THE FORECASTING AND MONITORING OF CONVECTION ASSOCIATED WITH FLASH FLOOD THREATS

Michael J. Folmer
(UMCP/ESSIC/CICS)
Satellite Liaison at WPC/OPC/TAFB/SAB
Contributions from:
Andrew Orrison (WPC), David Novak (WPC), Jamie Kibler (SAB),
Steve Goodman (GOES-R), and Mitch Goldberg (JPSS)

3rd Annual CICS-MD Science Meeting
11/13/14
Highlight regions where rainfall may exceed flash flood guidance at a point

Day 1 – 3 forecasts

Probabilistic
- Slight (5-10%)
- Moderate (10-15%)
- High (>15%)
Short-term, event-driven forecasts that highlight regions where heavy rainfall may **lead to flash flooding over the next 1-6 hours**

Goal – enhance near-term situational awareness among local NWS Offices, emergency managers, and the media
24x7x365 monitoring of precipitation with emphasis on satellite analysis, short term trends and rainfall estimates

**Supporting NWS WFOs/RFCs**

**Priorities**
- heavy rainfall / flash flooding
- moderate to heavy winter precipitation
  - West Coast winter storms
  - Great Lakes snows
- Consultation on satellite issues

**Supporting NWS NCEP WPC**

**Priorities**
- excessive rainfall area
- 0-6 hr rainfall guidance
- satellite precipitation trends
- tropical rainfall
- rainfall and snowfall estimates

http://www.ssd.noaa.gov/PS/PCPN/
New Products Introduced in the Satellite Proving Ground at WPC and SAB

- Overshooting Top Detection/Magnitude
  - CIMSS
- GLD-360 Lightning Density
  - OPC/NESDIS/CICS
- Convective Initiation
  - UAH/NASA SPoRT
- GOES-14 Super Rapid Scan Operations for GOES-R (SRSOR)
  - CIMSS & CIRA
- Nearcast
  - CIMSS
Lake Charles, LA

Localized Flash Flood
06/27/14
Convective Initiation
Satellite Analysis Branch
Satellite Precipitation Estimates (SPENES)

Analyst Warren
06/27/14 Flash Flood
Base Reflectivity with Overshooting Top Magnitude
06/27/14 Flash Flood
GOES-13 Infrared with GLD-360 Lightning Density
SHORT TERM OUTLOOK VALID 1750-2250Z...HIGH CONFIDENCE FACTOR IN SHORT TERM OUTLOOK...ALREADY CONVECTION HAS DEVELOPED ACROSS PORTIONS OF SE TX/SW LA THIS AFTERNOON WITH SOME LOCATIONS RECEIVING A QUICK 2-3" IN AN HR. INCREASING CONCERN OF ADDITIONAL CONVECTION DEVELOPING/EXPANDING N FROM GULF OF MEXICO AHEAD OF SHORTWAVE TROF THAT IS GRADUALLY LIFTING NEWD ACROSS ERN TX/WRN GULF OF MEXICO. WITHIN THE LAST HR AN OUTFLOW BOUNDARY HAS BEGUN TO PROPAGATE NWD TOWARDS TO COASTLINES OF SE TX/SW LA WITH NEW CONVECTION ALREADY BEGINNING TO INITIATE. GOES CI ALGORITHM DOES SUGGEST POSSIBLE TO LIKELY ADDITIONAL CONVECTIVE TO DEVELOP AHEAD/ALONG OUTFLOW BOUNDARY IN THE NEXT COUPLE OF HRS. ATTM OBJECTIVE SFC MOISTURE CONVERGENCE MOISTURE HAS A STRONG MAX LOCATED ALONG THE SW LA COAST. GIVEN THE STRONG SRLY 85H MOISTURE TRANSPORT OF 2.0"+ PWS AND SLOW-MOVING NATURE OF THE SHORTWAVE...THINKING THIS STRONG MOISTURE FLUX SHOULD ONLY GRADUALLY SHIFT NWD OVER THE NEXT 2-4 HRS...FAVORING REPEAT CELL ACTIVITY. ~Warren
TENNESSEE VALLEY

Heavy Rain Event
08/18/14
GOES-14 SRSOR
Weather Prediction Center
Mesoscale Precipitation Discussion

