Improving Weather Information for Terminal ATC

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The Problem

Terminal ATC's weather needs are not being met today!

Photo: Raytheon Company

- Weather on STARS* is provided by ASR radars **designed for aircraft surveillance**, **not weather**
- Terminal controllers **turn off clutter-contaminated weather**
- Radar **coverage is limited** at some TRACONs

* **STARS** is the Standard Terminal Automation Replacement System used by Terminal Air Traffic Control to show aircraft and weather
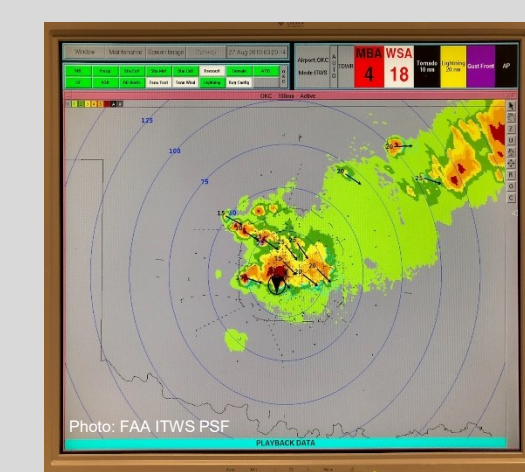
CYS
ASE
P50
ASR-8   ASR-9   ASR-11   TRACON
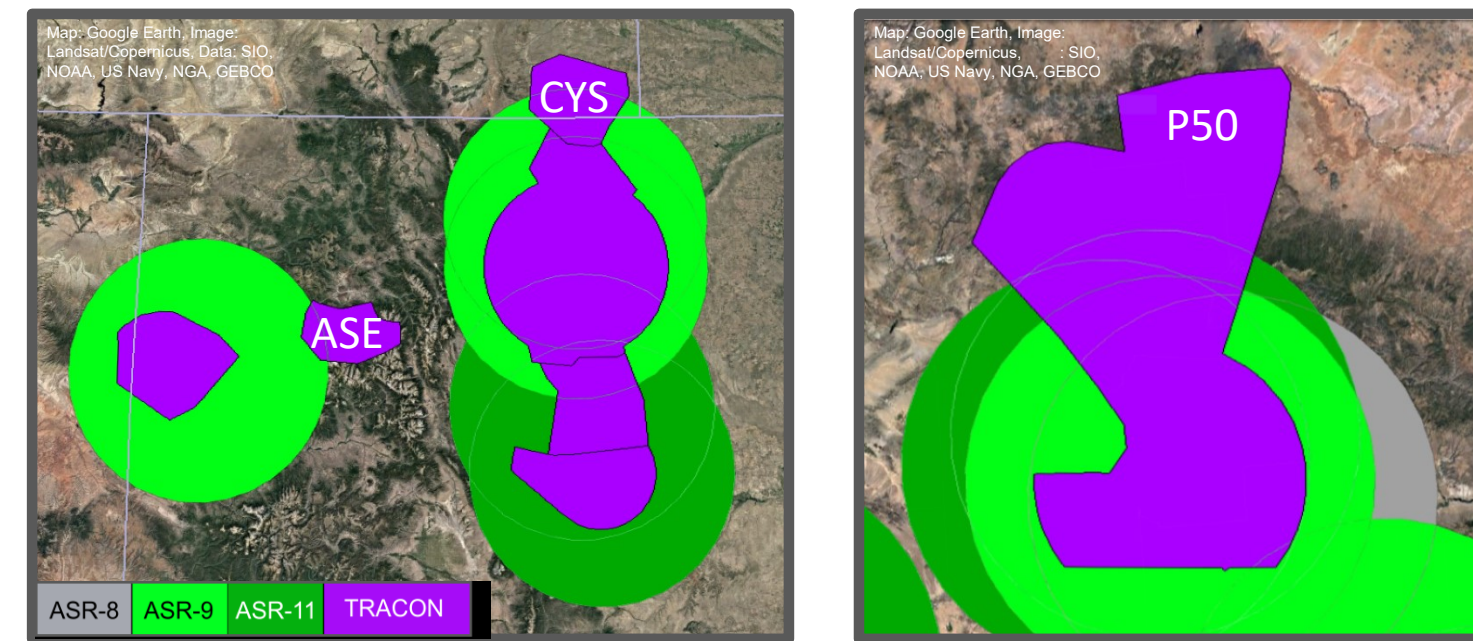
Background

