

ESCAPE forecasting update

12 May 2022 (v2)

Eric Bruning, Andrew Dzambo, and Mariko Oue

Agenda

- Forecast schedule (Eric Bruning)
- Sample TRACER+ forecast (Eric Bruning and Mariko Oue)
- Sample tailored forecast for ESCAPE operations planning (Andrew Dzambo)
- Coordination of nowcasting with aircraft and ground operations
 - Mechanisms - maps, chat. (Eric, Andrew, All)

TRACER+ Campaigns – Houston, TX Sept. 2021- Oct. 2022

Slide courtesy
M. Jensen, BNL

TRACER-AQ (NASA, TCEQ) – Sep '21

Aircraft: Gulfstream V

Remote Sensing: TOLNet, Pandora

Ozonesondes

TRACER (DOE) – Oct '21 through Sep '22

ARM Mobile Facility (Cloud, Aerosol)

C-band Scanning ARM Radar

ESCAPE (NSF) – June '22

Aircraft: SPEC Learjet, likely one more small aircraft

Radar: CSU C-band, OU X-bands, SBU Phased Array

Mobile: SBU Weather Truck, BNL Research Truck

TRACER IOP (DOE) – Jun '22 through Sep '22

Ancillary (ANC) Site (Aerosol, Thermodynamics)

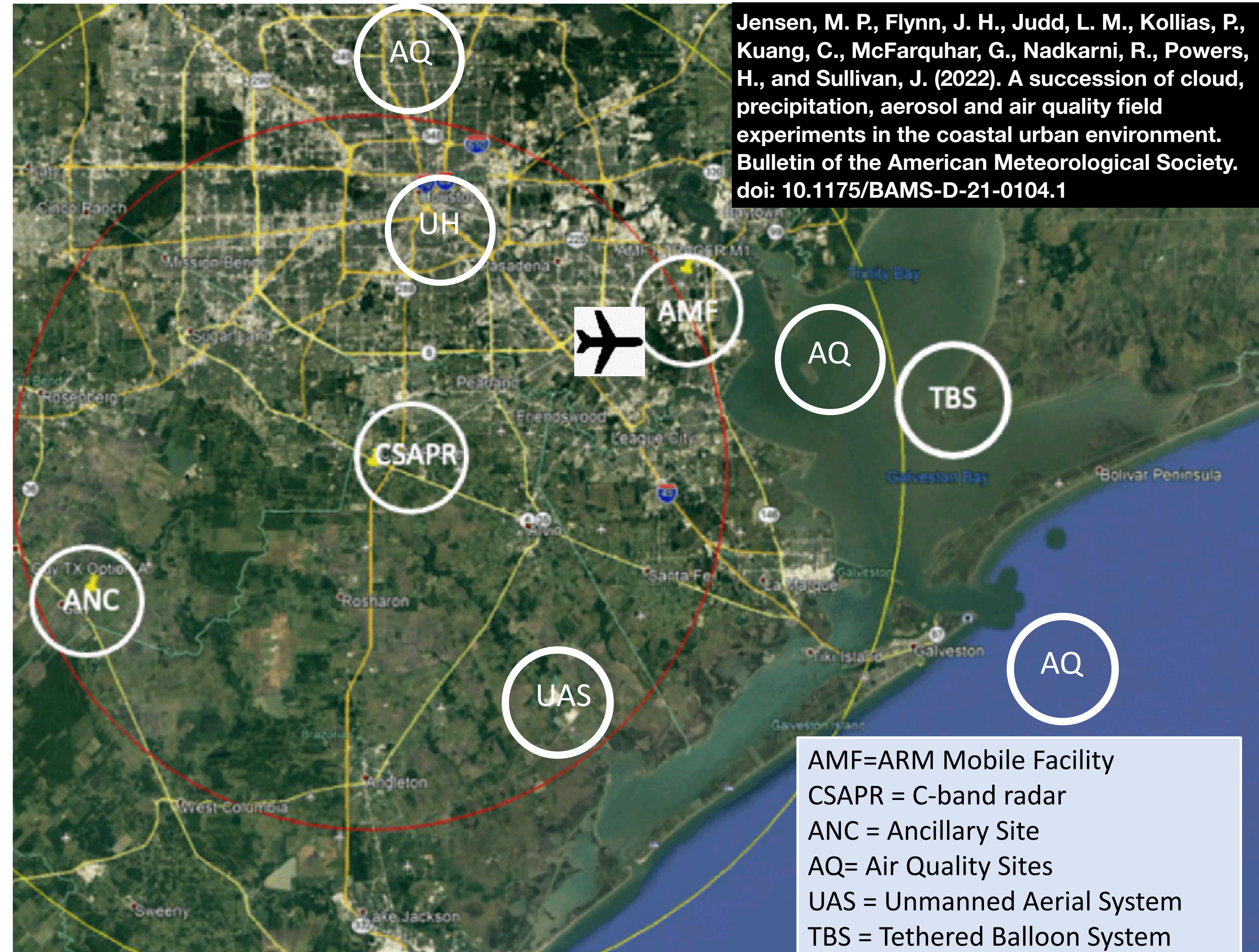
ARM Tethered Balloon System (TBS)

N-Pol S-band Radar (NASA)

Mobile Aerosol (Baylor), Boundary Layer (OU), Soundings

(TAMU), Lightning Mapping Array (TAMU, TTU)

Unmanned Aerial Systems (CU)



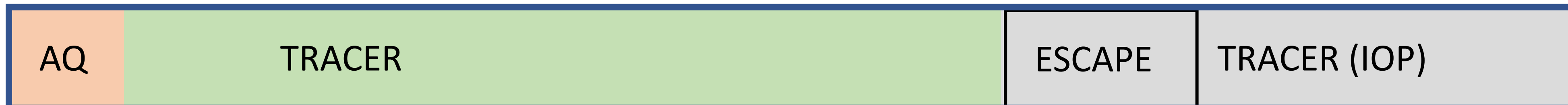
Jensen, M. P., Flynn, J. H., Judd, L. M., Kollias, P., Kuang, C., McFarquhar, G., Nadkarni, R., Powers, H., and Sullivan, J. (2022). A succession of cloud, precipitation, aerosol and air quality field experiments in the coastal urban environment. *Bulletin of the American Meteorological Society*. doi: 10.1175/BAMS-D-21-0104.1

AMF=ARM Mobile Facility
CSAPR = C-band radar
ANC = Ancillary Site
AQ= Air Quality Sites
UAS = Unmanned Aerial System
TBS = Tethered Balloon System
UH = University of Houston

