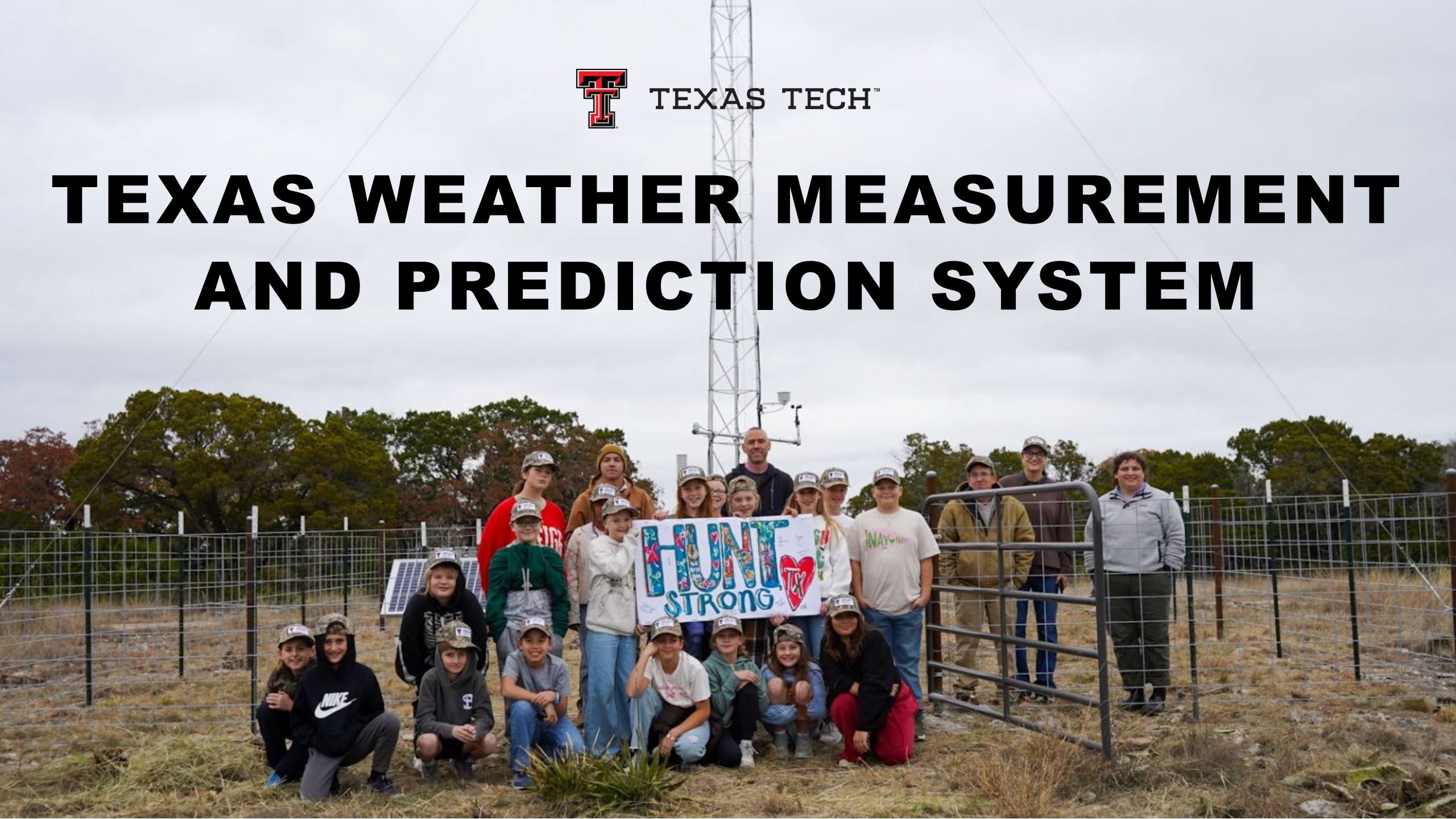
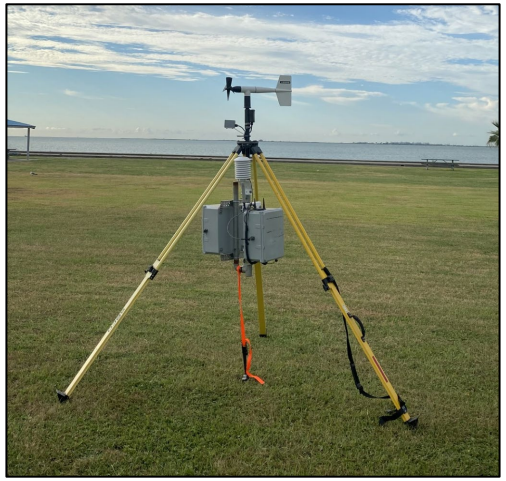
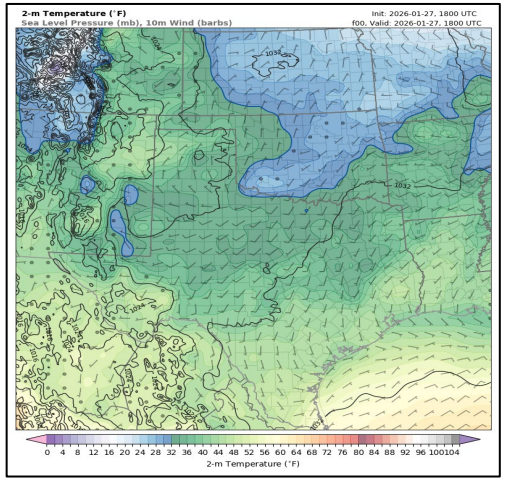
TEXAS TECH™

