0-6 hour Weather Forecast Guidance at The Weather Company

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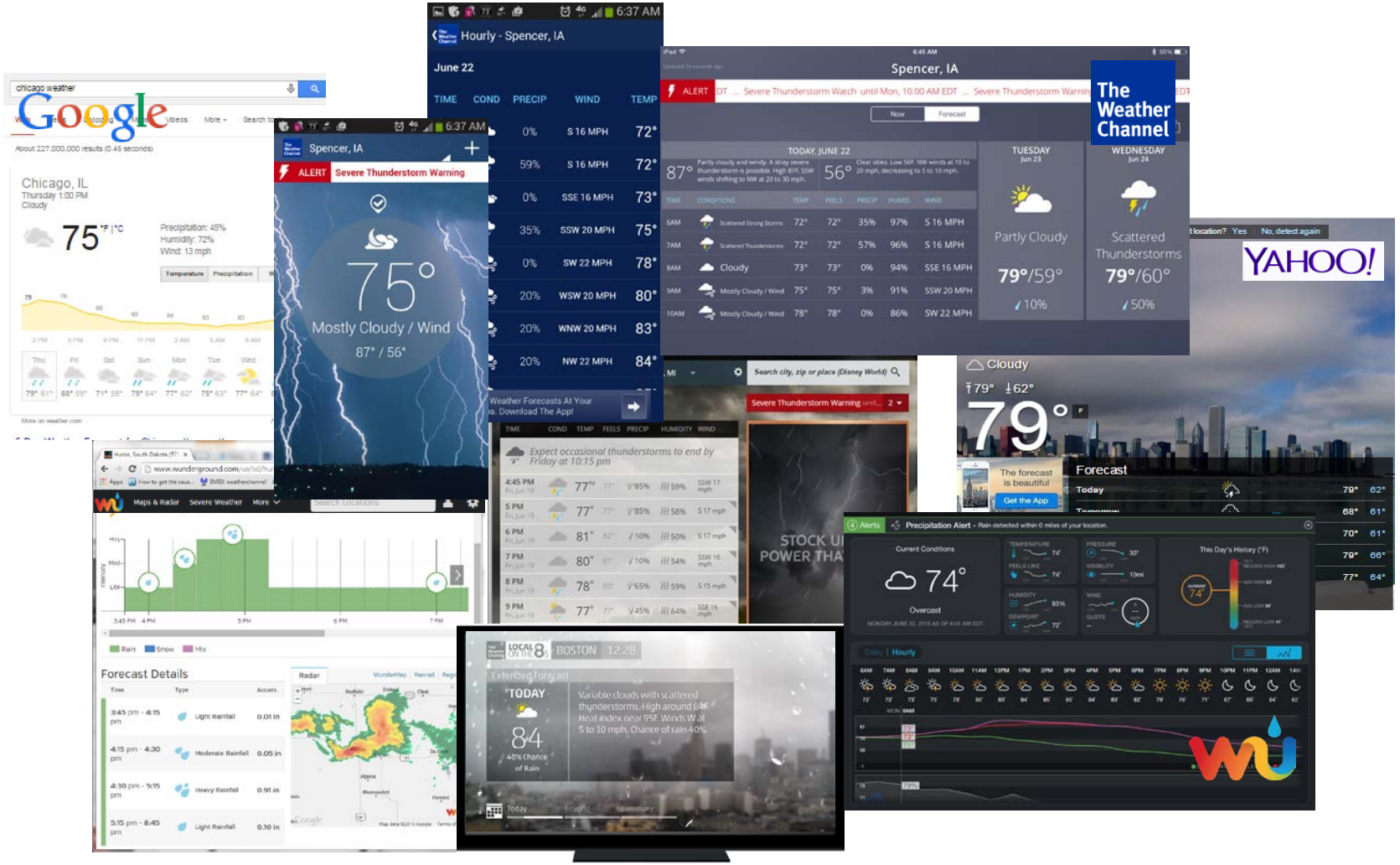
TWC Forecasts: Widespread Adoption



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0-6 Hour Forecast Details

- Global coverage
- 15-minute precision for forecasts of:
  - Precipitation: Type, Accumulation and Probability
  - Temperature
  - Cloud Cover
  - Government Warning Information
- Forecasts updated every 5 min using latest radar and NWP data
- Alerting capability for start of precipitation and Warnings

				temp/ dp						wind	pop	type	precip	snow	severity
Mon	Jun 22	4:45 PM	D	77F/ 70F	Cloudy		2600			S 15 mph	20%	rain	0	0	1
Mon	Jun 22	5:00 PM	D	78F/ 69F	Cloudy		2600	0		S 16 mph	20%	rain	0	0	1
Mon	Jun 22	5:15 PM	D	79F/ 69F	Cloudy		2600	0		S 16 mph	20%	rain	0	0	1
Mon	Jun 22	5:30 PM	D	79F/ 69F	Cloudy		2600	0		S 17 mph	20%	rain	0	0	1
Mon	Jun 22	5:45 PM	D	80F/ 69F	Cloudy		2600	0		S 17 mph	20%	rain	0	0	1
Mon	Jun 22	6:00 PM	D	80F/ 69F	Cloudy		2600	0		S 17 mph	20%	rain	0	0	1
Mon	Jun 22	6:15 PM	D	80F/ 69F	Cloudy		2600	0		S 17 mph	20%	rain	0	0	1
Mon	Jun 22	6:30 PM	D	80F/ 70F	Cloudy		2600	0		S 17 mph	20%	rain	0	0	1
Mon	Jun 22	6:45 PM	D	80F/ 70F	Cloudy		2600	0		S 17 mph	20%	rain	0	0	1
Mon	Jun 22	7:00 PM	D	80F/ 70F	Cloudy		2600	0		S 17 mph	20%	rain	0	0	1
Mon	Jun 22	7:15 PM	D	80F/ 70F	Cloudy		2600	0		S 17 mph	20%	rain	0	0	1
Mon	Jun 22	7:30 PM	D	80F/ 70F	Cloudy		2600	0		S 17 mph	20%	rain	0	0	1

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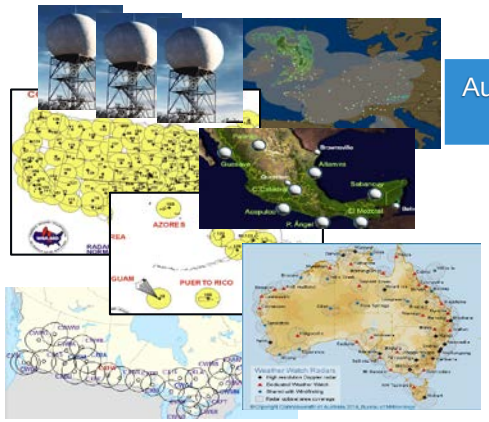
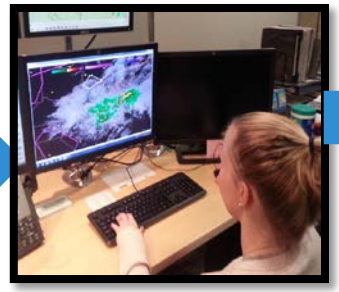
How are 0-6 hr forecasts built?