Strongest updrafts per experimental 1 min VIS images

80°F isotherm

MCV

Strongest updrafts per experimental 1 min VIS images at 21Z

MCV

850 MB WINDS 140818/1600UTC
WPC MPD #0290

SFC PW 140818/1900UTC
WPC MPD #0291

Forecaster Rubin-Oster

Forecaster Bann
ADDITIONALLY A MORE EXPANSIVE AXIS OF CONVECTION HAS DEVELOPED ALONG A WEST-EAST LINE WITH THE UPDRAFTS GROWING RAPIDLY PER THE EXPERIMENTAL 1 MINUTE RAPID SCAN VISIBLE IMAGERY. THE MEAN STEERING FLOW REMAINS WEST TO EAST WHICH SUGGESTS THE ACTIVITY WILL SLIDE EASTWARD INTO CENTRAL TN DURING THE NEXT COUPLE OF HOURS. ~Rubin-Oster

SUPER RAPID SCAN IMAGERY CONTINUES TO SHOW THAT MOST OF THE MOST ACTIVE UPDRAFTS WERE LOCATED FROM SOUTH CENTRAL TN INTO NORTHERN AL...A REGION WHERE THE MEAN MID LEVEL FLOW WAS ROUGHLY THE SAME AS LOW LEVEL INFLOW. ~Bann
Upper Mississippi Valley

Heavy Rain Event
08/26/14
Nearcast Model
Weather Prediction Center
Mesoscale Precipitation Discussion

Forecaster Orrison
THE 00Z NAM-CONEST AND 00Z NSSL-WRF INDICATE A FORMIDABLE W/E OR WSW/ENE AXIS OF STRONG CONVECTION SETTING UP THROUGH 06Z AND TWD THE PREDAWN HOURS INVOLVING SERN NEB AND CNTRL AND SWRN IA. ADDITIONALLY...THE EXPERIMENTAL NEARCAST PRODUCT INDICATES AN AXIS OF DIFFERENTIAL THETA-E THAT SUPPORTS AN INSTABILITY AXIS ACROSS SERN NEB AND THROUGH A LARGE PART OF CNTRL AND SRN IA. THIS IS ALREADY WITHIN THE INSTABILITY GRADIENT AS SEEN BY THE LATEST RAP ANALYSIS...BUT THE NEARCAST PRODUCT INDICATES THIS PERSISTING THROUGH 12Z. THEREFORE...CONFIDENCE IS RATHER HIGH THAT CONVECTION WILL CONTINUE TO ORGANIZE AND EXPAND IN A GENERAL WSW/ENE FASHION OVERNIGHT AND ADVANCE INTO OR DEVELOP ACROSS CNTRL/SWRN IA IN PARTICULAR. ~Orrison
BEYOND THE SHORT TERM (LIKELY CLOSER TO 00Z AND BEYOND), EXPECT UPSTREAM SHORTWAVE ENERGY LIFTING NE FROM THE SW US EMBEDDED WITHIN SW-NE AXIS CURRENTLY ACROSS E NM EXTENDING INTO THE NW TX/OK PANHANDLE REGION AND SW KS DEPICTED IN WATER VAPOR IMAGERY AND IN CIMSS-GOES-R PROVING GROUND NEARCAST VERTICAL THETA-E DIFFERENCE PRODUCT TO COINCIDE WITH SUBTLE BACKING OF LLJ TO A MORE SOUTHERLY DIRECTION AND FOCUS ASCENT ALONG W-E ORIENTED LOW LEVEL BOUNDARY DRAPED ACROSS KS/MO. ~Simko
The WPC and SAB are finding great utility in using new satellite products to assist in diagnosing the threat for heavy rain and potential flash flood events.

The Overshooting Top Detection and GLD-360 Lightning Density products have been in operations (experimental mode) for 1.5 years.

The Convective Initiation product was introduced in May-June and has already proven to be useful in diagnosing areas to focus on for heavy rain.

The Nearcast product is the newest product, but forecasters are already finding it to be quite useful in analyzing observed Theta-E or layered PW.

More research into the uses of these products in combination with one another will be done prior to GOES-R launch (March 2016) to give forecasters a working “toolbox” of heavy rain monitoring satellite products.
Questions?
michael.folmer@noaa.gov