Terminal Weather Precip Options   System Coverage   Terminal Coverage

ASR / ASR Mosaic
- Current weather on STARS
- ASR-8, 9, 11 fan beam radars
- 28 sec update rate
- Refreshes full radar volume each update
- Simple radar mosaic

Photo: FAA/NATCA
https://www.youtube.com/watch?v=hNJ9d3xIzIs

ALASKA
HAWAII
GUAM

Dallas/Ft. Worth (D10) TRACON

ITWS Long Range Mosaic
- Mosaic of NEXRAD and TDWR pencil beam radars
- 150 sec mosaic update rate
- Refreshes radars at end of volumes
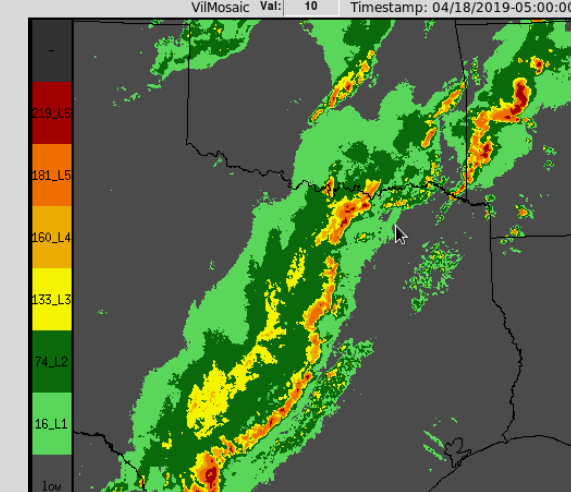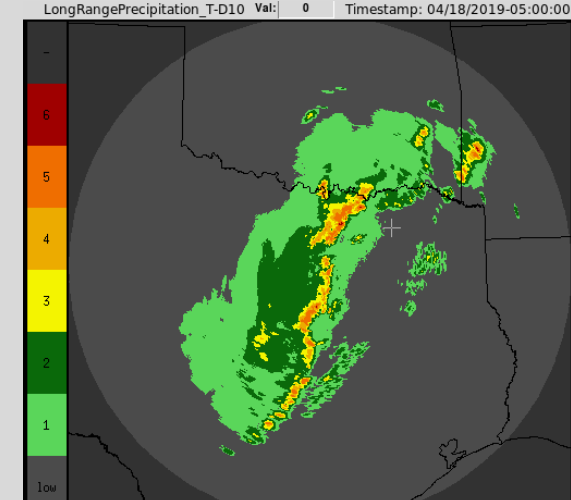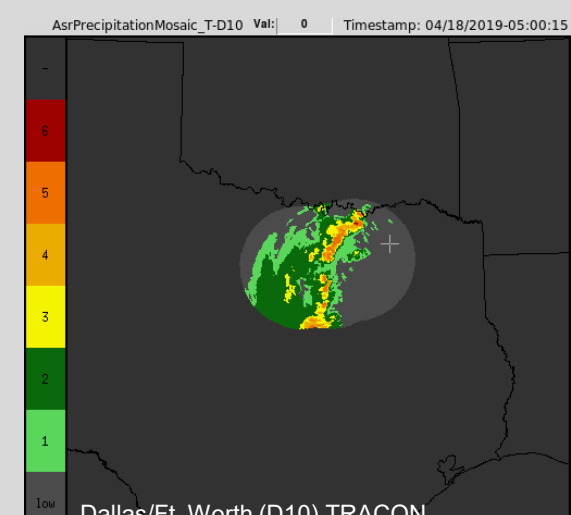- 34 TRACON locations