09/21 10/21

06/22

10/22



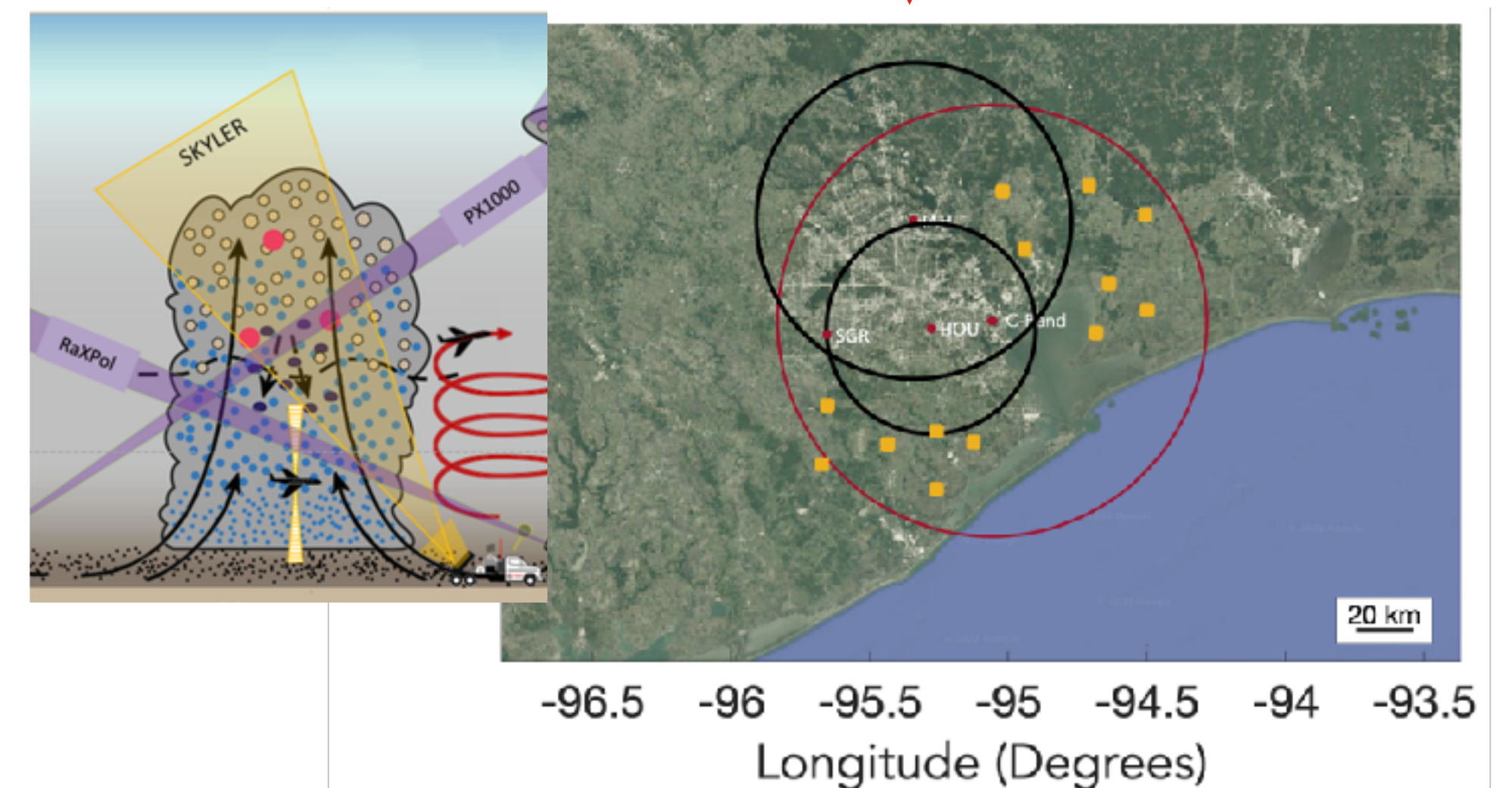
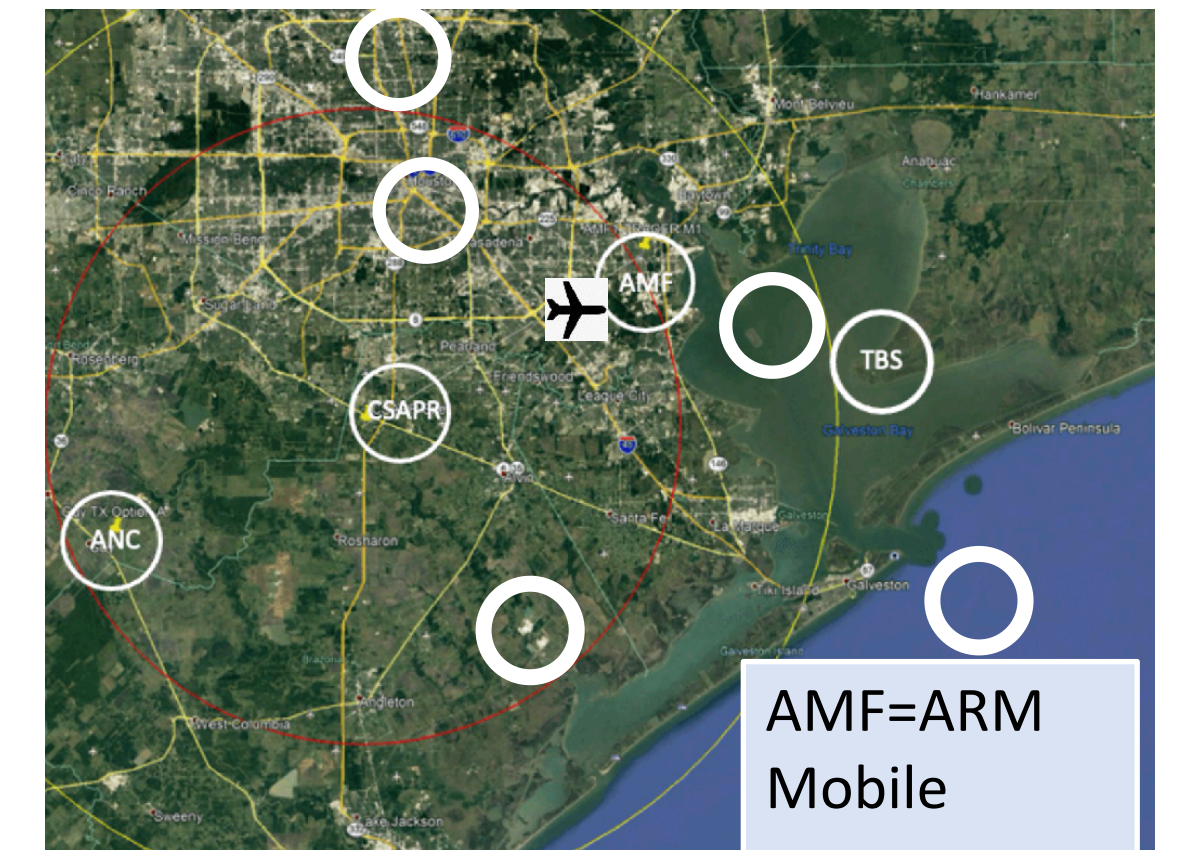
Terminology and design principles

- TRACER+ forecasting
 - Shared forecast effort across all field efforts in Houston
 - Prior experience with TRACER-AQ
- ESCAPE forecasting
 - Virtual forecast team (Mariko): joins TRACER+ forecast team (1-2+)
 - On-site (Eric and Andrew)
 - Decision forecast team (at least 2)
 - Supports operations planning
 - Nowcast team (at least 2)
 - Support aircraft and ground ops

High-level TRACER+
shared forecast

Refine

ESCAPE-relevant
details



DRAFT forecasting schedule (rev. 12 May, afternoon)

- **Pre-flight day (local time):**

- **9:00 AM - 1:00 pm: Forecast briefing prep.** ESCAPE virtual team participates in TRACER+ briefing preparation, as run by their forecast leadership. ESCAPE decision team also reviews guidance, focusing on the radar/flight areas, storm modes, likely storm evolution and timing during next two days.
- **1:00 - 1:45 pm: TRACER+ forecast briefing.** ESCAPE virtual team contributes/helps present. ESCAPE Forecast decision team listens in, and is ready to contribute to discussion.
- **1:45 - 2:30 pm: TRACER+ PI operations decision call.** DOE mission scientist decides go/no go. ESCAPE PIs and forecast leadership participate in decision.
- **2:30 - 3:00 pm: ESCAPE PIs make final go/no go decision for flights** for next two days. Decide on takeoff time; notify pilots of decision. Decide on SBU/BNL truck ops, radar ops; PSU swarmsonde sea breeze/clear air ops. Input from ESCAPE decision team.
- **3:00 - 4:00 pm: Tailoring of flight plans** by smaller group of PIs and pilots, supported by ESCAPE decision team.
- 4:00 - 5:00 pm: Day two planning or margin.