Integrate radar data into mosaic

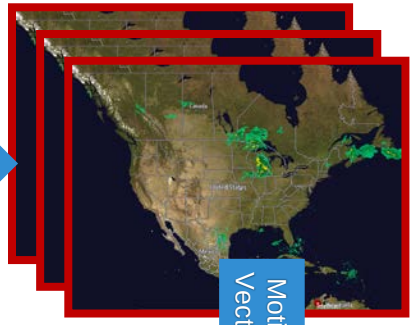


Automated QC + Time Synchronization

Manual QC



5m Mosaics



Motion Vectors

Blend POP QPE

Forward Err. Correction of T, Td, Wind

T, Td, vis, mslp, rh

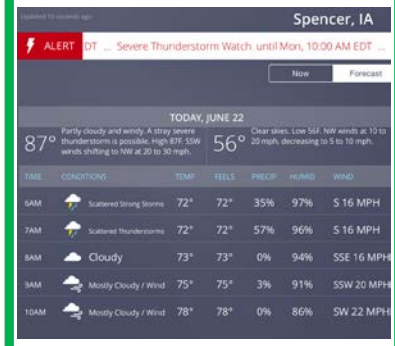
1-15 day multi-model ensemble blend

HOTL

Fcster edits

TOR/SVR Update

Public Forecast and Alerts



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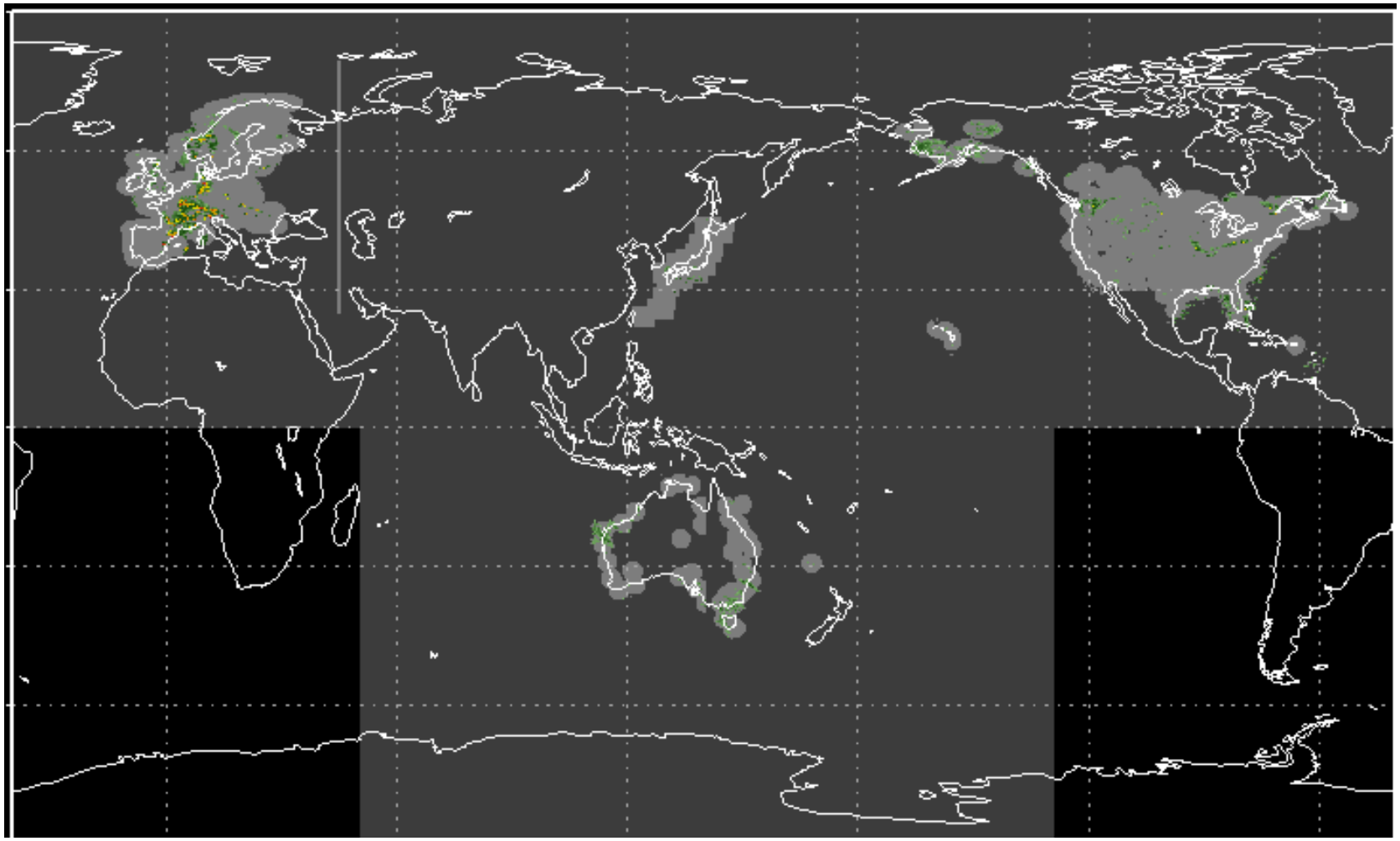
Radar Processing: TWC Global Coverage