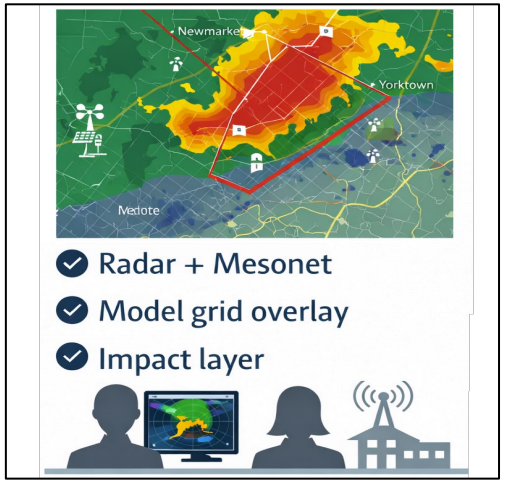
TEXAS WEATHER MEASUREMENT AND PREDICTION SYSTEM



CAPACITY AND EXPERTISE







WEST TEXAS MESONET
- 25+ year history
- Engrained in the fabric of West Texas
- Close collaboration with NOAA, NWS and TWDB

SPECIALIZED RADAR
- 20+ years experience designing and building
- 13 systems deployed across the world
- Real-time dual-Doppler analysis and products

DEPLOYABLE SYSTEMS
- 28+ years field experience
- 48 rapidly deployable weather stations
- 41 tropical cyclones
- Real-time data feeds

HI-RES ENSEMBLE NWP
- 3 km WRF-ARW running since 2012
- Deterministic and ensemble system
- Probabilistic output to characterize uncertainty

DECISION SUPPORT
- Risk communications
- Operational needs assessment
- User-informed products

Texas Tech University (TTU) excels at developing and maintaining real-time systems serving operational needs.

SB5 FLOOD PROJECT

$24M funding from SB5 has been allocated to Texas Tech University (TTU) to provide:

Enhanced atmospheric **measurement and modeling techniques** to improve meteorological forecasting, enhance weather intelligence and forecasting accuracy, and improve flood management and timeliness of flood warnings.