- **Flight day**

- **T-3.5:** ESCAPE decision team preps morning forecast briefing, assessing mesoscale details (ongoing convection, remnant outflows, updated model guidance, etc.)
- **T-2.5:** preflight weather briefing, focused on changes that impact previous day's plan.
- **T-2:** last chance for no go decision by ESCAPE PIs (rarely used).
- **T-2 (or 3):** Convair pilots do flight planning/prep.
- **T-2:** LEAR pilots do flight planning/prep, flight instrument teams do any necessary prep. Radar teams deploy.
- **T0** (e.g., 8:15 am): takeoff
- **T0 until end of flight:** nowcasting / coordination with ground assets

Sample slides from TRACER-AQ

Should be representative of the general format of the TRACER+ forecasting

Forecast Discussion

TRACER AQ IOP 1

20 September 2021

Forecasters: Chris Nowotarski

Interns/Assistants: Garrett Tornow

Forecast Coordinator: Mike Jensen

Summary matrix

Details: days 1-2


Extended: general idea

Forecast	Tue 9/21 AM	Tue 9/21 PM	Wed 9/22 AM	Wed 9/23 PM	Long Term (Thurs-Sun)
Low-level Cloudiness	Scattered	Broken	Few	Clear	Thursday looks clear, but some indication of high cloud return by weekend
Mid-level Cloudiness	Scattered	Broken	Few	Clear	
Upper level Cloudiness	Few	Broken -> OVC	Broken	Scattered	
Convection	Isolated, scattered offshore/coastal	Scattered -> Widespread by evening	None	None	No Conv/Precip expected
Seabreeze	No	Yes, pre front	Strong offshore	Strong offshore	Likely to return
Ozone	Low	Low-Mod	Low	Low	Potential to increase to MOD
PM2.5	Low	Low-Mod	Low	Low	Low

Verification

Verification

Forecast	Mon 9/20 AM	Mon 9/20 PM
Low-level Cloudiness	Few	Scattered
Mid-level Cloudiness	Few	Isolated
Upper level Cloudiness	Few	Scattered
Convection	Isolated	Isolated
Seabreeze	Possible	Possible
Ozone	Low	Low
PM2.5	Low (Moderate end)	Low



Forecast summary

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Verification

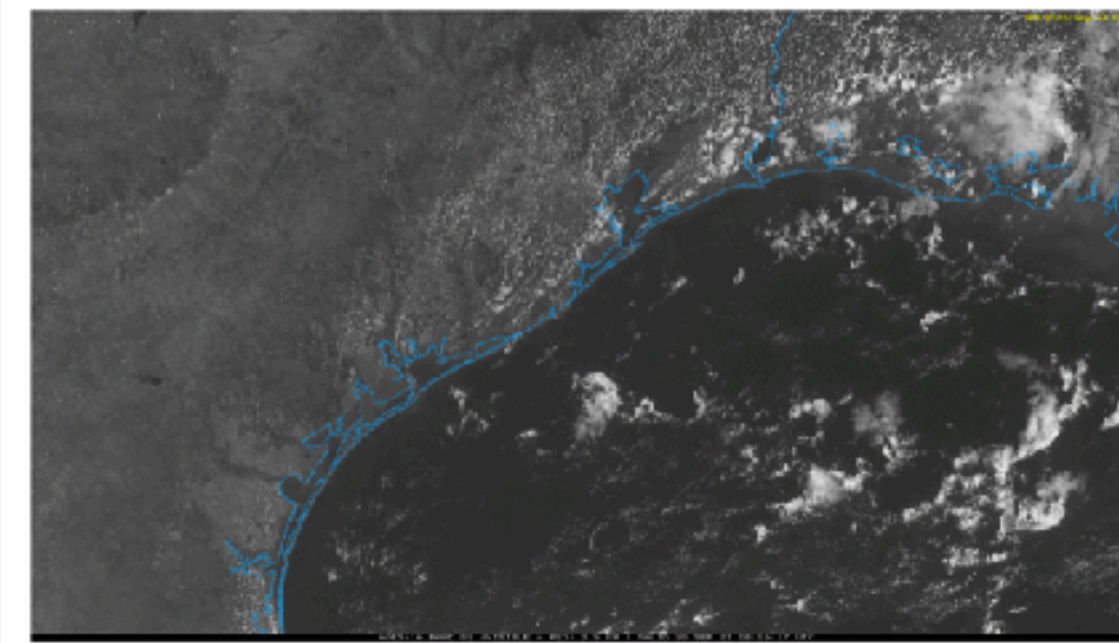
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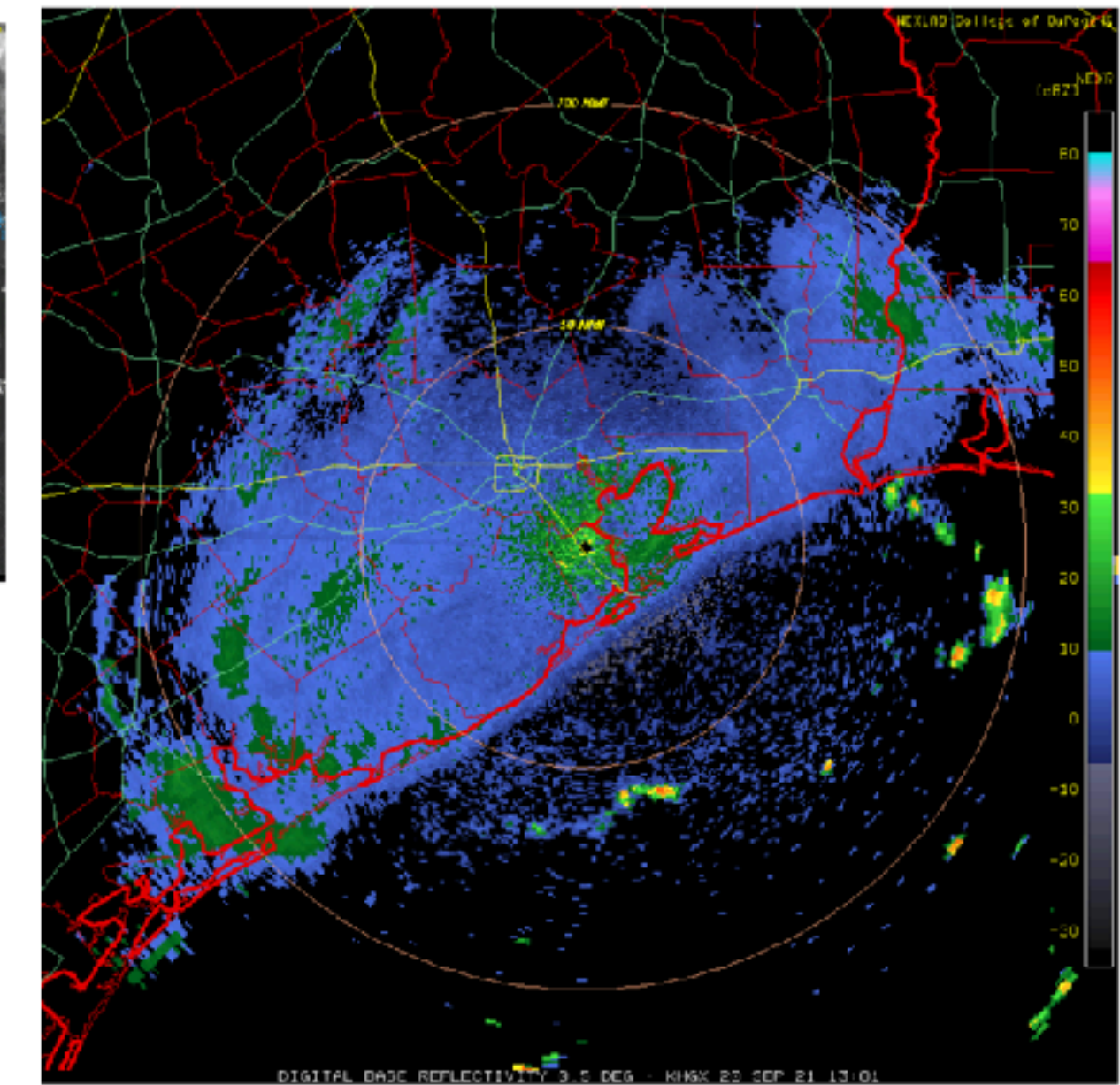
Current conditions