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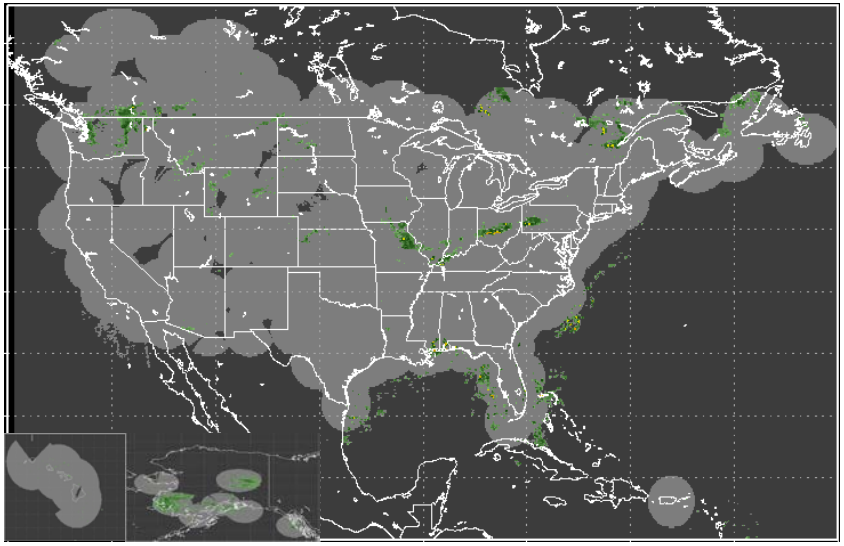
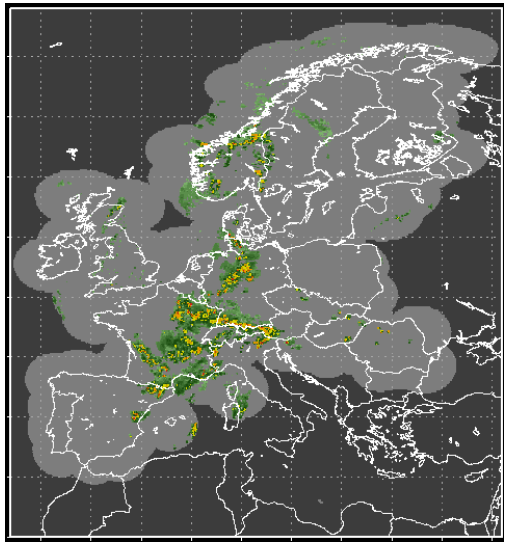
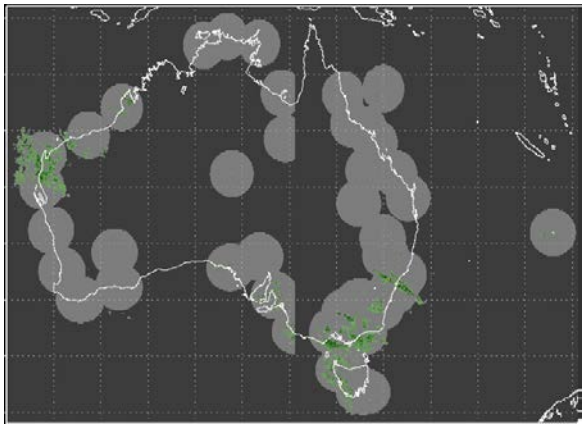
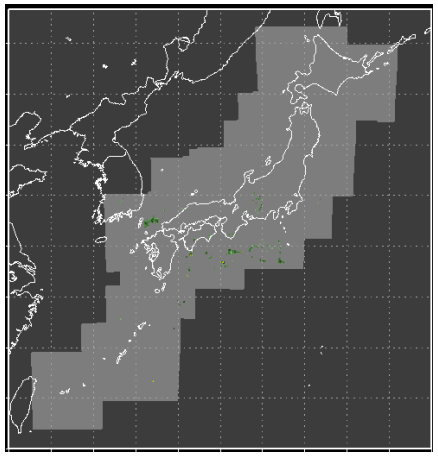
Radar Processing: TWC NOWRad Coverage









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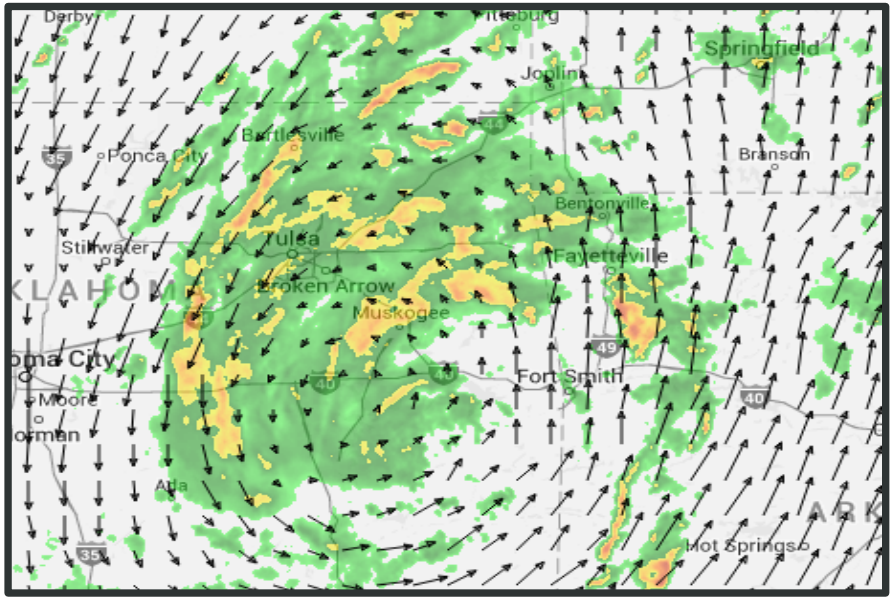
Radar Processing: Extrapolation

- Radar extrapolated out to 7 hours
  - Radar motion detected by tracking cells in subsequent radar mosaics
  - Extrapolation forward in time using a backward semi-lagrangian advection scheme