Activities to be completed by Fall 2027 include:

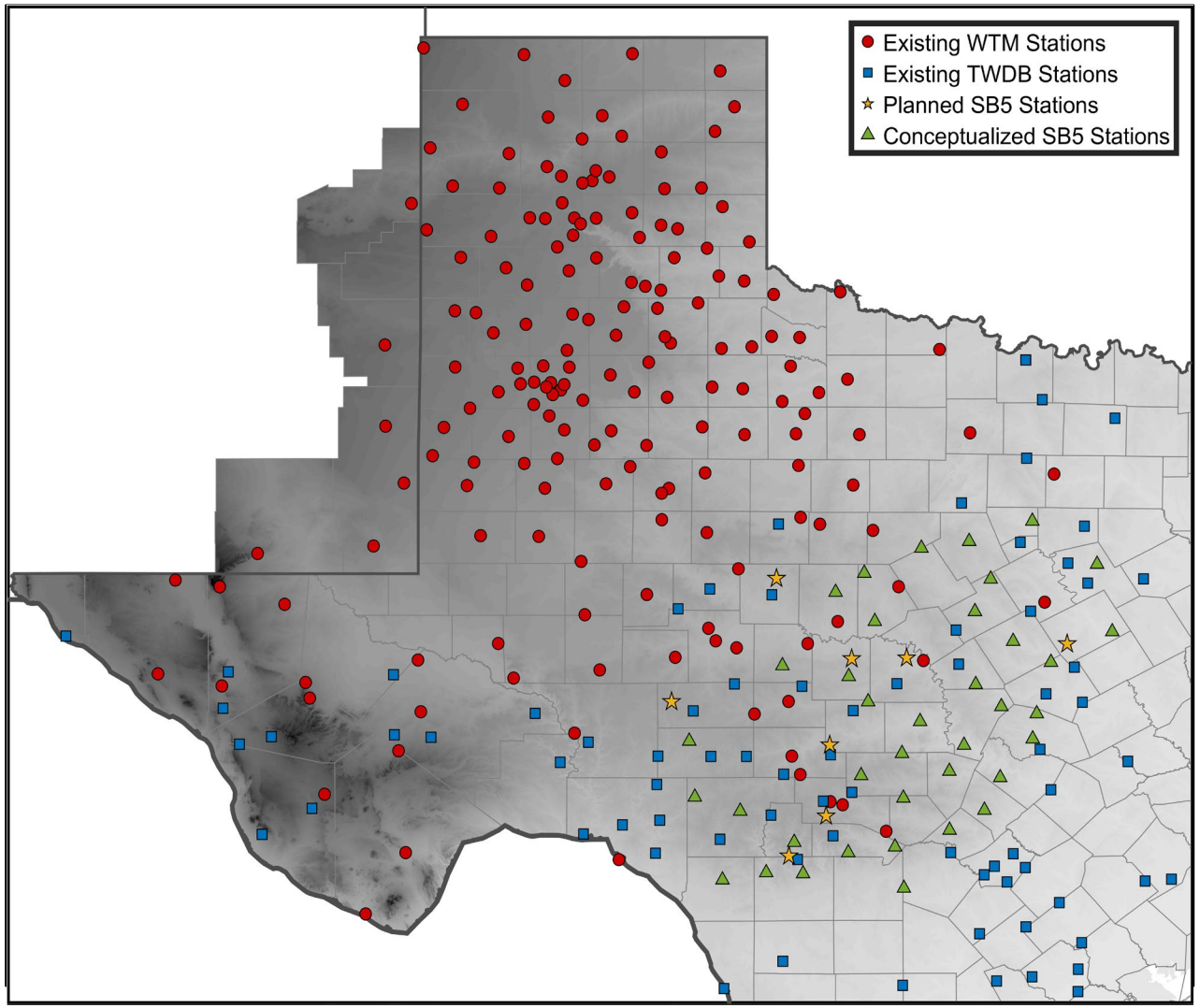
- Expansion of the West Texas Mesonet
- High-resolution radar coverage
- Creation of a Texas Prediction System
- Custom data products & feeds

An Integrated Weather Solution for Texas by Texas.

