Improvements to QPE using GOES visible ABI and model data

Robert Rabin, Jian Zhang (NOAA/NSSL); Bob Kuligowski (NOAA/NESDIS/STAR)
Jason Otkin (CIMSS, U. Wisconsin-Madison); Louie Grasso (CIRA, Colorado State); V. Lakshmanan (CIMMS, Univ. Oklahoma)

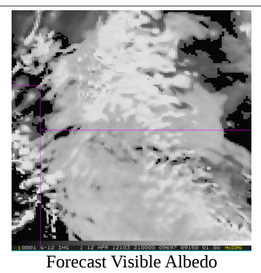
Objective: Improve SCaMPR (Self-Calibrating Multivariate Precipitation Retrieval): using high resolution visible imagery and model data

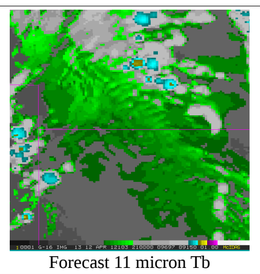
- ***New predictors developed as inputs to SCaMPR****

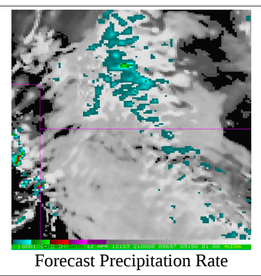
****SCaMPR was selected as the GOES-R Rainfall Rate Algorithm***

1. Devised methods to extract information on precipitation rate versus albedo and Tb from forecast GOES imagery and apply to observed satellite imagery.

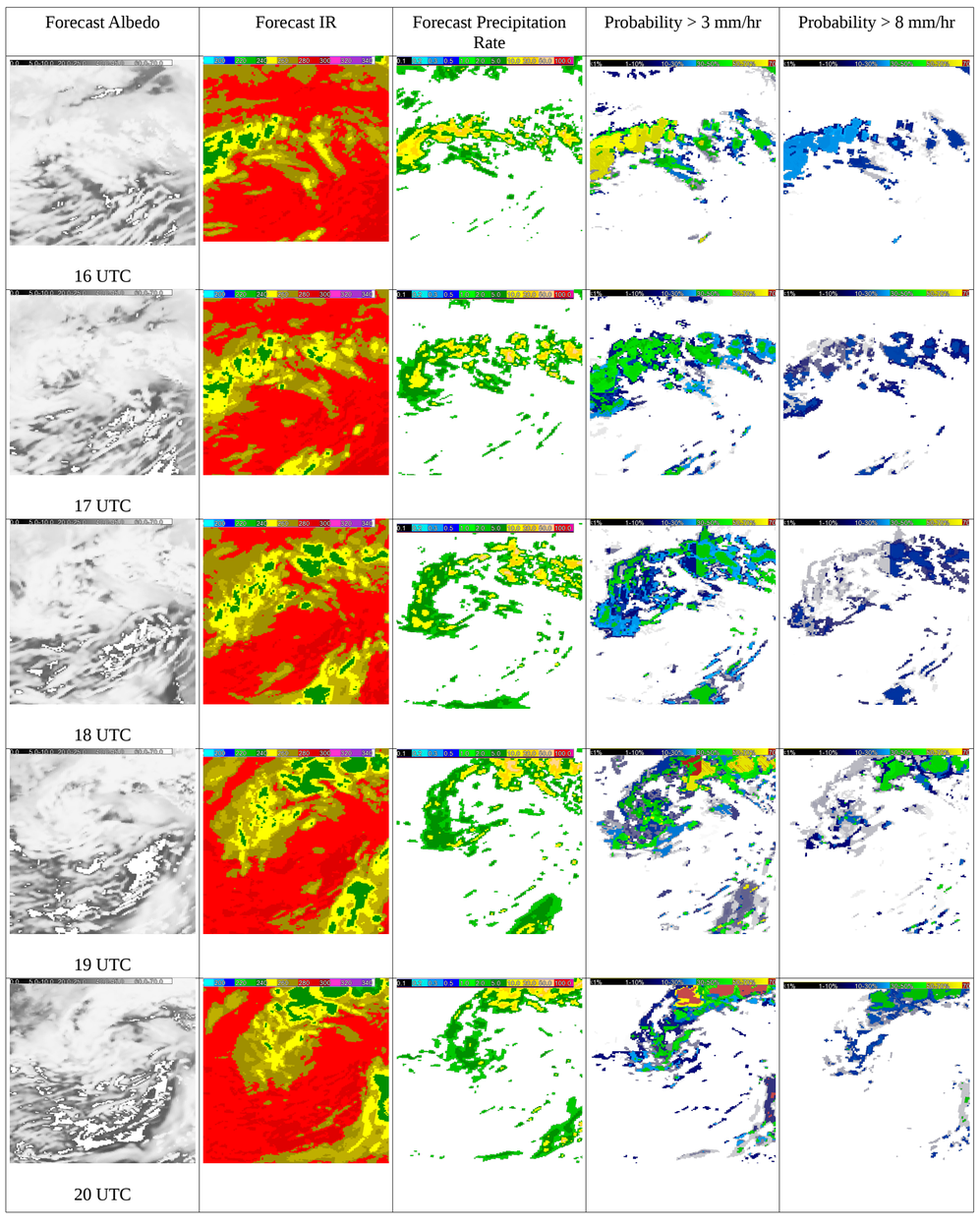
a: Rain rate associated with Tb and albedo thresholds from nearest NSSL-WRF forecast time:


Forecast Visible Albedo


Forecast 11 micron Tb


Forecast Precipitation Rate

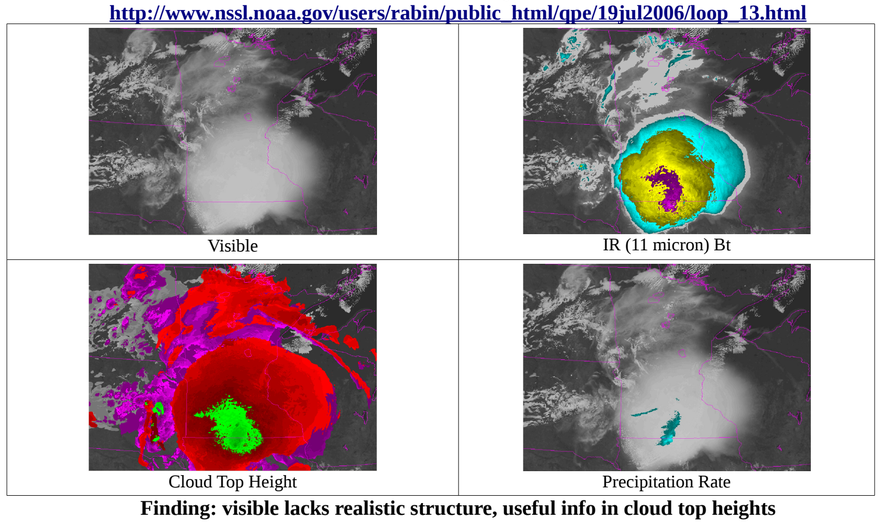
b: Probabilities of rain classes associated with Tb and albedo from nearest NSSL-WRF forecast time using a Vector Quantization Technique (V. Lakshamanan):



2. Cloud-top analysis algorithms from visible and IR imagery to identify convective structure (to be used as input to SCaMPR).