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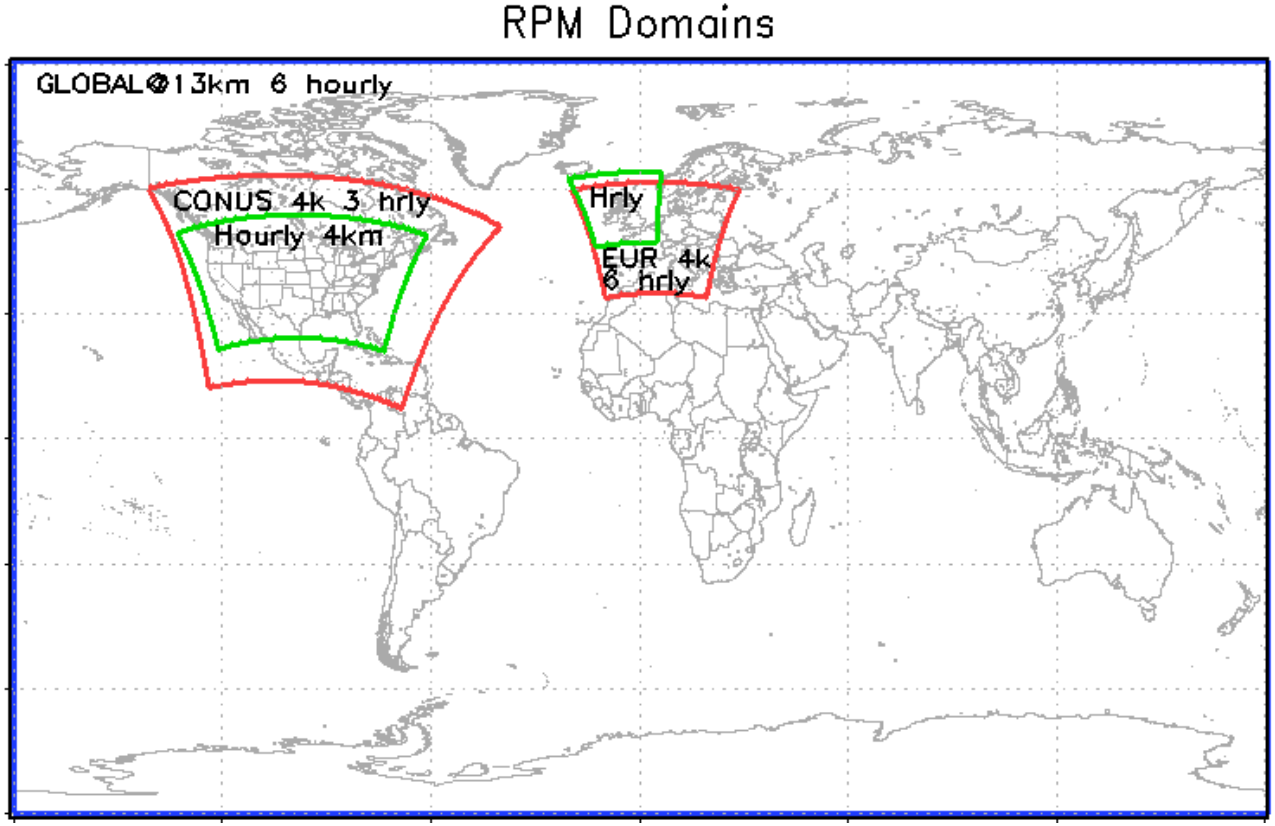
Deep Thunder: TWC Numerical Weather Prediction

- 13km Global, 6-hour updates
- 4km Regional with 3 and 1-hour updates



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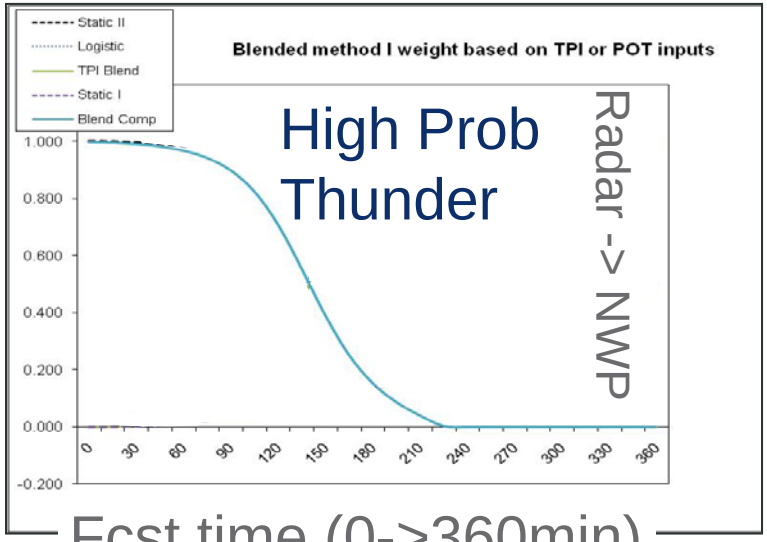
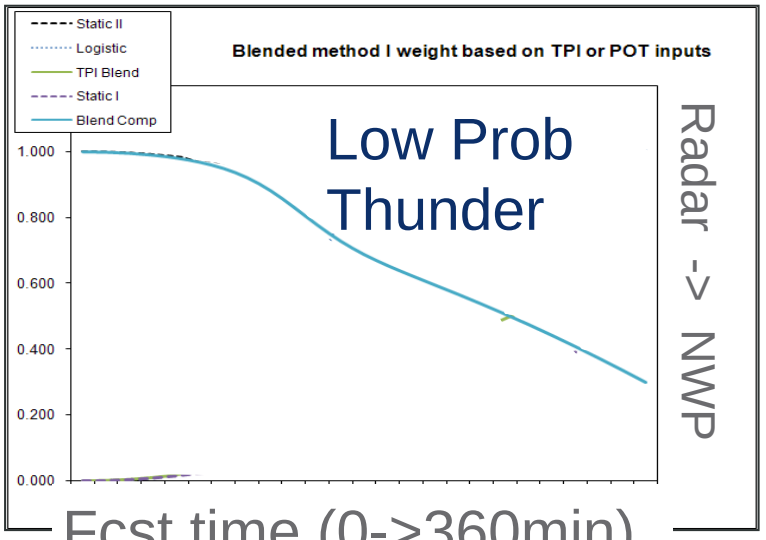
Radar + NWP Blending

- Temporal Blend of radar extrapolated and NWP forecasts with weight as a *f*(forecast time, prob thunder)
  - Assumption is that precipitation motion and initiation is more linear when non-convective