TEXAS TECH™

WEST TEXAS MESONET EXPANSION

- Network currently 178 stations
- 10-m tower, measure 28 parameters
- 1-minute data, 5-minute reporting
- Roughly 20-30 mile spacing
- SB5 funding will extend to fill gaps in the Hill Country with 40+ new stations
- All equipment has been obtained
- 6 SB5 stations installed to date
- Next 8 SB5 sites formalized
- Data immediately available on existing website and apps



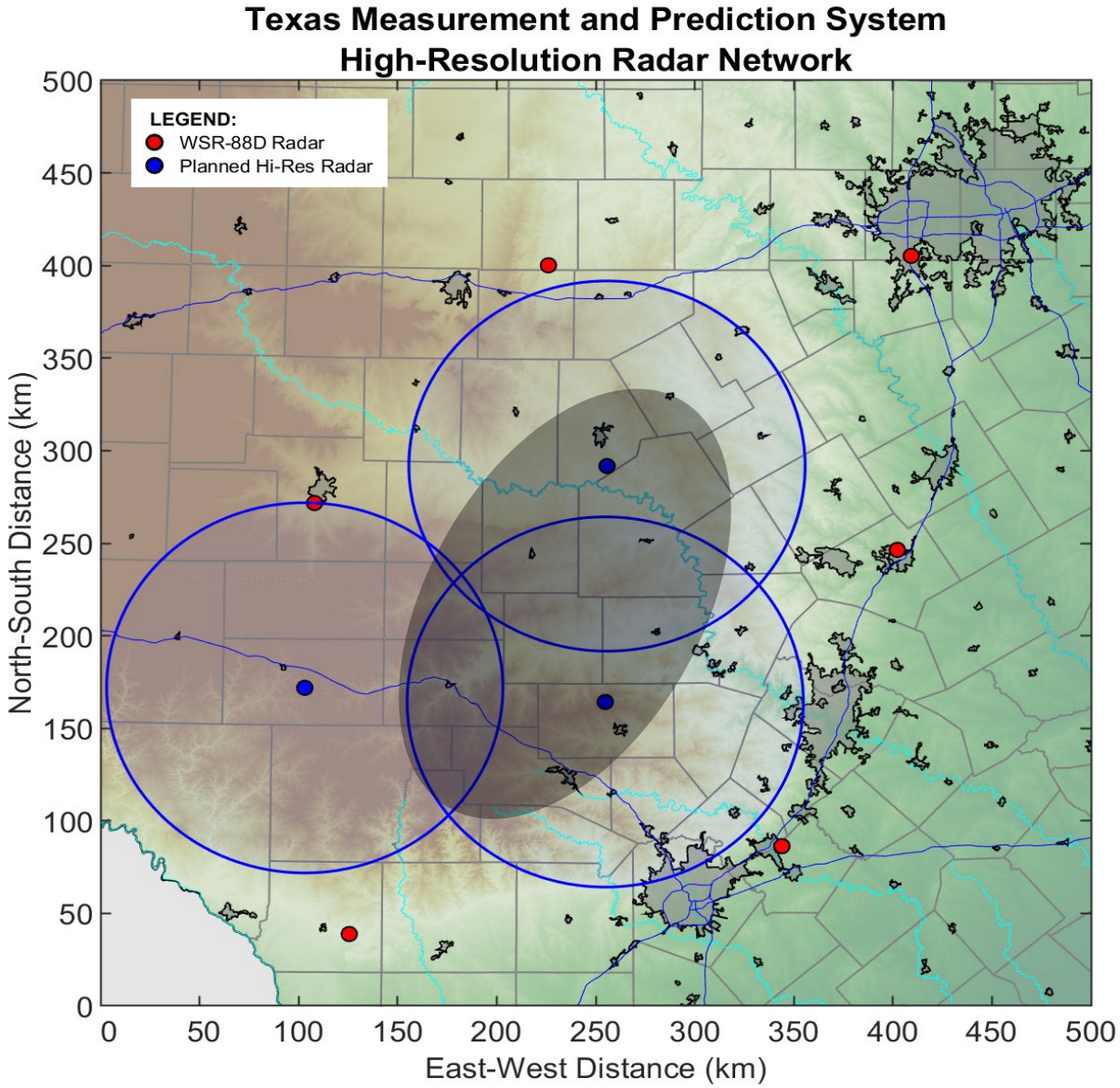
NATIONAL MESONET Program Partner

TexMesonet

www.mesonet.ttu.edu

HIGH-RESOLUTION RADAR COVERAGE

- Install advanced weather radar systems to augment existing NWS radar network
- Dual-pol, 1-degree, C-band
- Target low-level gap in existing
- NWS S-band coverage
- Three radar sites anticipated, 30 sites already scouted
  - Brownwood
  - Fredericksburg
  - Sonora/Eldorado
- Active discussions for specific site locations
- Radar procurement underway