Radar, satellite loops



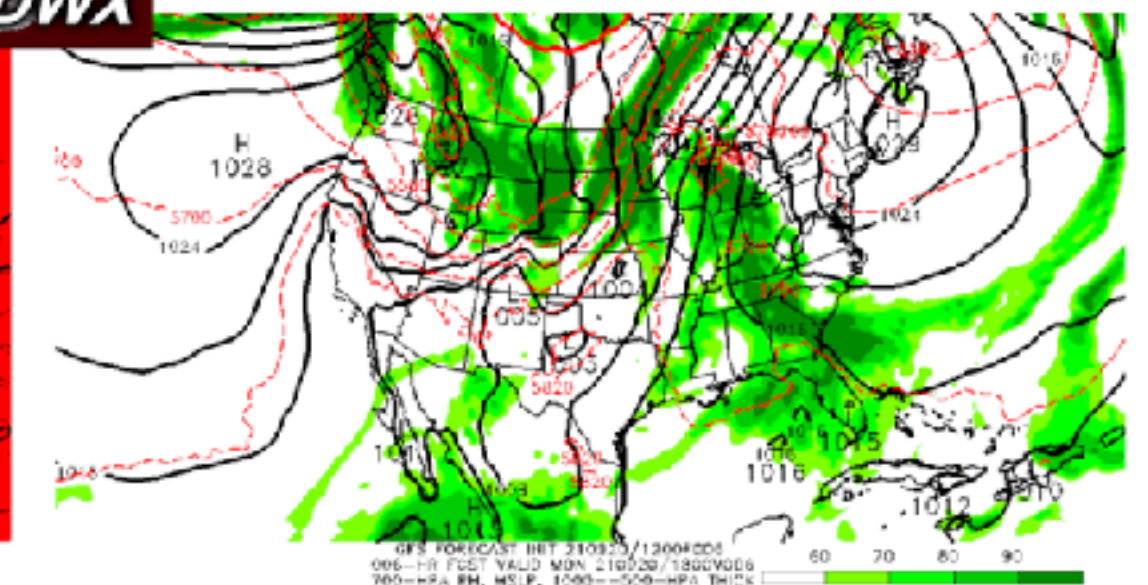
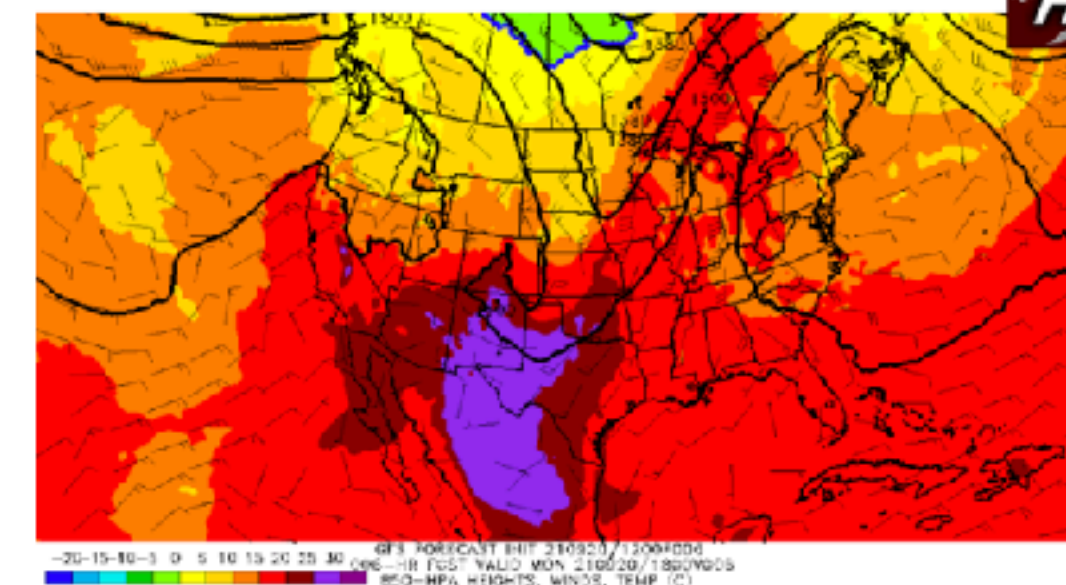
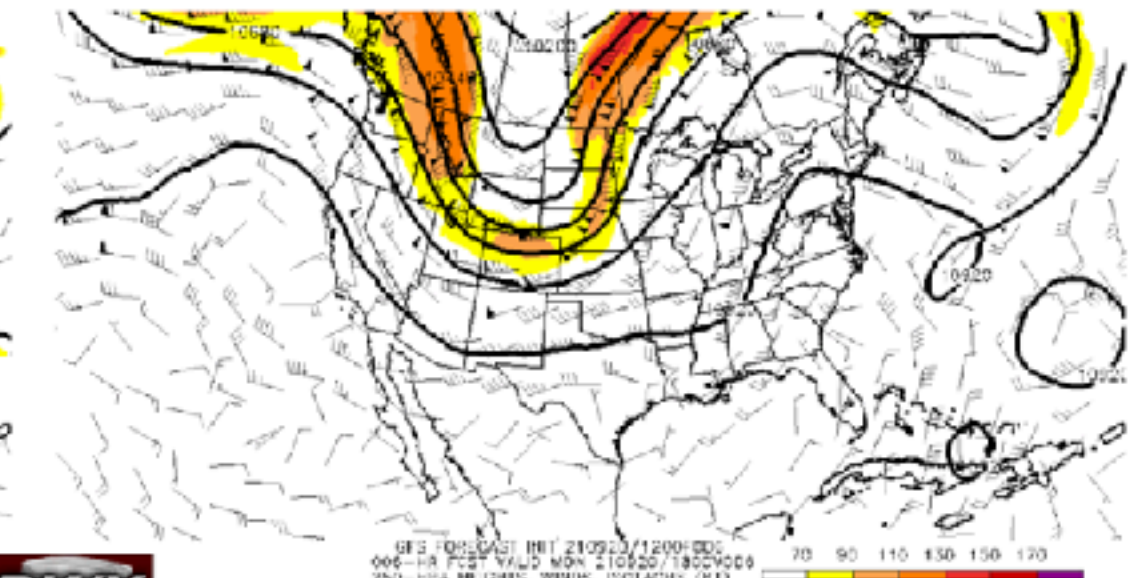
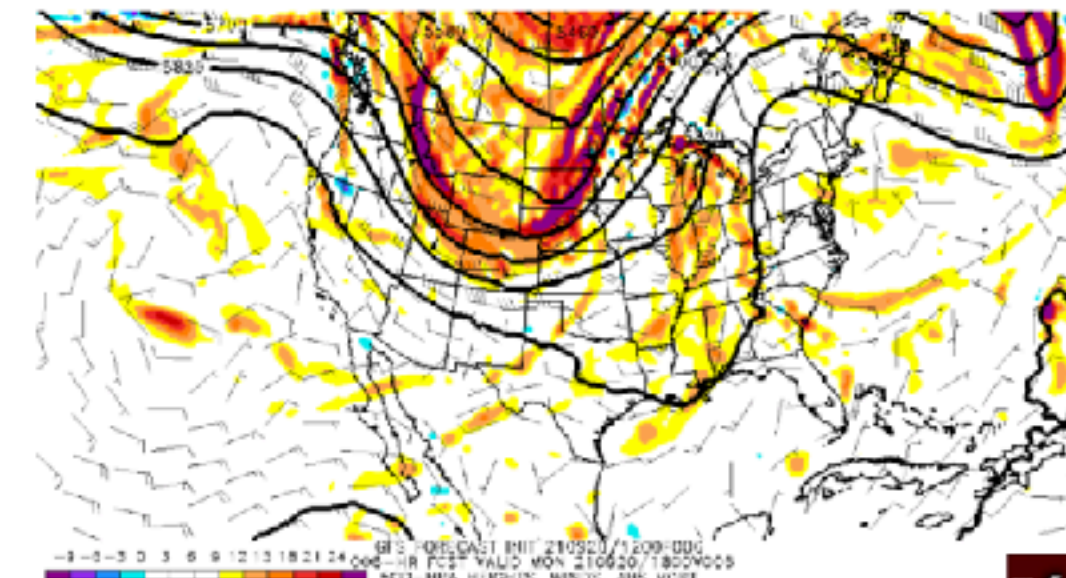
1130 - 1900 UTC