- Currently working to incorporate more advanced blending algorithms

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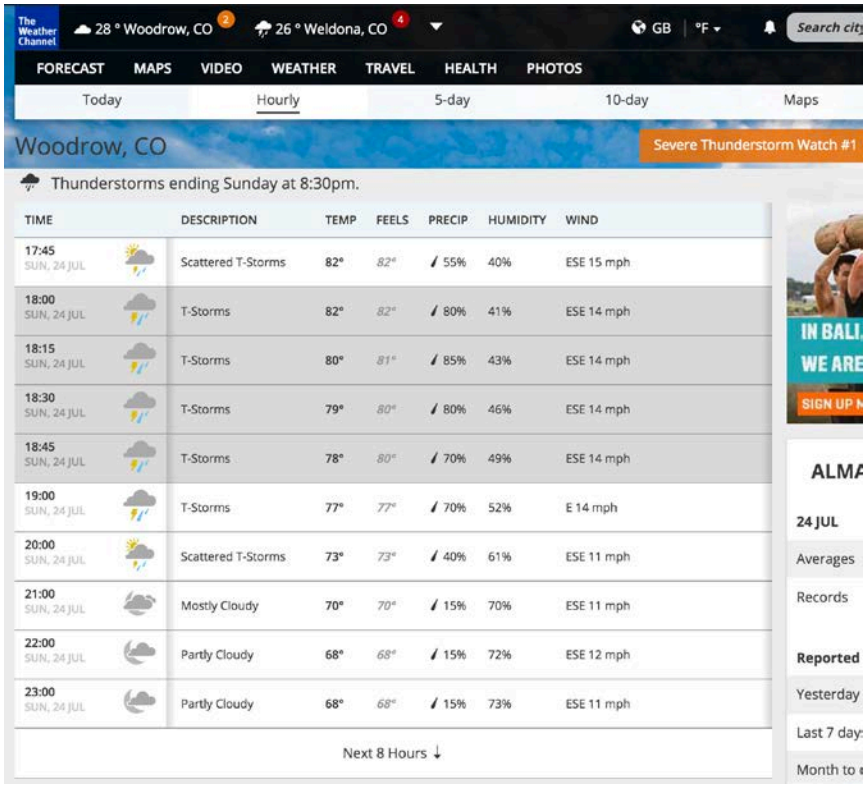
Probability of Precipitation

- POP is critical to TWC Consumer Forecasts:



- 30-39%: “Isolated Showers”
- 40-59%: “Scattered Showers”
- >60%: “Rain”

- How do we get probability from deterministic nowcasts?

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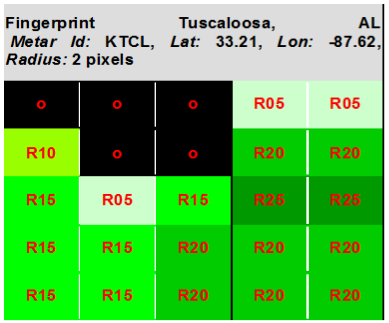
Probability of Precipitation: Radar Extrapolation

- Intensity-weighted spatial analysis at each grid point

  Example: 20 km box on 4km grid

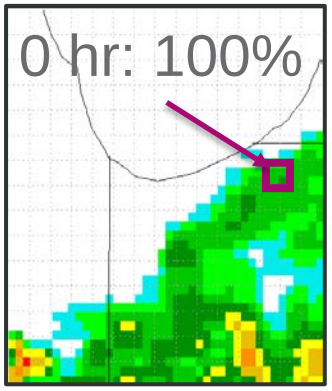


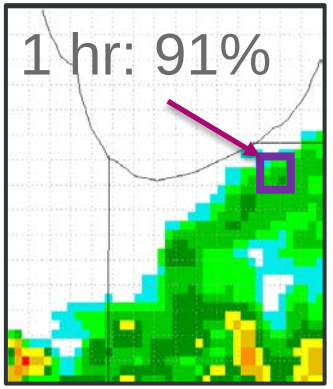
= Coverage * Weighted Intensity

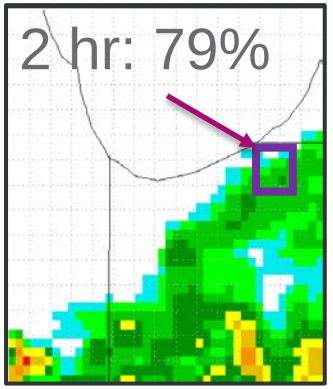
= 0.80 * 325 / 500

= 52% POP

- Analysis box increases from 12 km to 40 km between 0 and 2 hours, then remains constant to 7 hours







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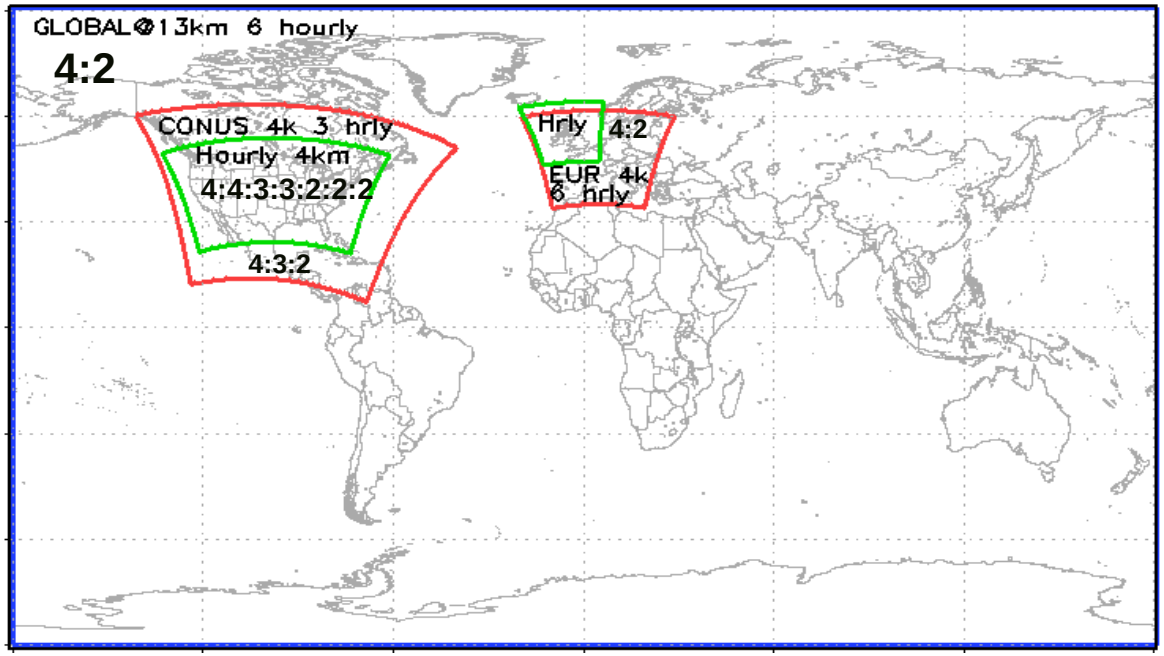
Probability of Precip: NWP Time Lagged Ensemble

1. Spatial POP calculated for all NWP forecasts using a 40km box
2. Weighted average of spatial POP from all forecasts with lead time <= 8 hours
3. Calculated every 15 min between now and 9 hours from now