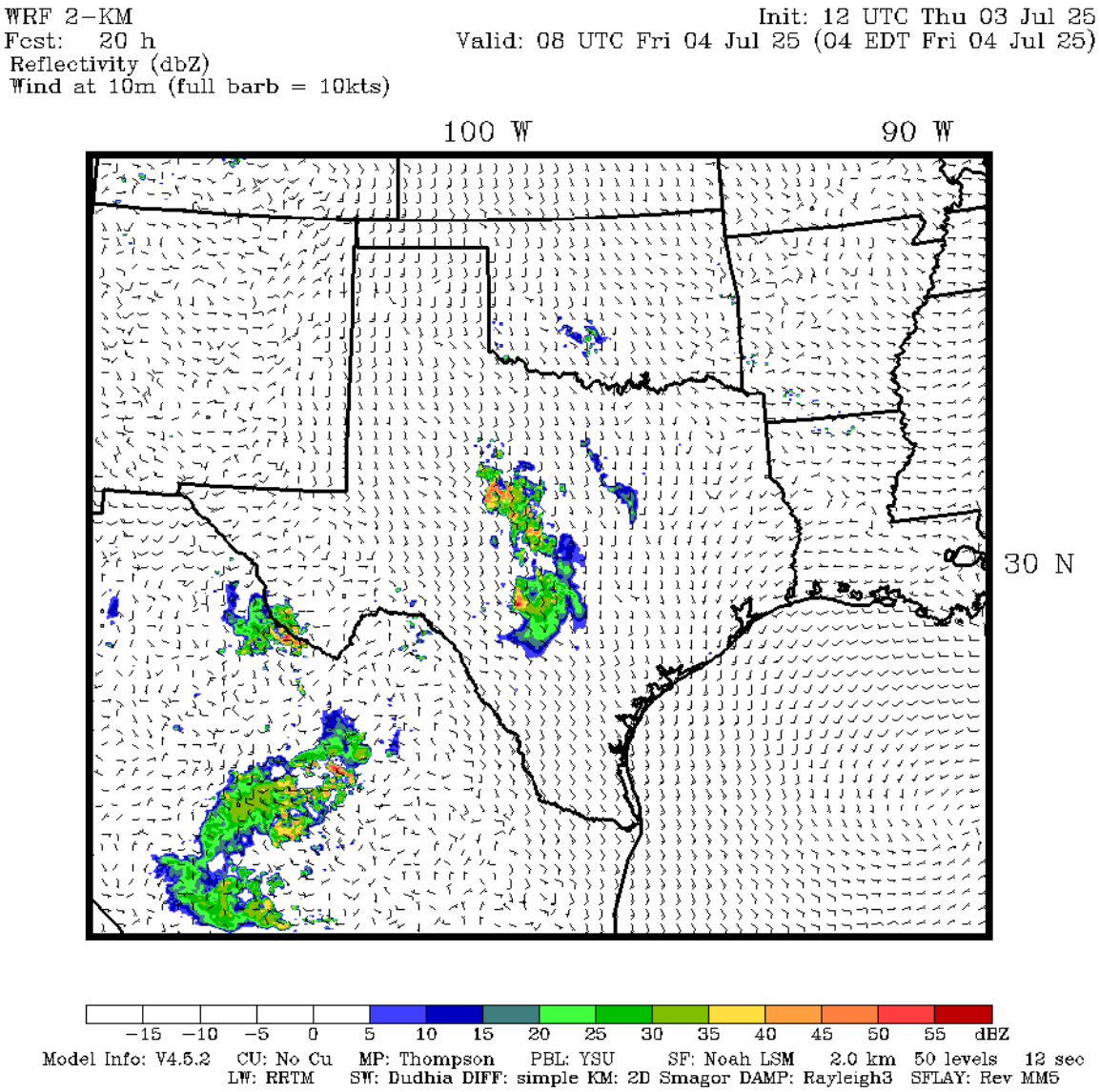


TEXAS PREDICTION SYSTEM

- High-resolution Numerical Weather Prediction (NWP) system dedicated specifically to Texas
- Two ensemble forecast components
  - 2-Day (0-48 hour)
  - Warn-on-Forecast (0-6 hour)
- HPC cluster purchased from Dell
  - 200 nodes, 288 cores/node
  - Rack integration ongoing
  - Will be housed at the Nexus datacenter at Angelo State University
- Installation planned for May/June 2026
  - 2-Day forecast system available this summer
  - WoFS available this fall