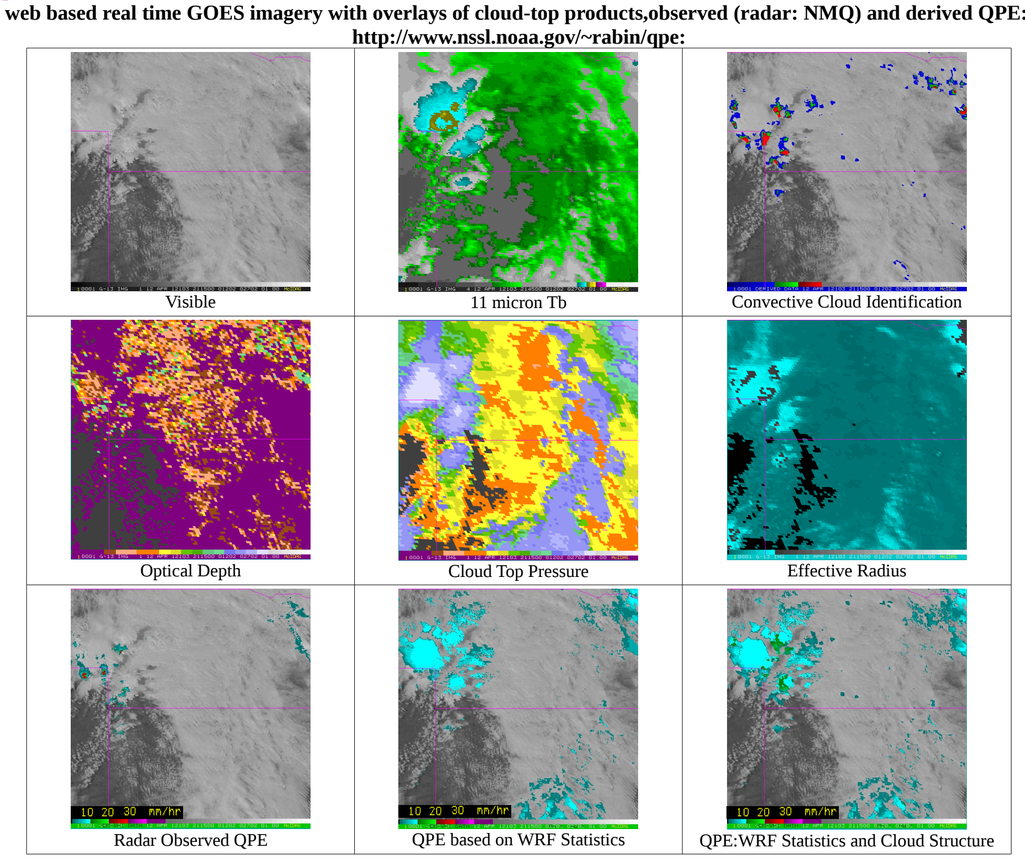
Visible Structure Analysis, CTP, Particle Effective Radius, Optical Depth, Overshooting tops (CIMSS)

a. Began Testing capabilities of high resolution WRF simulated visible imagery (250 m) to model relationship between cloud-top structure and QPE:
http://www.nssl.noaa.gov/users/rabin/public_html/qpe/19jul2006/loop_13.html

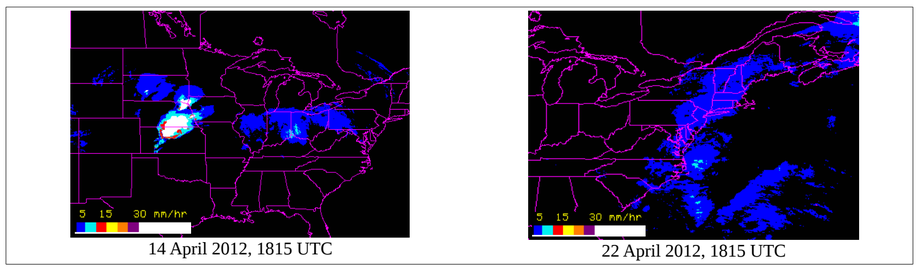

Visible
IR (11 micron) Bt
Cloud Top Height
Precipitation Rate

Finding: visible lacks realistic structure, useful info in cloud top heights

3. Development and assessment tool:
web based real time GOES imagery with overlays of cloud-top products,observed (radar: NMQ) and derived QPE:
http://www.nssl.noaa.gov/~rabin/qpe:


Visible
11 micron Tb
Convective Cloud Identification
Optical Depth
Cloud Top Pressure
Effective Radius
Radar Observed QPE
QPE based on WRF Statistics
QPE:WRF Statistics and Cloud Structure

4. Implementation of current GOES version of SCaMPR (to be used for testing).


14 April 2012, 1815 UTC
22 April 2012, 1815 UTC

Future Plans

Year 2:	**Refine algorithm to identify convective regions of cloud from structure/shadow analysis of observed visible imagery Incorporate new predictors into SCaMPR.**
Year 3:	**Testing will be required to refine predictors and substantiate improvements in QPE for ranges of conditions.**