Satellite and radar loop this morning thru mid afternoon



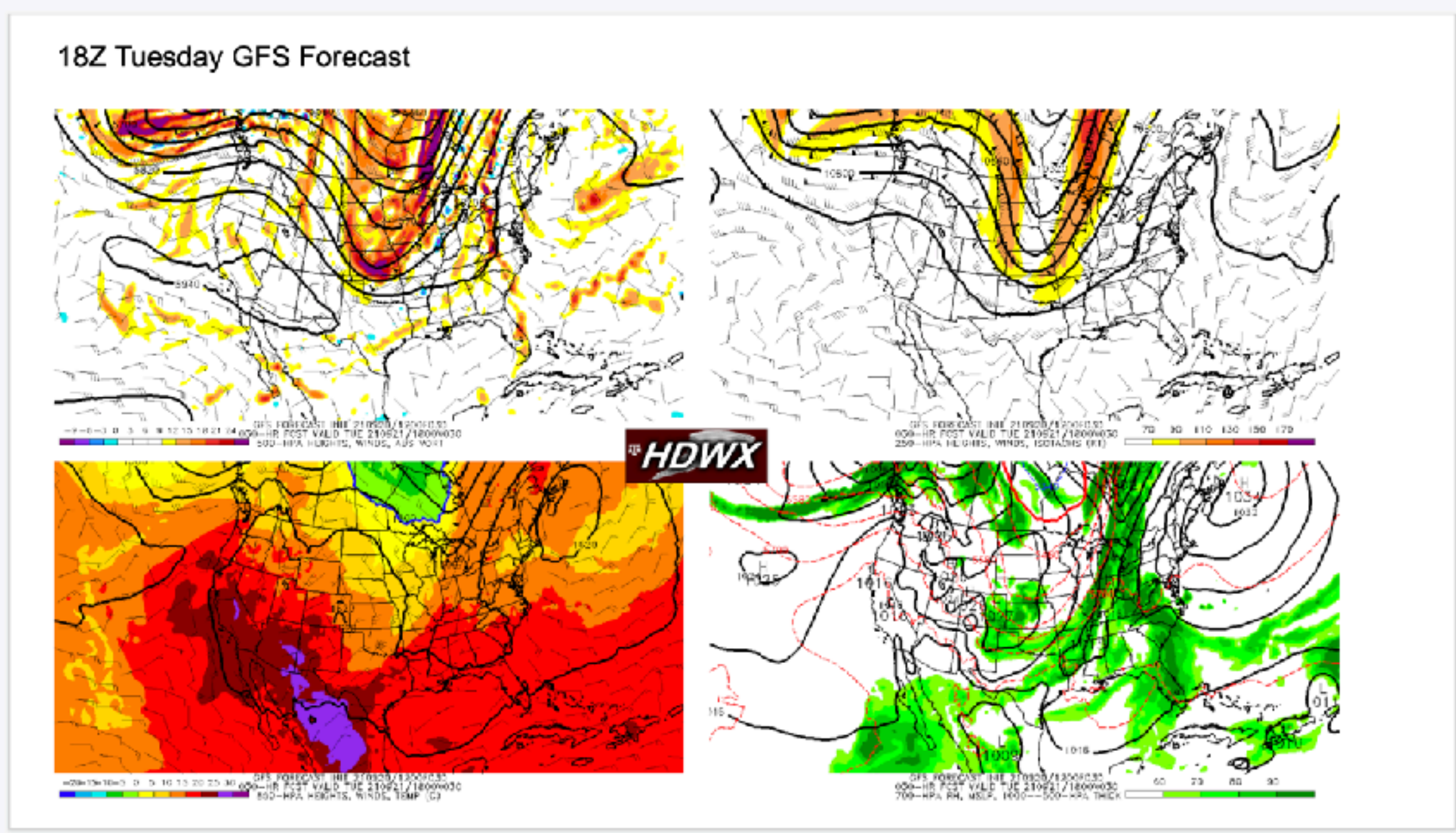
Surface, upper air maps

MON 18 Z GFS



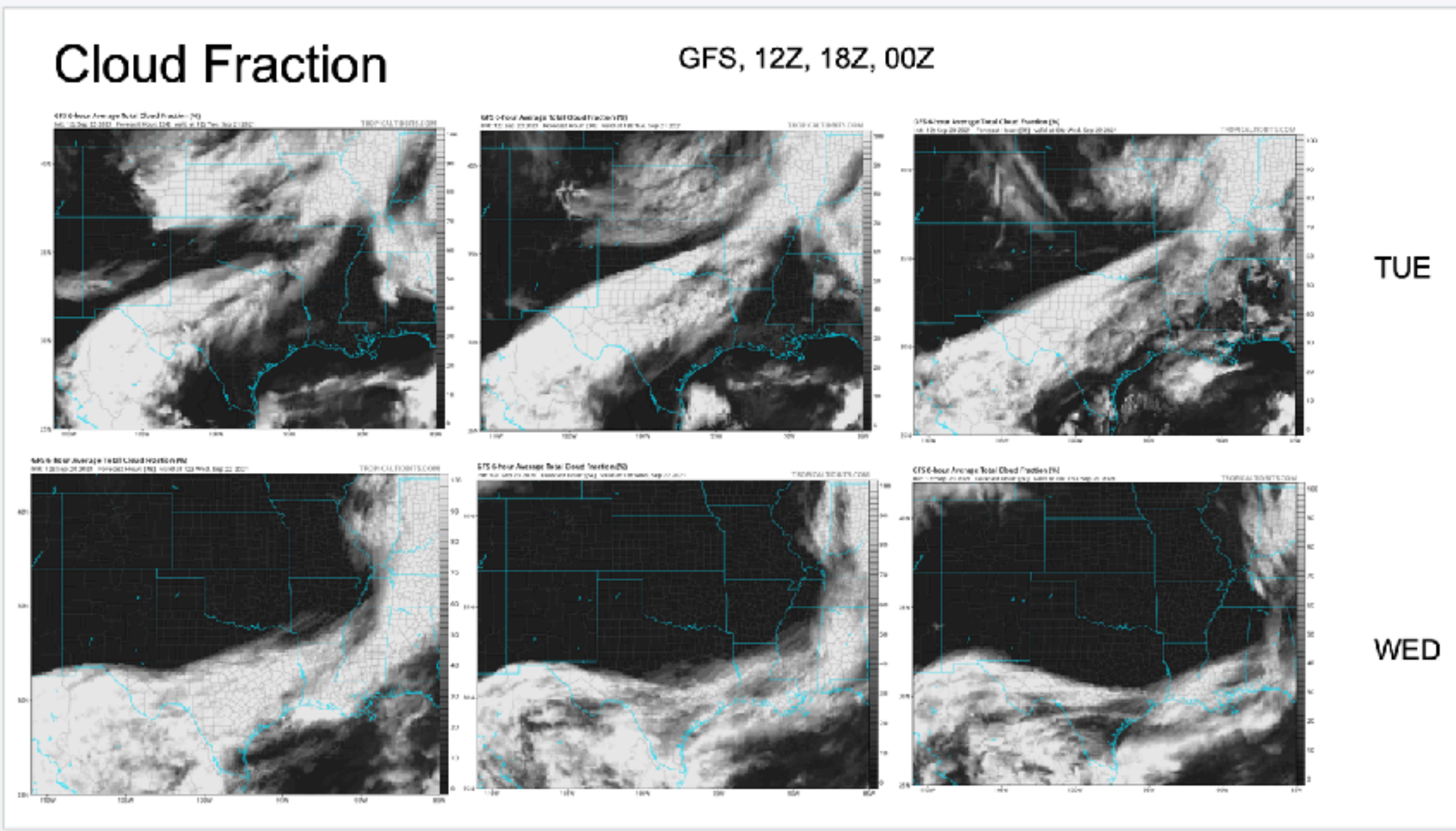
Forecast

Upper-air, surface



Expected clouds

(also uses forecast soundings)