TEXAS PREDICTION SYSTEM

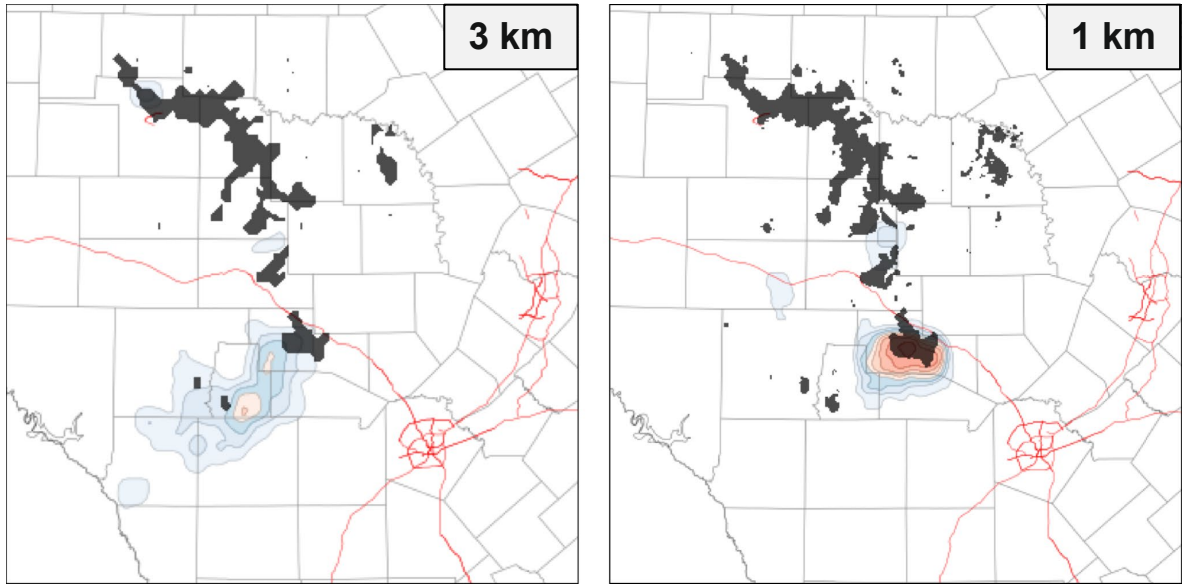
- Two-day forecast ensemble
  - Texas focused domain
  - 0-48 hour prediction run every 6-hours, up to 5-min time steps
  - 2 km horizontal resolution
  - 100 ensemble members



TEXAS PREDICTION SYSTEM

- Two-day forecast ensemble
  - Texas focused domain, run every day
  - 0-48 hour prediction run every 6-hours, up to 5-min time steps
  - 2 km horizontal resolution
  - 100 ensemble members
- Warn on Forecast System (WoFS)
  - Event based trigger
  - Incorporates regional measurements
  - 0-6 hour prediction run hourly, 5-min time steps
  - 1 km horizontal resolution
  - 50 ensemble members

WoFS Probability of > 5” rain from 1 – 4 AM



Source: NOAA/NSSL/CIWRO

WHAT TOOLS ARE USEFUL?

Our goal is to understand how flood measurement data reaches and is used by decision-makers. These pilot interviews are the first step: eliciting decision workflows and tool feedback from two key user groups: National Weather Service and Emergency Managers.