NO COVERAGE in ALASKA, HAWAII and GUAM

NextGen Weather Mosaic
- Mosaic of all NEXRAD and TDWR pencil beam radars
- 25 sec mosaic update rate
- Refreshes radars with each new tilt
- Nationwide coverage

ALASKA
HAWAII
GUAM
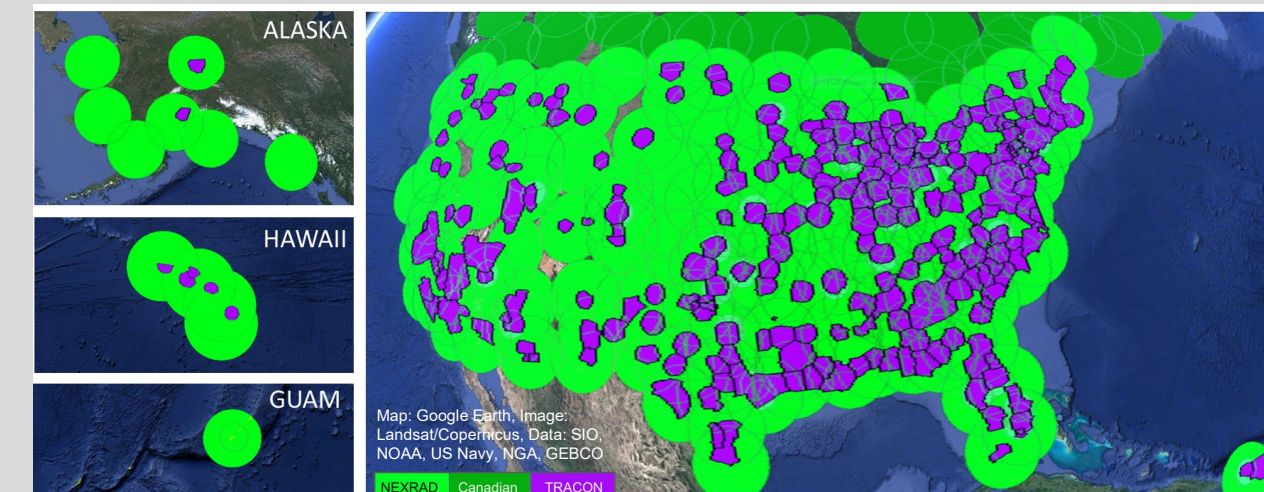