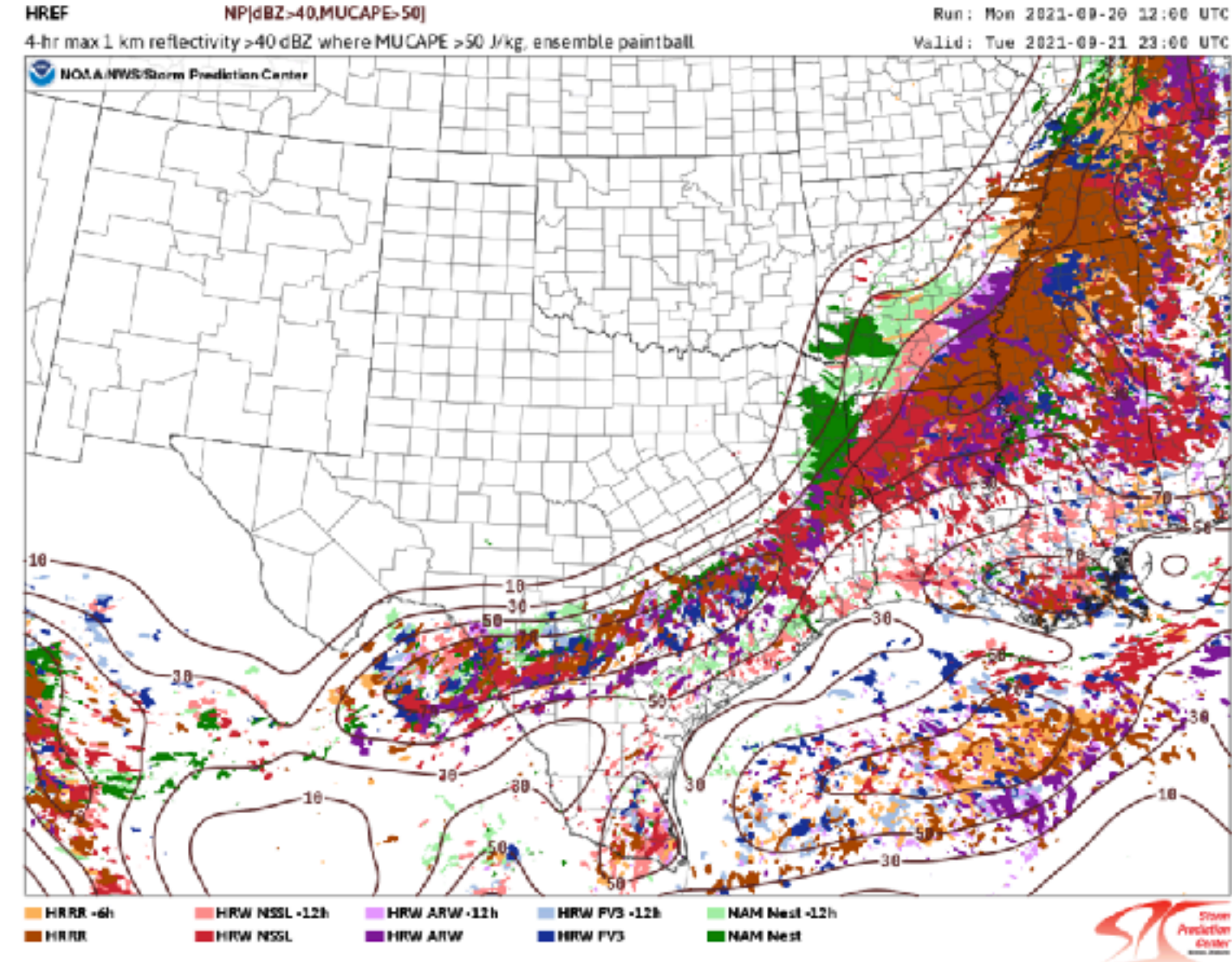
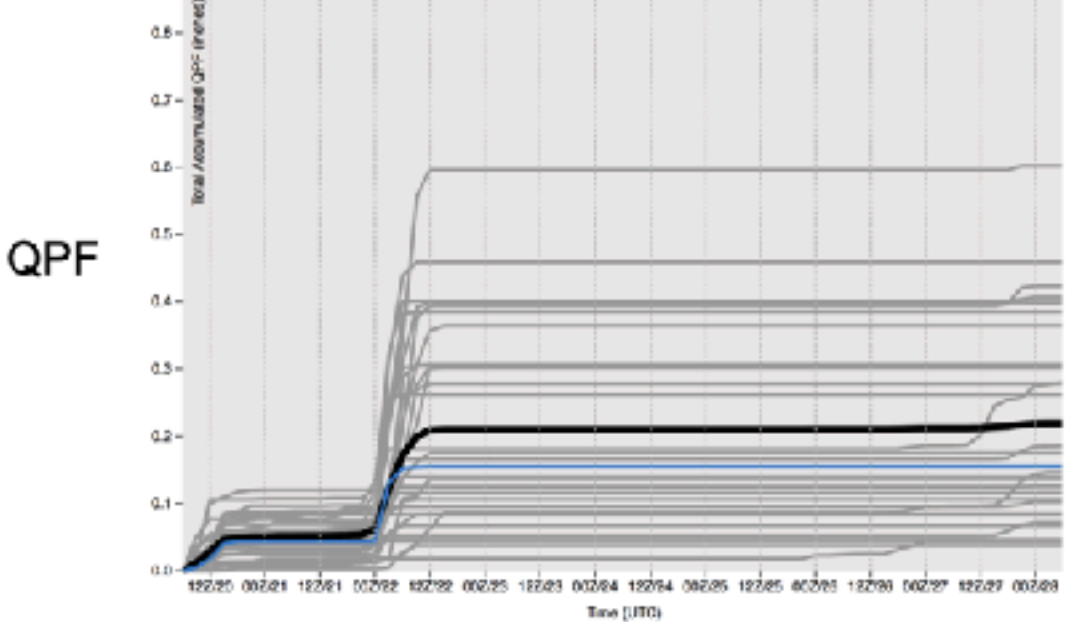
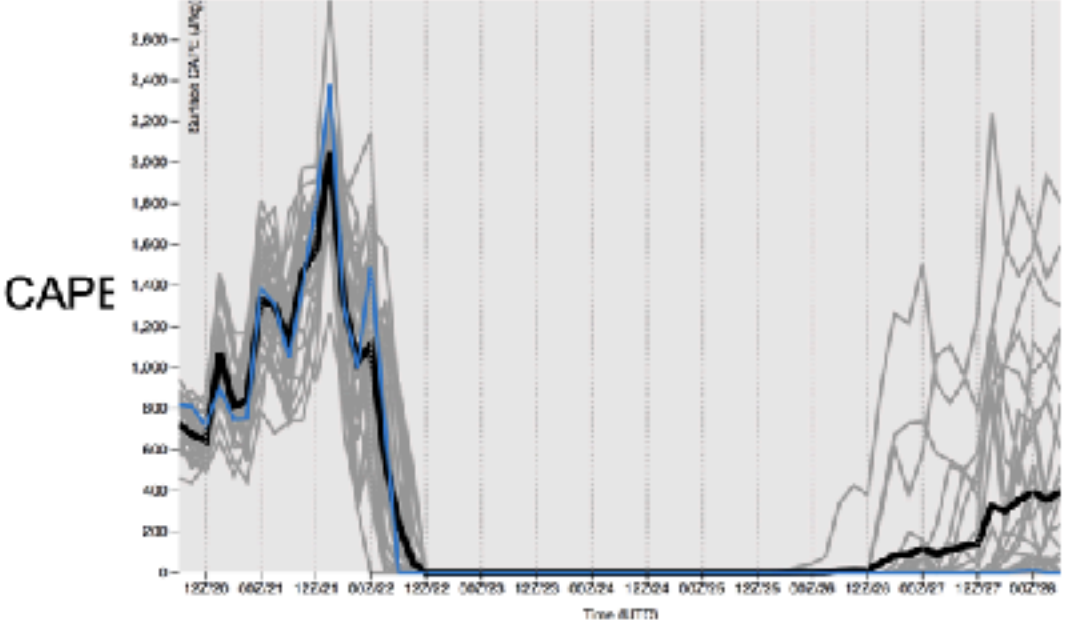
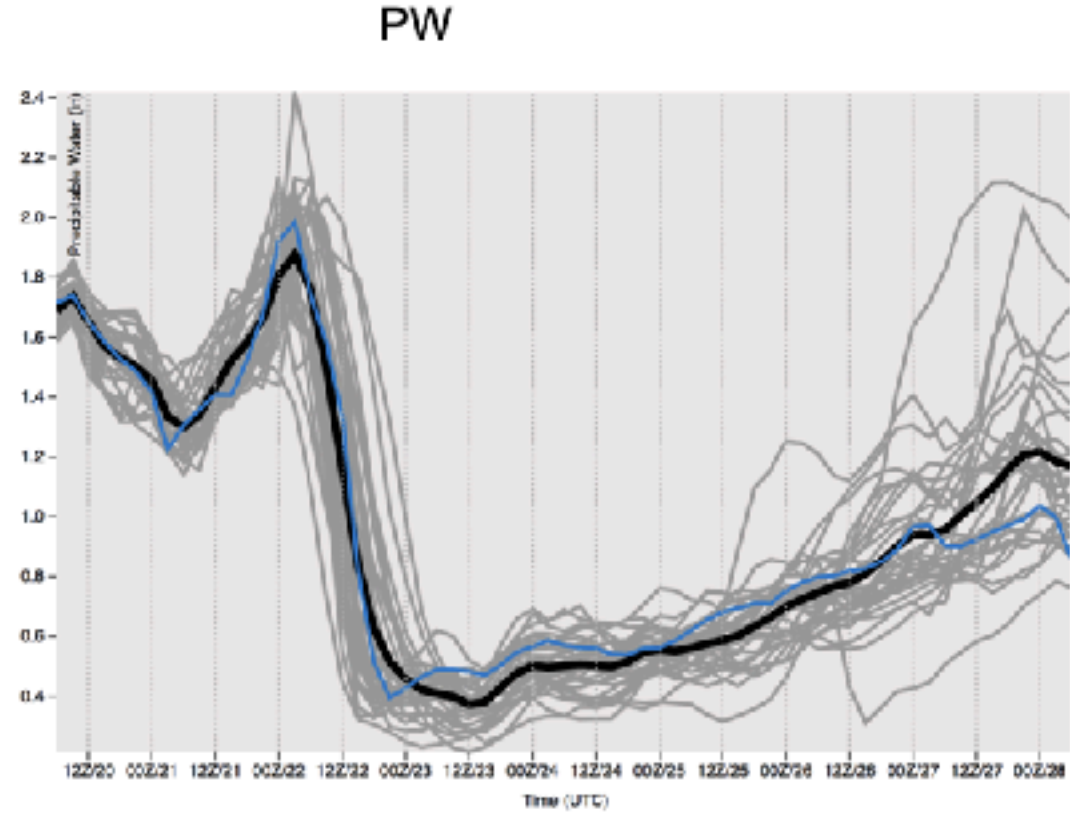
Forecast

Ensemble precipitation (5 day)

Deep convection ensembles (“paintballs”)

Including timing, mode, position, etc.