Weights for recent runs



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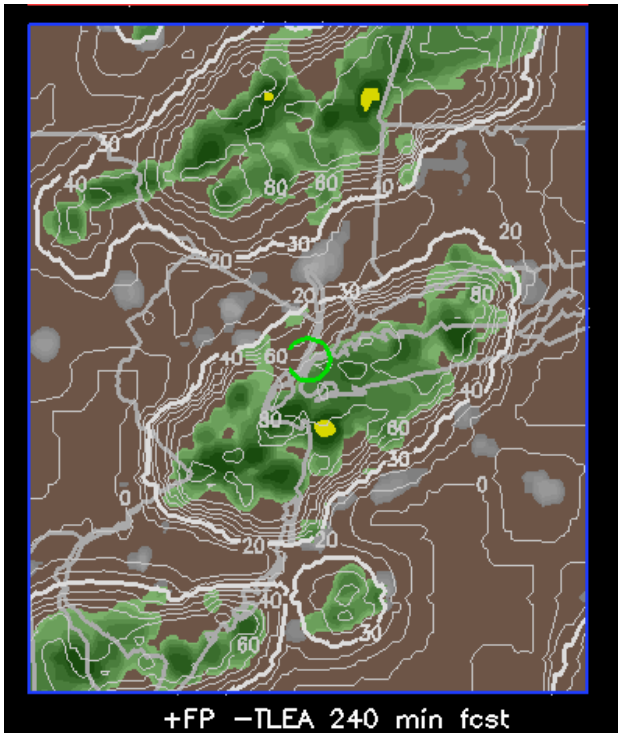
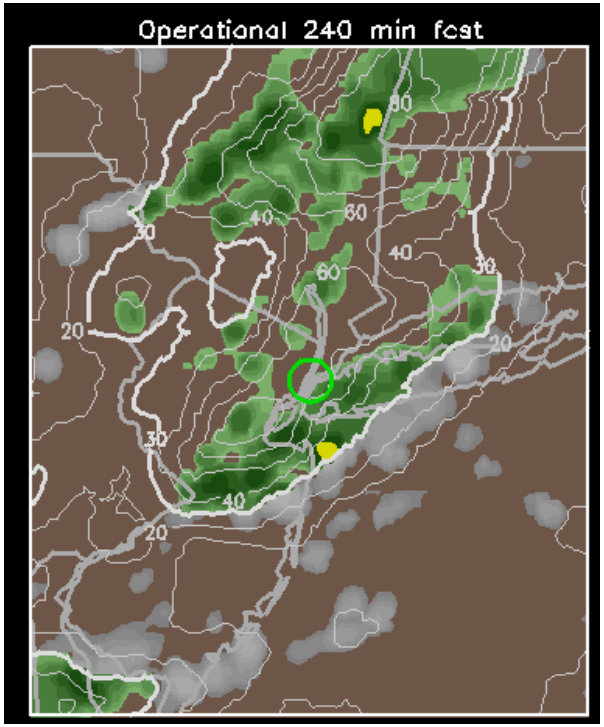
Probability of Precip: NWP Time Lagged Ensemble

Contour: POP
Shaded: Blended radar + model precipitation rate forecast

Spatial Only



Spatial + TLE



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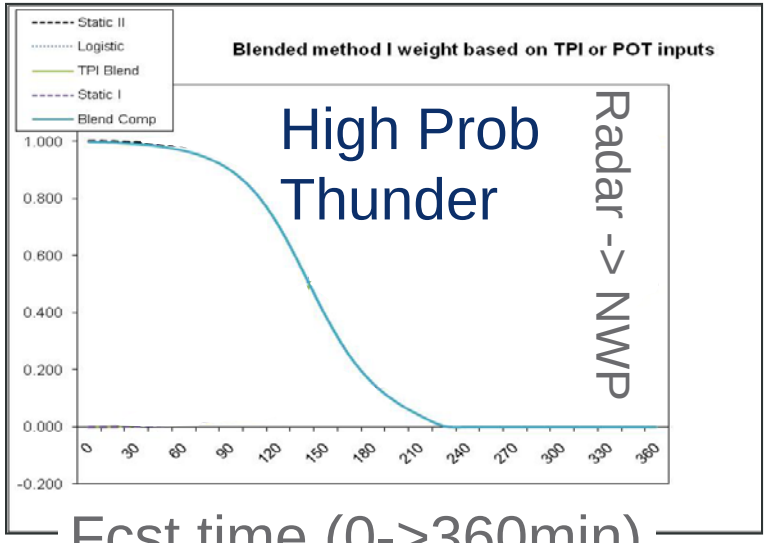
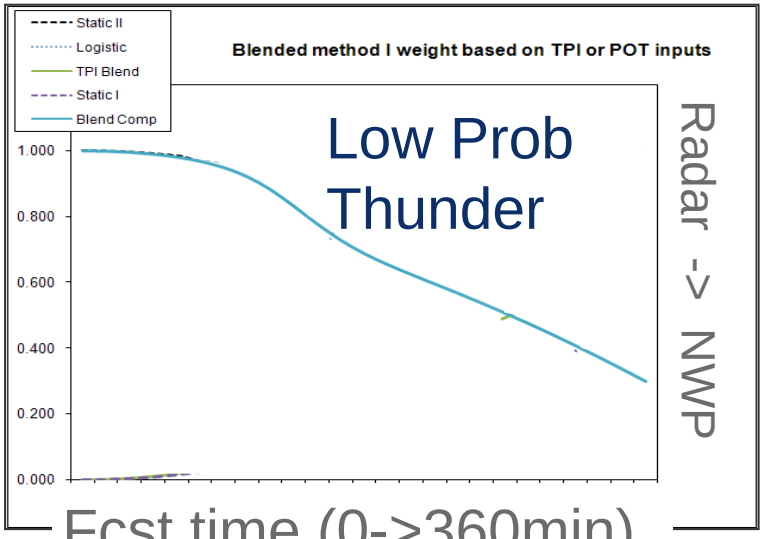
Probability of Precipitation: Blend

- Temporally blend the Radar extrapolated POP and the NWP (time-lagged ensemble) POP, in same way that precipitation rate is blended