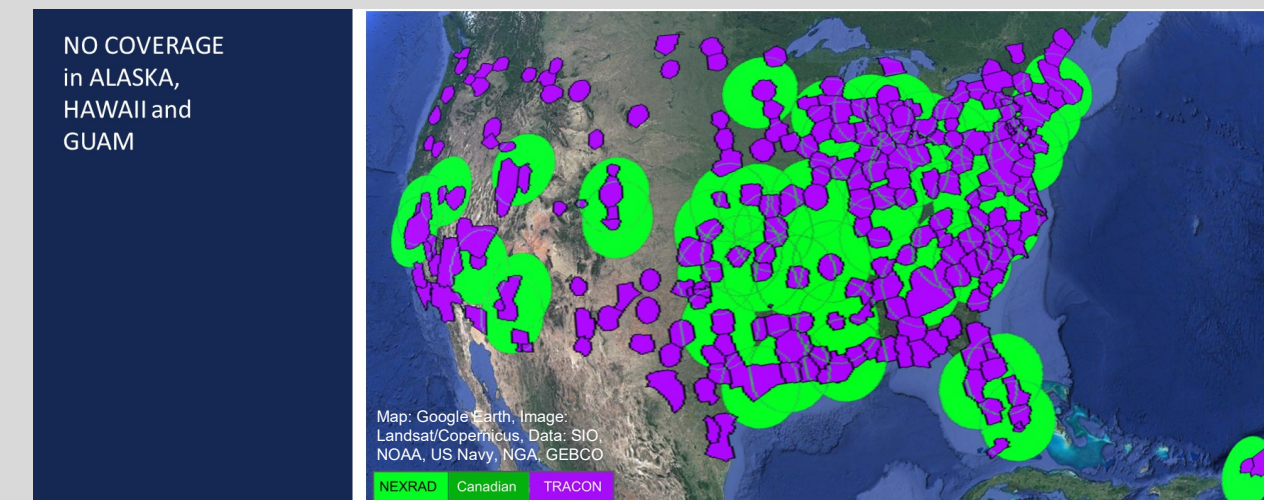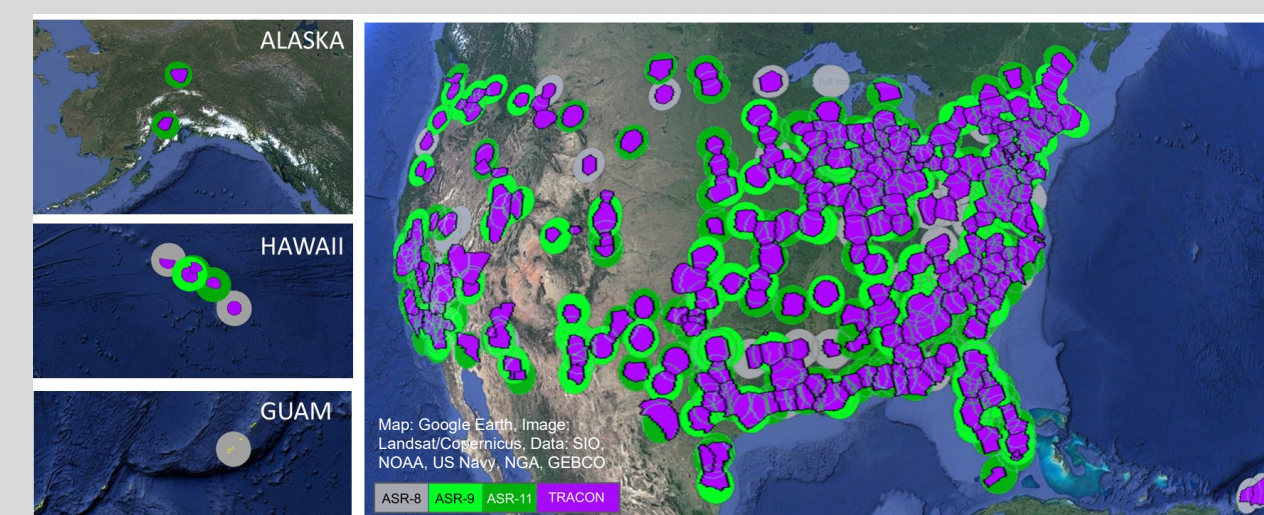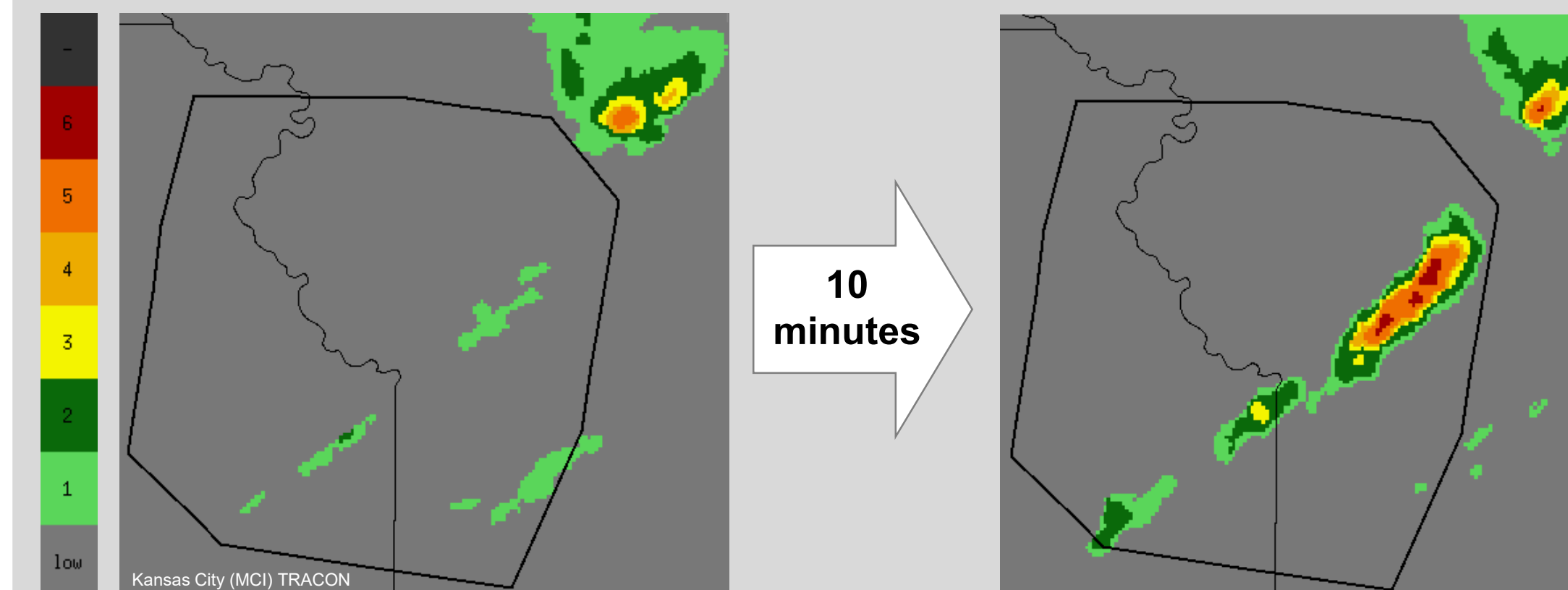
Analysis