1 Guide Design

60-min interview guides for each user group

1. Workflow questions first
2. Targeted tool feedback second.
3. Adaptive event framing & participants anchor to their own real flood events

2 Pilot Interviews

2 sessions conducted in March 2026

1. County Emergency Manager, (1.5 hrs, 35 min, virtual)
2. 3 NWS Lubbock forecasters: hydrologist, SOO, and forecaster (2 hrs, in-person)

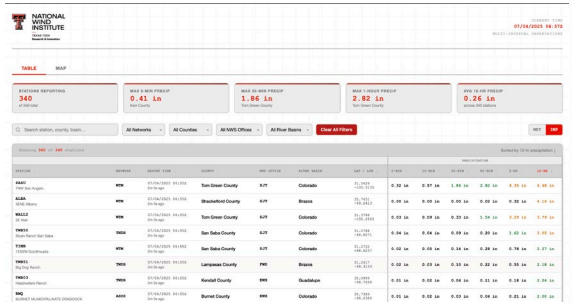
3 Coded Analysis

Transcripts coded thematically

1. Themes follow guide structure
2. Extend to emergent content
3. Verbatim quotes anchor each finding

4 Tool Reviewed

NWI Daily Precipitation Dashboard



Note: These are formative, pilot interviews, not a representative sample. The goal is to build conceptual grounding and design hypotheses, not to generalize findings statistically.

EMERGENCY MANAGER FINDINGS

4 months in role | Atmospheric science background | Solo-operator office | Anchor event: Nov 19–20, 2024 flooding

HAZARD-TO-IMPACT GAP

- Cannot translate rainfall amounts into predicted impacts
- The rainfall-to-impact link is filled by local knowledge, not data products
- No flood mapping tools; relies on memory, site visits, and citizen reports

> *"I understand what 3 to 5 inches might be, but what are the real impacts? I don't know what the roads look like and I can't see them.*

DATA FRAGMENTATION & COGNITIVE LOAD

- Monitors 8–10 platforms pre-event (NWS, WPC, CoCoRaHS, CoAgMet, KBDI, LCRA…)
- Cognitive load spikes during events; reverts to minimal familiar tools
- No single view integrates rainfall, road status, and population exposure

> *"If you did have one platform that pulled everything into it — I think that really helps the brain drain of having to go through bookmarks.*

NWI DASHBOARD: KEY FEEDBACK

✓ County filter is the highest-value feature
✓ Color coding is intuitive and consistent

- Needs data freshness labels (how old is this reading?)
- Station IDs should be visible on map without zooming
- Would screenshot map view for briefings if exportable

> *"The report time is really important… it's important to know how old your data is.*

STRUCTURAL OBSERVATIONS

- Solo operator: cannot monitor during active field response
- No required weather training for emergency managers in Texas
- No regional EM coordination structure for shared situational awareness

> *"…I …think it's best to build it for the smallest offices. If the office of one [EM] can do it, you're…going to have capacity for larger ones.*

TEXAS WEATHER MEASUREMENT& PREDICTION SYSTEM

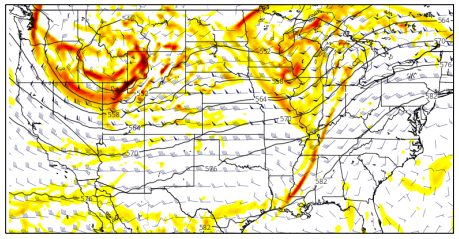
TEXAS TECH™

Existing Measurement Sources

- Regional weather stations
- Regional rain gauges
- NWS WSR-88D radar

National Weather Models

- NOAA

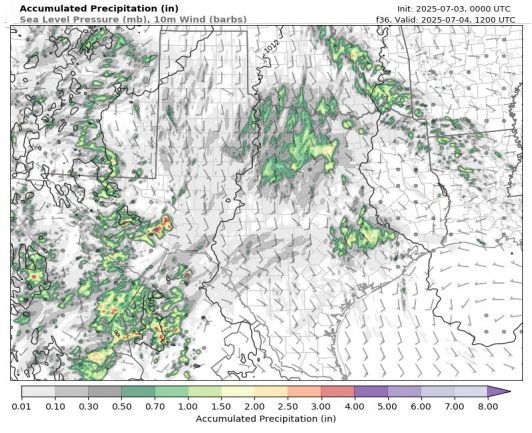


Enhanced Weather Measurements

- Mesonet weather stations
- Fast response rain gauges
- High-resolution radar

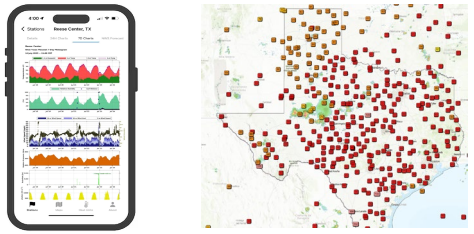
Texas Prediction System

- Always available for Texas
- High resolution ensemble forecasts
- 2-Day forecast system
- Warn-on-forecast system
- New measurement assimilation