GEFS Plumes at KIAH until next Monday (9/27)



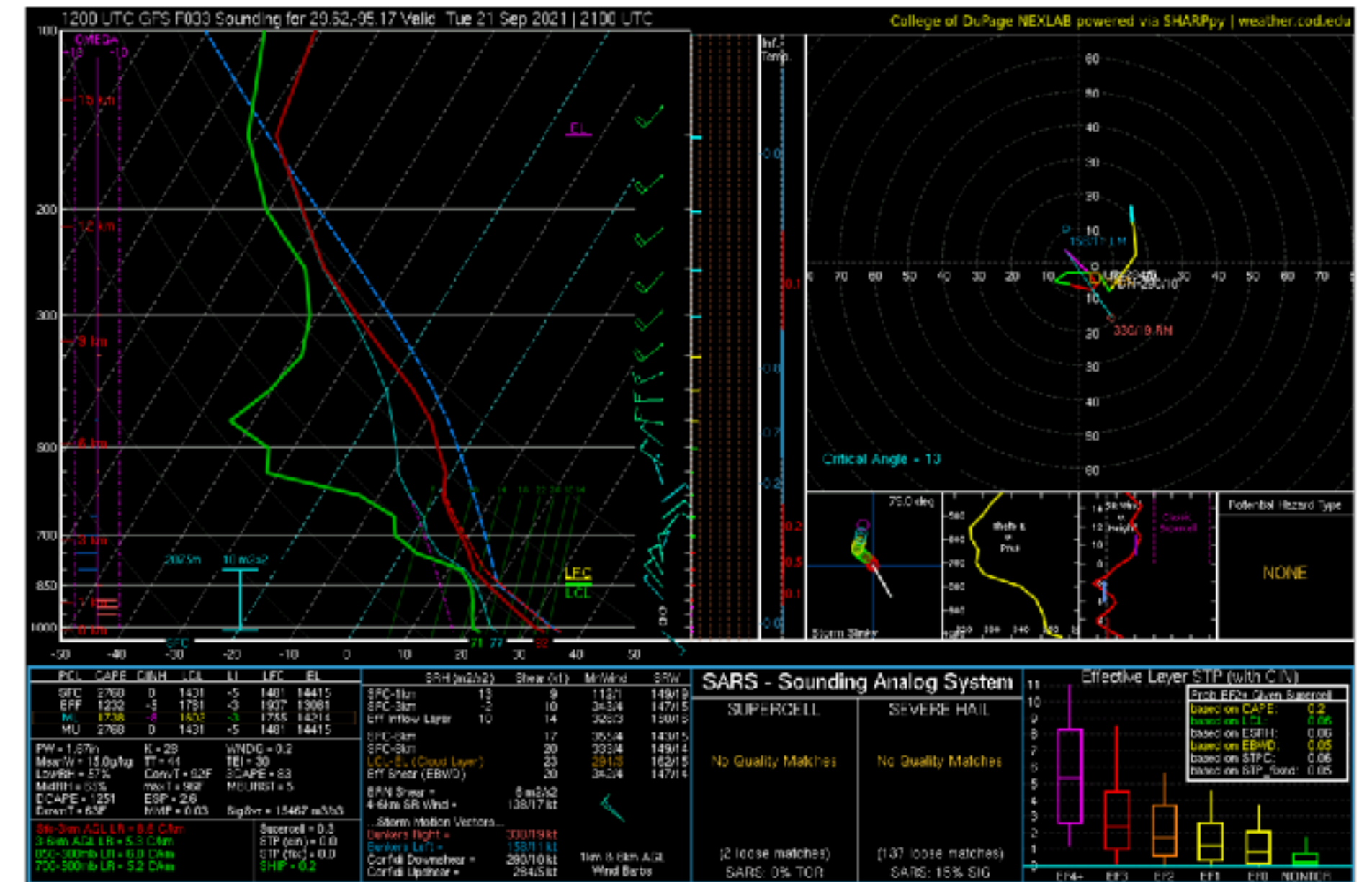
Composite Reflectivity > 40 DBZ:
4 hour period ending TUES 23 Z

Forecast

Soundings (multiple models)

21 Z
TUES

Forecast
sounding



TCEQ Forecast

Air quality

September 20, 2021

Forecast is for Ozone, PM2.5, & PM10, and is based on EPA's Air Quality Index (AQI)



Forecast Region (Click name for AIRNOW version)	Mon 09/20/2021	Tue 09/21/2021	Wed 09/22/2021	Thu 09/23/2021
Amarillo	PM2.5/PM10	PM2.5/PM10	Good	Good
Austin	Ozone	Good	Good	Good
Beaumont-Port Arthur	Ozone	Good	Good	Good
Big Bend	Ozone	Good	Good	Good
Brownsville-McAllen	Good	Good	Good	Good
Bryan-College Station	Ozone	Good	Good	Ozone
Corpus Christi	Good	Good	Good	Good
Dallas-Fort Worth	Ozone/PM2.5	Good	Good	Ozone
El Paso	PM2.5/PM10	PM2.5/PM10	Ozone	Ozone
Houston	Ozone/PM2.5	Ozone/PM2.5	Good	Ozone
Laredo	Good	Good	Good	Good
Lubbock	PM2.5/PM10	PM2.5/PM10	Good	Good
Midland-Odessa	Ozone	PM2.5/PM10	Good	Good
San Antonio	Ozone	Good	Good	Ozone
Tyler-Longview	Ozone/PM2.5	Good	Good	Good
Victoria	Good	Good	Good	Good
Waco-Killeen	Ozone	Good	Good	Ozone

An asterisk (*) indicates that an Ozone Action Day is or will be in effect for the indicated region.

A caret (^) indicates that levels of PM may exceed the applicable short-term NAAQS. For more information see the following TCEQ websites: [Air Pollution from Particulate Matter](#) and [Voluntary Tips for Citizens and Business to Reduce Emissions](#).

Additions to TRACER+; ESCAPE tailoring?

- What do we want from TRACER+ in support of ESCAPE?
 - Location and timing of convection relative to metro area, including uncertainty
 - Expected timing is especially crucial, since it determines start of flight ops
 - ESCAPE virtual team participation in TRACER+ forecasting provides an opportunity to look out for our interests
- Andrew will talk about the ESCAPE forecast tailoring that will be provided by the on-site forecasting team.
 - Tailored maps for AQ and convection, including gradients, near mobile radar ground sites and potential flight track areas
 - Pull EOL instrument status into ESCAPE forecast slides

Nowcast Coordination

For aircraft and ground operations

- Mechanisms
 - Catalog map is preferred for overlay of all platforms
 - Likely to have RadarScope and/or GR2 operating as well
 - Chat for comms with mission scientist on aircraft?
 - How to communicate with aircraft scientist before flights, since they will be a 20 min drive away?
 - Will any aircraft team members be present in hotel ops center?