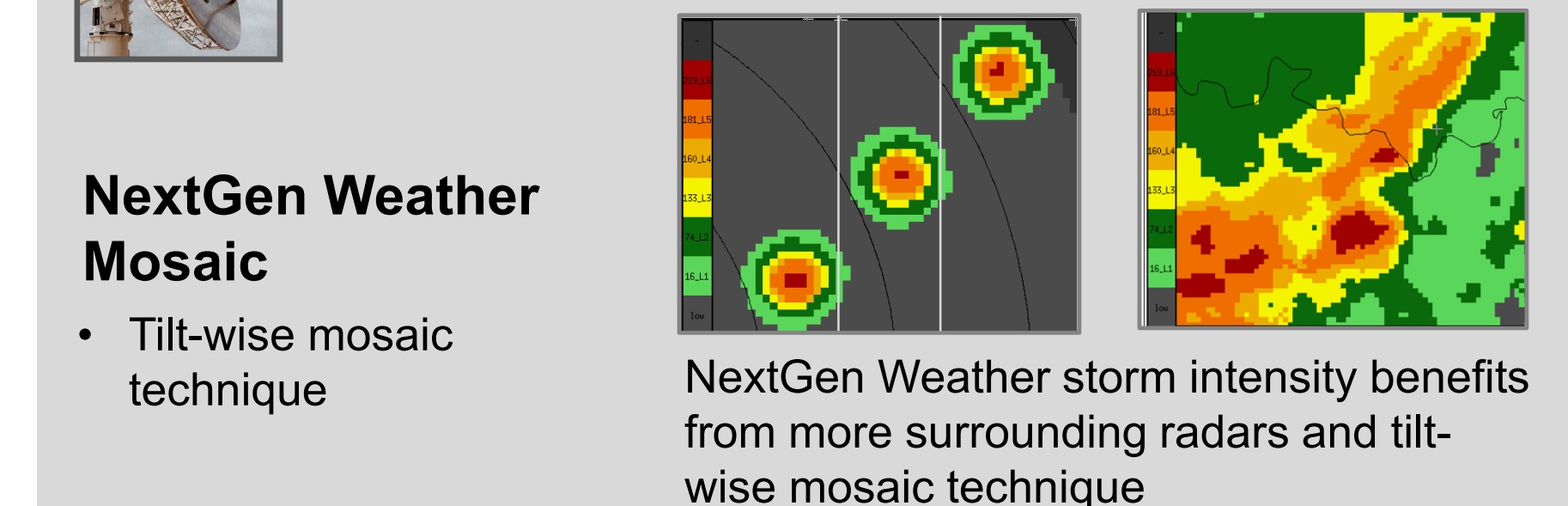### Update Rate of Weather on the Glass
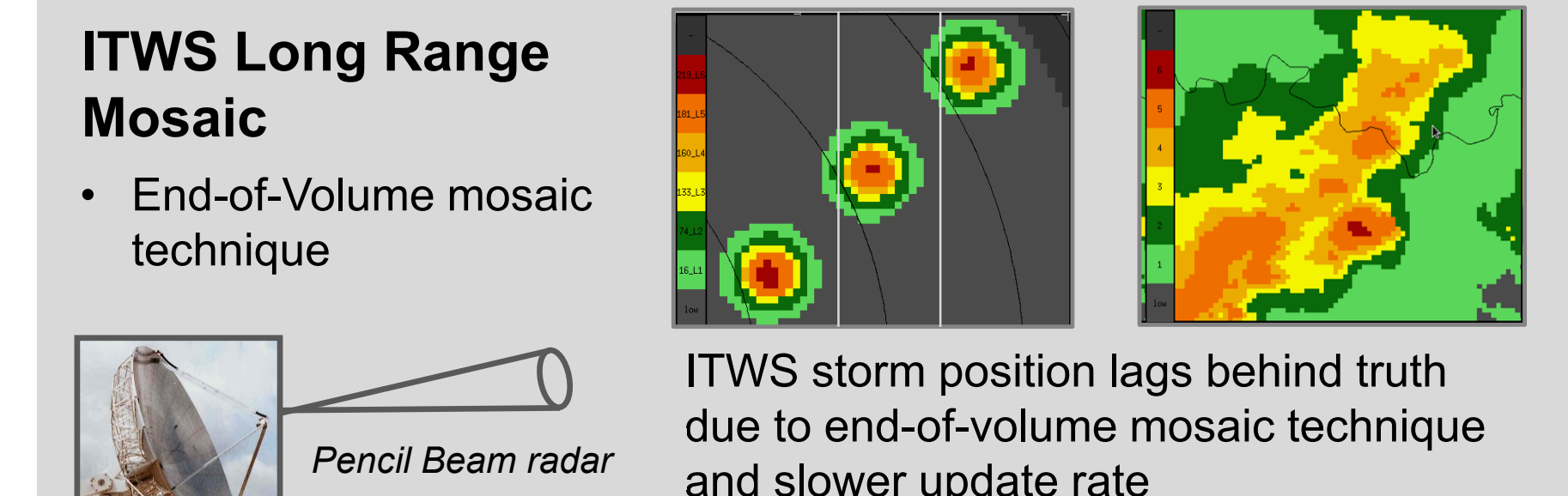