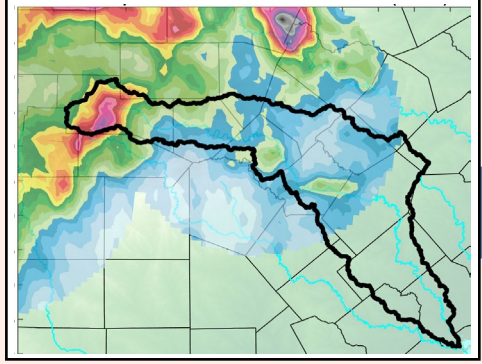
Public Websites & Apps

- TTU West Texas Mesonet
- Texas Water Development Board
- Other Agencies



Product Generation & Data Streams

- Statewide QPE
- Probabilistic QPF
- Custom data formats
- Direct data feeds
- Region-specific products



NWS Forecasting & Warnings

```
BULLETIN - EAS ACTIVATION REQUESTED
FLASH FLOOD WARNING
NATIONAL WEATHER SERVICE AUSTIN/SAN ANTONIO TX
534 AM CDT FRI JUL 4 2025

...FLASH FLOOD EMERGENCY FOR THE GUADALUPE RIVER FROM HUNT THROUGH
KERRVILE AND CENTER POINT...

THE NATIONAL WEATHER SERVICE IN AUSTIN/SAN ANTONIO HAS ISSUED A

* FLASH FLOOD WARNING FOR...
  EAST CENTRAL KERR COUNTY IN SOUTH CENTRAL TEXAS...

* UNTIL NOON CDT FRIDAY.

* AT 534 AM CDT, AUTOMATED RAIN GAUGES INDICATE A LARGE AND DEADLY
  FLOOD WAVE IS MOVING DOWN THE GUADALUPE RIVER. FLASH FLOODING IS
  ALREADY OCCURRING.

  THIS IS A FLASH FLOOD EMERGENCY FOR THE GUADALUPE RIVER FROM HUNT
  THROUGH KERRVILE AND CENTER POINT. THIS IS A PARTICULARLY
  DANGEROUS SITUATION. SEEK HIGHER GROUND NOW!

  HAZARD...LIFE THREATENING FLASH FLOODING. THUNDERSTORMS
           PRODUCING FLASH FLOODING.
```

Serve State Interests:

- Operational Forecasting
- Hydrological Models & Mapping
- Emergency Management Planning & Response
- River & Water Authorities
- Transportation
- Energy
- Forest Service
- Other Agencies & Users

SUMMARY

- TTU is developing an enhanced measurement and modeling system to serve the state of Texas
  - New mesonet stations installed in the Hill Country
  - Regional high-resolution radars to fill existing gaps
  - TPS modeling suite run in real-time focused on Texas

- TTU is developing a suite of products to serve a wide diversity of users
  - State-wide measurement and ensemble forecast gridded fields
  - Soliciting input from state and local agencies and EMs to understand what data products will enhance forecasting and decision-making processes

- Anticipated state provided O&M funding should allow broad access to all generated data and products

John Schroeder, Ph.D. – Project Management
Senior Director, *National Wind Institute*
john.schroeder@ttu.edu

Wes Burgett – West Texas Mesonet Expansion
Operations Manager, *West Texas Mesonet*
wesley.burgett@ttu.edu

Brian Hirth, Ph.D. – Radar Expansion
Research Professor, *National Wind Institute*
brian.hirth@ttu.edu

Brian Ancell, Ph.D. – Texas Prediction System Implementation
Professor, *Atmospheric Science Group*
brian.ancell@ttu.edu

Jen Henderson, Ph.D. – Decision Support
Assistant Professor, *Department of Geosciences*
jen.henderson@ttu.edu