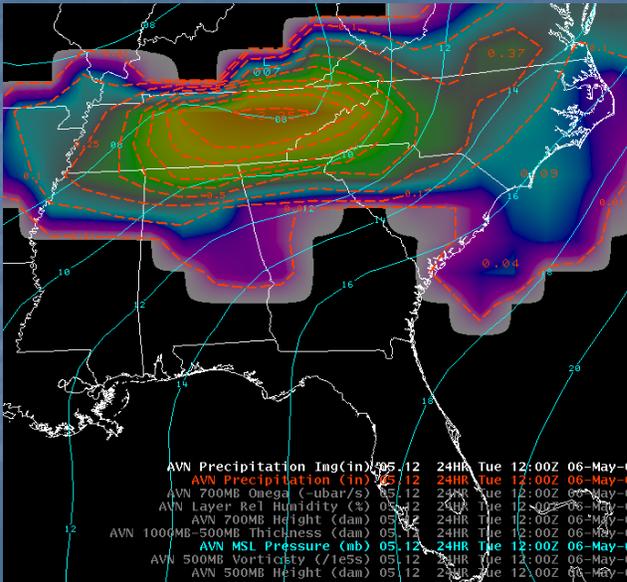


- The ETA run the day prior to the heavy rain indicated widespread amounts of 0.25 to 0.50 inch across northern Alabama from 12-18Z.

ETA QPF Forecast

- Between the 06Z and 18Z timeframe on Tuesday, May 6th, the ETA model showed QPF amounts of 1.25 to 1.50 inches.
- This 12-hour rainfall amount was below the 6-hour FFG of 2.5 inches issued at 10:30 am on May 5th.

12Z AVN Run valid at 12Z Tuesday, May 6th

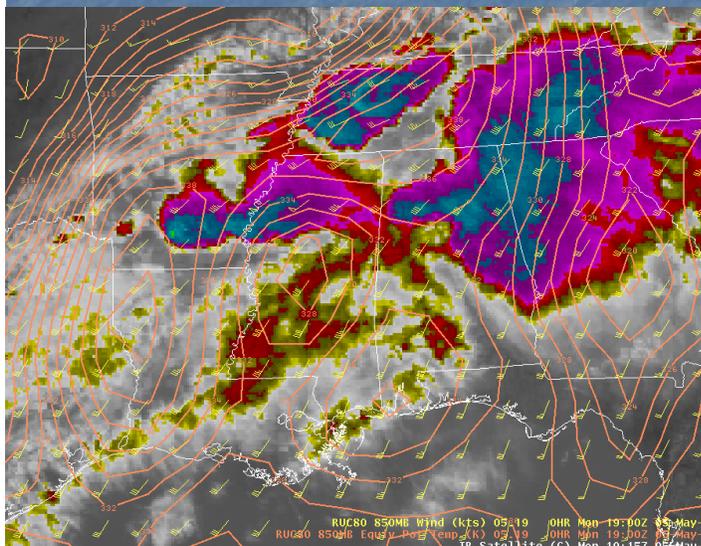


- AVN run gives 6 hour QPF amounts of just over 1 inch across extreme Northern Alabama with widespread 0.50 inch amounts elsewhere.

AVN QPF Forecast

- 12-hour QPF amounts from the AVN model showed approximately 1.25 to 1.50 inches between 06Z and 18Z Tuesday May 6th.
- These amounts were below the 6-hour FFG values of 2.5 inches issued at 10:30 am on May 5th.

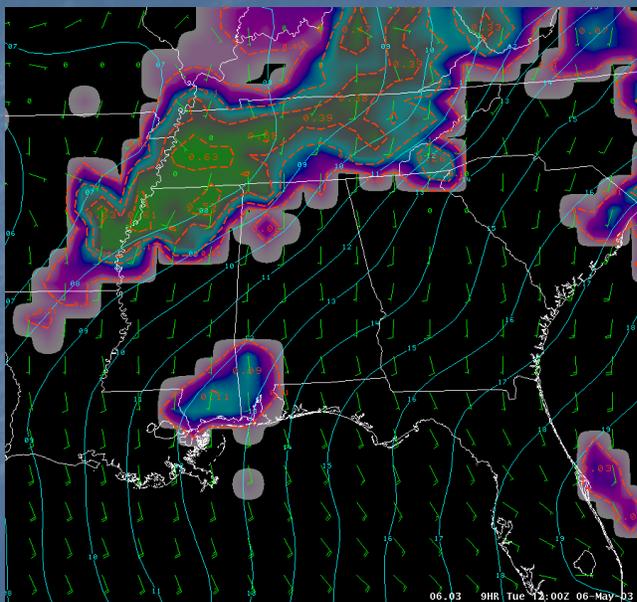
19Z IR Imagery, RUC 850MB Theta-E Ridge and winds.



Storms are developing just south of 850MB Theta-E Ridge across southern Arkansas.

The RUC forecasts this ridge to remain slightly north of the CWA through approximately 15Z May 6th.

05Z RUC Data valid at 12Z Tuesday, May 6th



- 05Z RUC Data indicates QPF between 0.25 to 0.50 inch across extreme Northwest Alabama at 12Z.