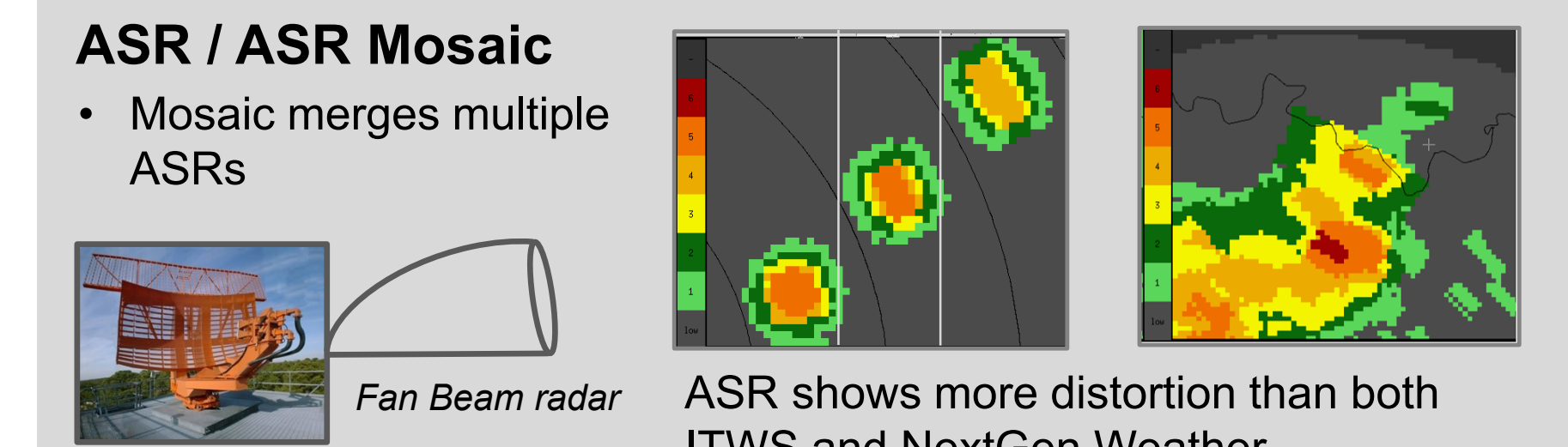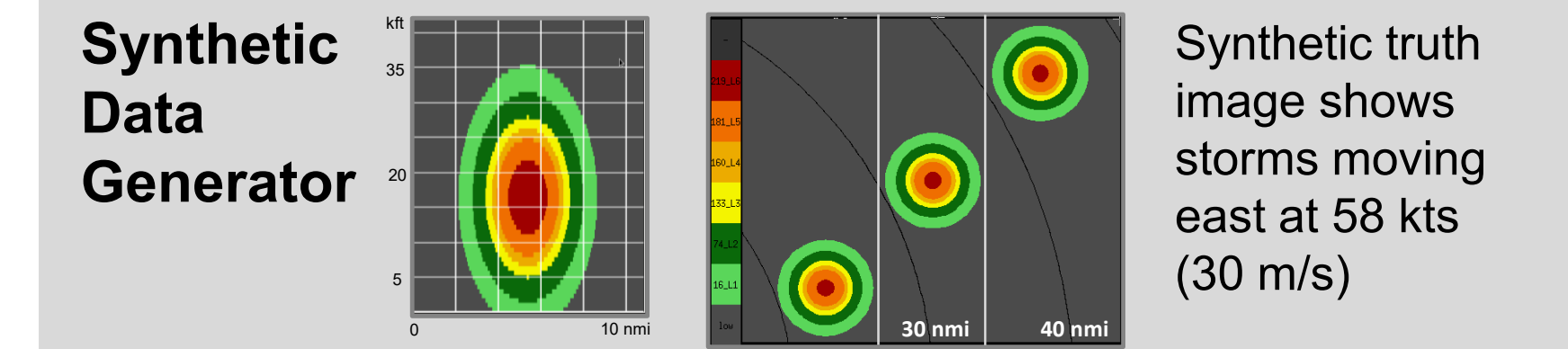
10 minutes