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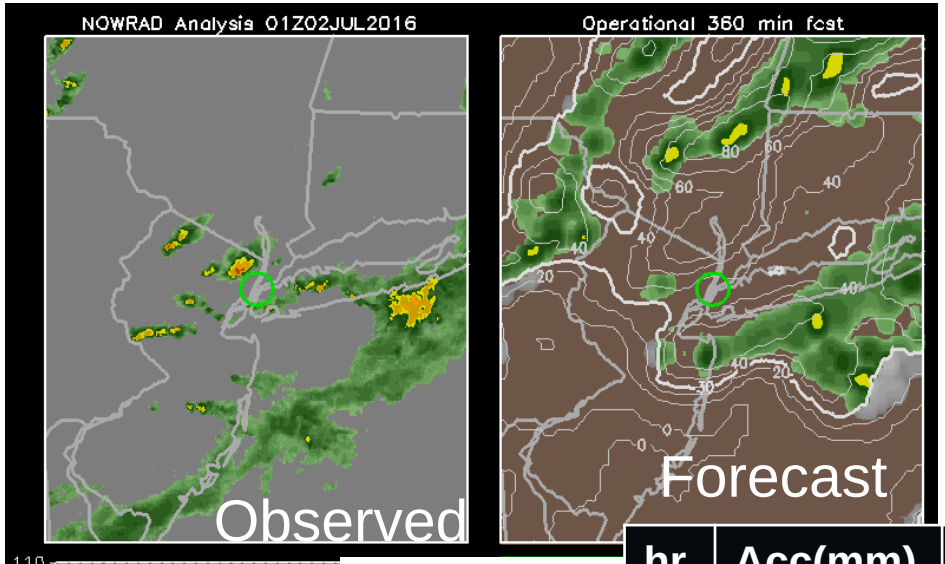
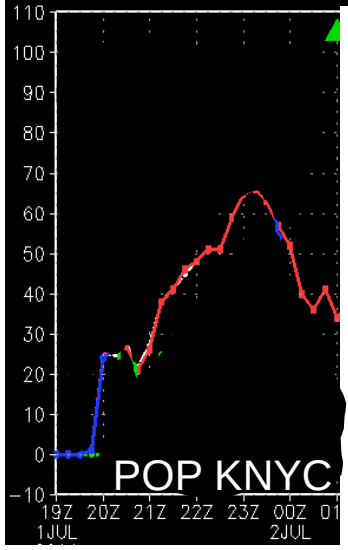
Putting it all together





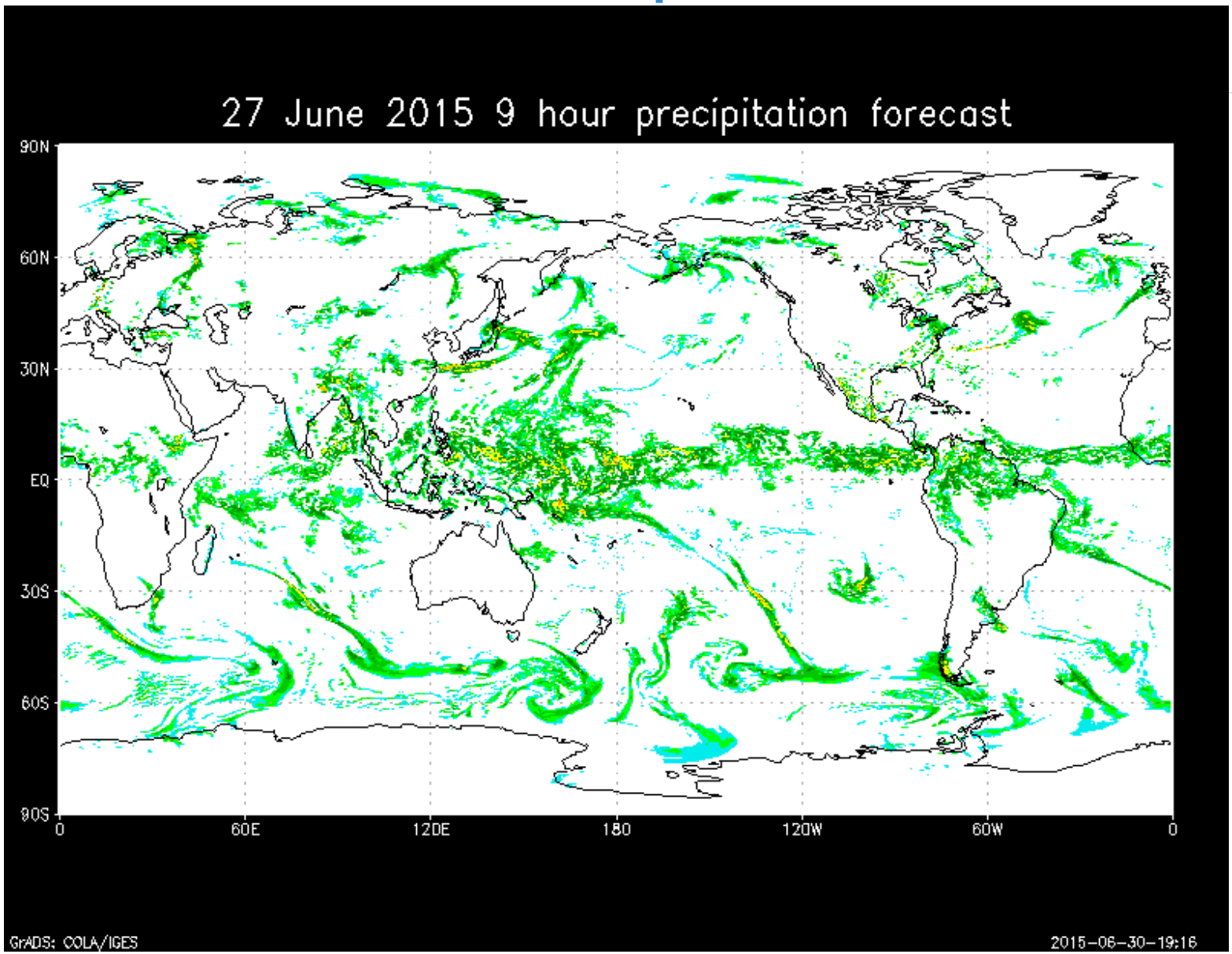
Deterministic precipitation accumulation (shaded)

Probabilistic Occurrence (contour)

Public Forecast

hr	Acc(mm)	POP	Worded Forecast
0	0	15	Cloudy
1	1	36	Scattered Strong Storms
2	4	47	Scattered Strong Storms
3	5	64	Strong Storms
4	1	71	Thunderstorms
5	2	58	Scattered Thunderstorms
6	4	40	Scattered Thunderstorms