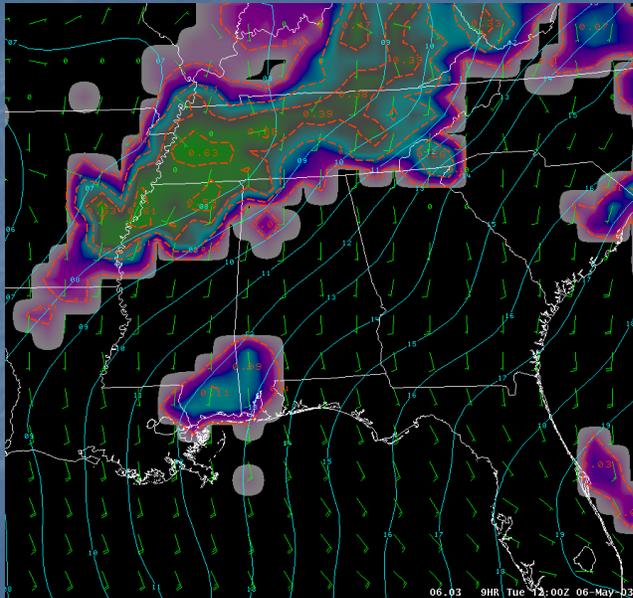
- The heavy rainfall of approximately 4 inches fell in Huntsville between 13 and 14Z.

- The RUC model 9 hours prior indicated < 0.10 inch would fall one hour prior to actual event.

19Z RUC Data

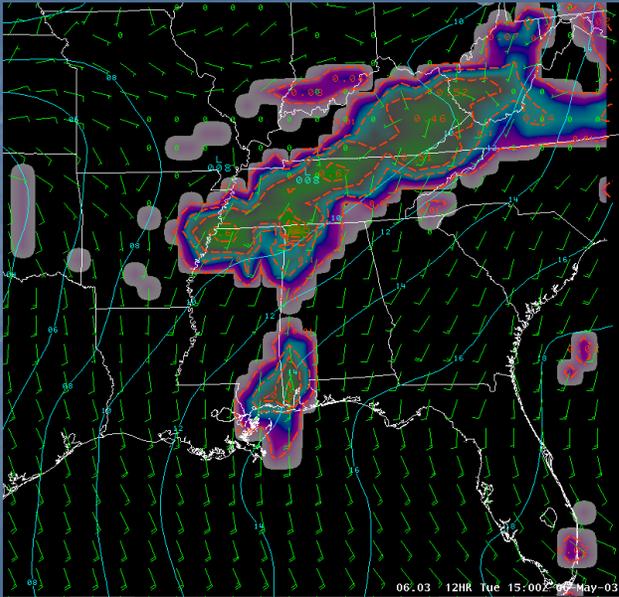
- The 19Z RUC indicated a Theta-E Ridge across central Arkansas with thunderstorms developing along and south.
- This ridge was forecast to remain slightly north of the CWA, leaving area in prime location for thunderstorm activity.
- QPF from subsequent RUC runs do not indicate heavy rainfall, however placement of surface and upper level features indicate heavy rainfall potential was present.

05Z RUC Data valid at 12Z Tuesday, May 6th



- 05Z RUC Data indicates QPF between 0.25 to 0.50 inch across extreme Northwest Alabama at 12Z.
- The heavy rainfall of approximately 4 inches fell in Huntsville between 13 and 14Z.
- The RUC model 9 hours prior indicated < 0.10 inch would fall one hour prior to actual event.

05Z RUC Data valid at 15Z Tuesday, May 6th 2003



- The 05z RUC indicated approximately 0.05 inches would fall between 12 and 15Z in the Huntsville area.
- The heaviest rain fell between 1330 and 14Z with a five minute rainfall amount of 0.96 inches from 1345-1350Z.
- It did a better job picking up heavy amounts across NW AL.

FFG Values issued by LMRFC the day prior to heavy rainfall.

➤FFG values (1-hr, 3-hr and 6-hr respectively) were well above the QPF amounts forecast by the 12Z models.

1030 AM MON MAY 05 2003

ALZ002	1.4/	1.9/	2.3	:COLBERT
ALZ010	1.9/	2.4/	2.7	:DE_KALB
ALZ003	1.4/	1.9/	2.3	:FRANKLIN
ALZ009	1.9/	2.4/	2.7	:JACKSON
ALZ001	1.4/	1.9/	2.3	:LAUDERDALE
ALZ004	1.6/	2.1/	2.5	:LAWRENCE
ALZ005	1.4/	2.0/	2.3	:LIMESTONE
ALZ006	1.9/	2.3/	2.6	:MADISON
ALZ008	1.9/	2.3/	2.6	:MARSHALL
ALZ007	1.9/	2.3/	2.6	:MORGAN

930 PM MON MAY 05 2003

ALZ002	1.4/	1.9/	2.3	:COLBERT
ALZ010	1.9/	2.4/	2.7	:DE_KALB
ALZ003	1.4/	1.9/	2.3	:FRANKLIN
ALZ009	1.9/	2.4/	2.7	:JACKSON
ALZ001	1.4/	1.9/	2.3	:LAUDERDALE
ALZ004	1.6/	2.1/	2.5	:LAWRENCE
ALZ005	1.4/	2.0/	2.3	:LIMESTONE
ALZ006	1.9/	2.3/	2.6	:MADISON
ALZ008	1.9/	2.3/	2.6	:MARSHALL
ALZ007	1.9/	2.3/	2.6	:MORGAN