Kansas City (MCI) TRACON

- **Rapid update rate is critical when storms are growing.** As seen above, in just **10 minutes** level 1 precip has evolved into **severe level 6 thunderstorm.**

- The images below compare NextGen Weather, ASR, and ITWS, illustrating the rapid growth from small spot of level 3 to widespread levels 3, 4, and 5 over the **central 3.75 minutes.**

NextGen Weather Mosaic

ASR / ASR Mosaic

ITWS Long Range Mosaic
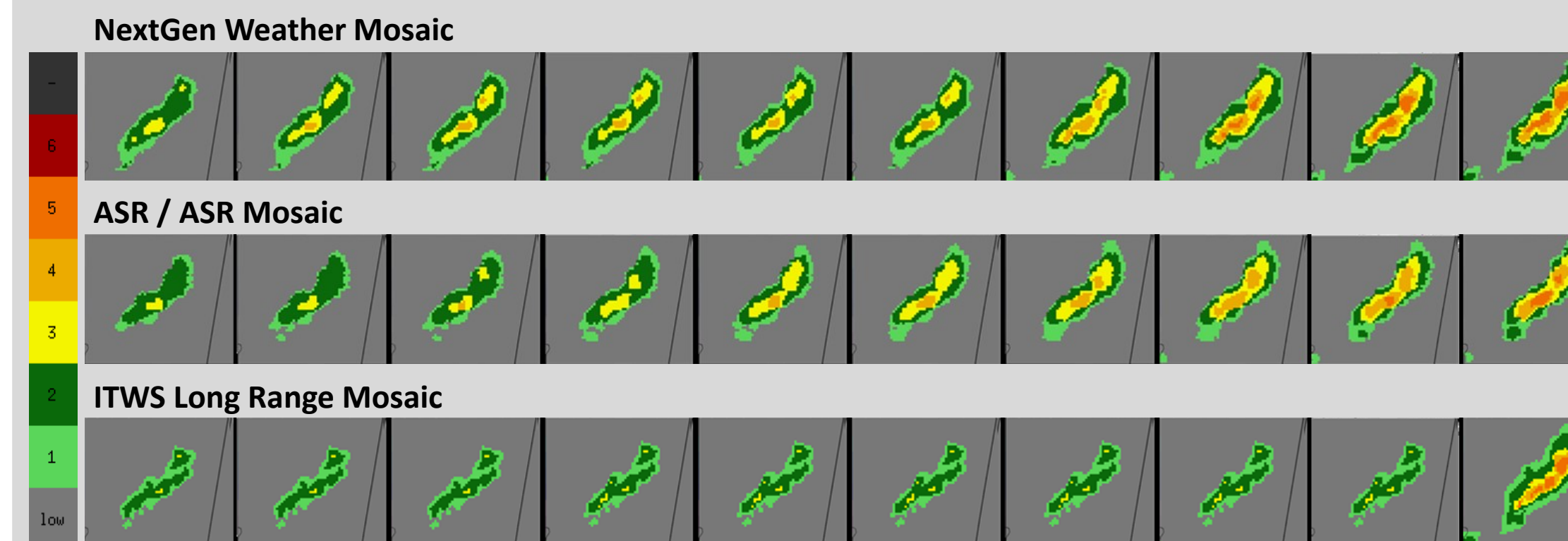
- ITWS, with its 150 sec update, misses most of the growth during this time period.

Radar Distortion of Weather

Synthetic Data Generator

Synthetic truth image shows storms moving east at 58 kts (30 m/s)

10 nmi   30 nmi   40 nmi

ASR / ASR Mosaic
- Mosaic merges multiple ASRs

Fan Beam radar

ASR shows more distortion than both ITWS and NextGen Weather

ITWS Long Range Mosaic
- End-of-Volume mosaic technique

Pencil Beam radar

ITWS storm position lags behind truth due to end-of-volume mosaic technique and slower update rate

NextGen Weather Mosaic
- Tilt-wise mosaic technique

NextGen Weather storm intensity benefits from more surrounding radars and tilt-wise mosaic technique

Summary

	ASR / ASR Mosaic	ITWS Long Range Mosaic	NextGen Weather Mosaic
PROS	• Fast radar update rate (28 sec)	• Good weather depiction • Operationally available today	• Excellent weather depiction & coverage • Uniform architecture - 25 sec update
CONS	• Limited radar coverage • Fan beam distorts weather	• Limited radar coverage & update • Storm position and growth lag	• Not yet deployed

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Weather examples from NextGen Weather 48-hr Test Case April 18-19, 2019
Fan beam image: https://en.wikipedia.org/wiki/Airport_surveillance_radar#/media/File:ASRDaytonBeach.jpg
Pencil beam image: MIT Lincoln Laboratory