Radar + NWP: 6-hour Precipitation Forecasts



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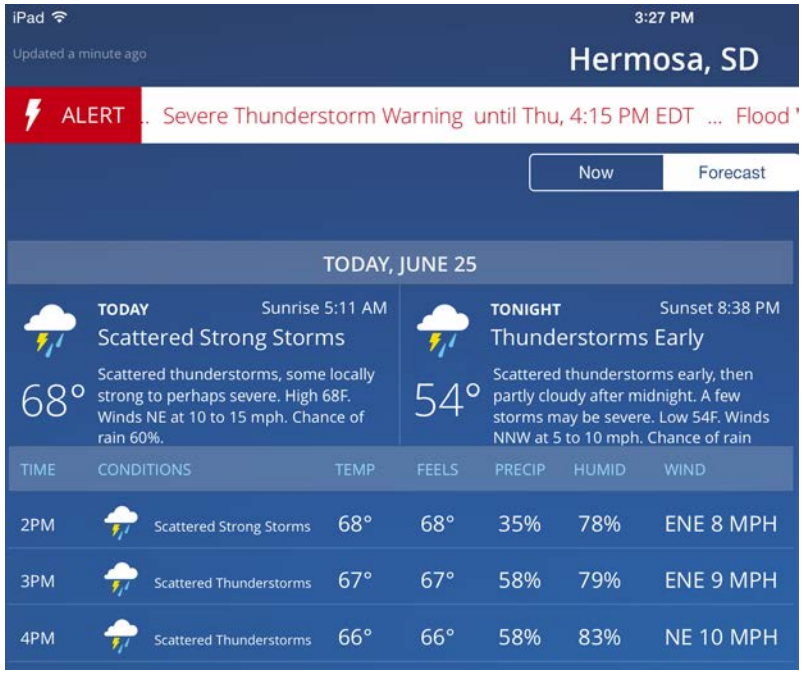
Government Issued Warnings

- TOR/SVR Warning “promote” textual forecasts
- NOWCAST Without Warning:
  - “Expect occasional thunderstorms to end at 3:30pm.”
- NOWCAST When SVR Warning is issued:
  - “Showers and thunderstorms ending around 3:30pm. Some of the storms could be severe.”



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Looking ahead

- Acquire more radar data to expand radar coverage
- We will use other sources (satellite, lightning) to enhance initial precipitation analysis
- Parameters will become dynamic
  - Temporal blending weights
  - Spatial analysis size
  - Time-lagged ensemble weightings
  - Alternative methods for deriving POP from radar extrapolation
- Spatial phase correction applied to model
- Intensity correction applied to model

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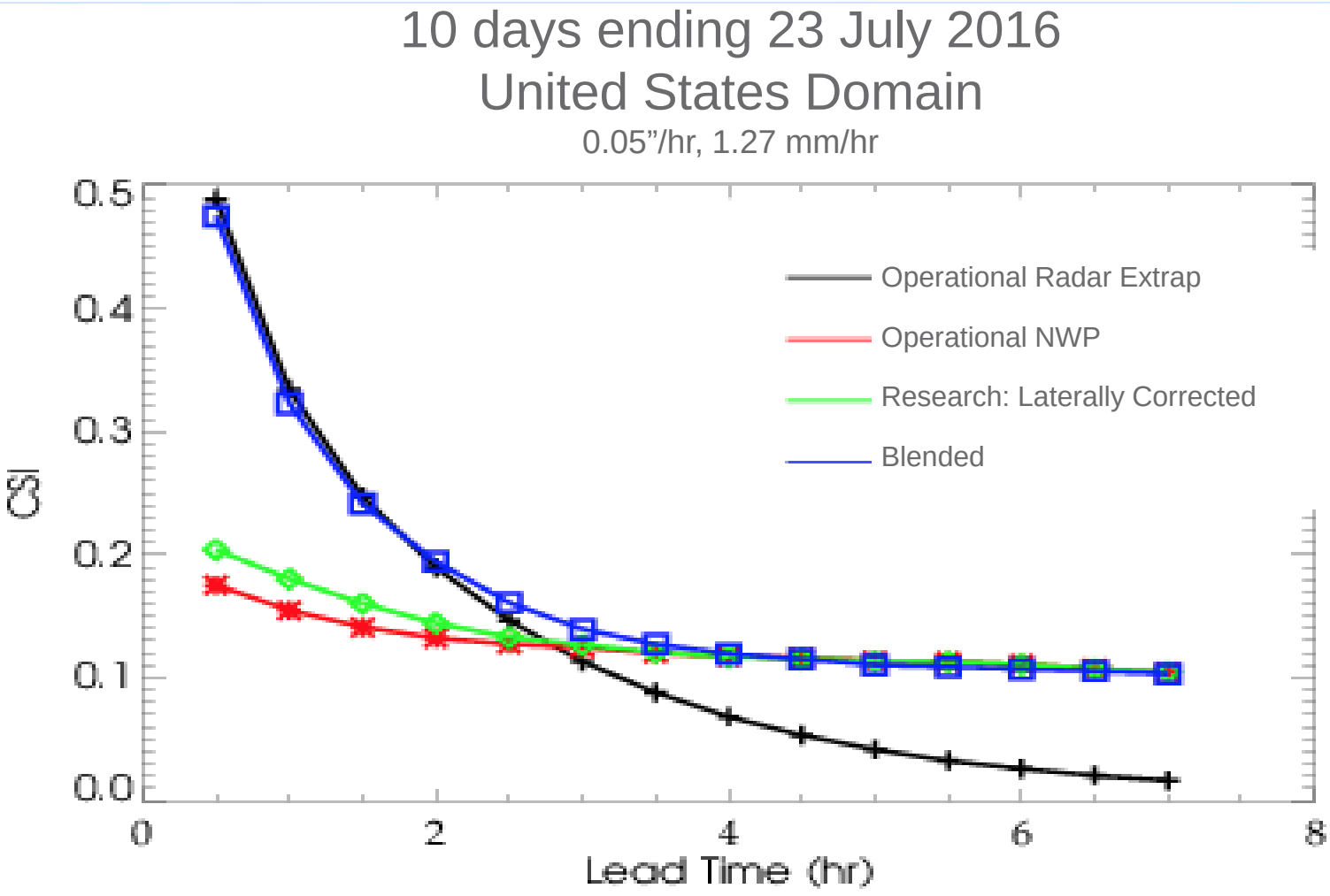
Looking Ahead



Courtesy James Pinto, NCAR