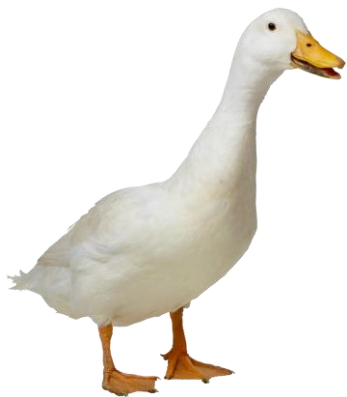
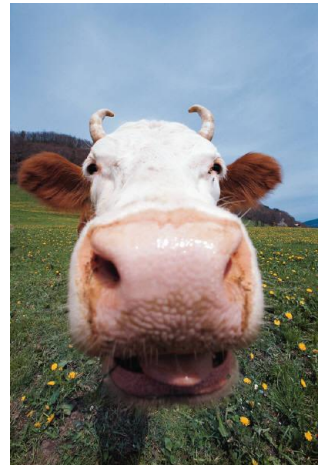


We need a  
**LOGO!!**  
(and mascot)



## Mesoscale Predictability Experiment (MPEX)



Science Aircraft Ops Field Catalog Data Archive Outreach



### What's New?

#### December 13-14 Planning Meeting Draft Agenda

#### Project Description

The Mesoscale Predictability Experiment (MPEX) will be conducted within the U.S. intermountain region and high plains during the late spring/early summer of 2013 and will include the use of the NCAR GV, along with the new Airborne Vertical Atmospheric Profiling System (AVAPS) dropsonde system and the Microwave Temperature Profiling (MTP) system for the field experiment which will take place during a 4-week time period from 15 May to 15 June 2013.

#### Scientific Objectives

MPEX is motivated by the basic question of whether experimental, sub-synoptic observations can extend convective-scale predictability and otherwise enhance skill in regional numerical weather prediction over a roughly 6 to 24 hour time span. The experimental plan is guided by the following two scientific hypotheses:

Hypothesis 1: Enhanced synoptic and sub-synoptic scale observations and their assimilation into convection-permitting models over the intermountain region during the early morning will significantly improve the forecast of the timing and location of convective initiation as well as convective morphology and evolution during the afternoon and evening to the lee of the mountains and over the High Plains.

Hypothesis 2: Enhanced sub-synoptic scale observations in the late afternoon, over regions where the atmosphere has been/is being convectively disturbed, will significantly improve the 6-24 hr forecast of convection evolution and perhaps initiation

#### Logistics

Logistics Information



Gulfstream V  
(Click Image for Full Resolution)

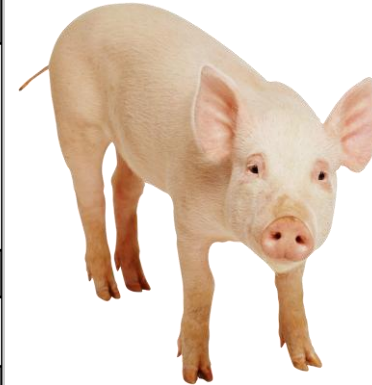
#### Meetings and Presentations

December 13-14 Planning Meeting Draft Agenda

#### Documents

- MPEX Proposal
- MPEX Facility Request
- Facility Assessment Table
- OFAP Cost Analysis
- OFAP Feasibility Analysis
- OFAP Response

#### Data Access



<http://www.eol.ucar.edu/projects/mpex/>

**MPEX Workshop : Dec. 13,14 2012  
(NCAR: FL1 EOL Atrium)**

**Thursday, Dec. 13:**

**1:00 PM:** Introduction: Morris Weisman

**1:10 PM** Upsonde Update: (Jeff Trapp)

**1:30 PM** Aircraft operations update: (Pavel Romashkin RAF)

**2:00 PM** Dropsonde Update: (Terry Hock)

**2:20 PM** PI presentations: (10 min each plus discussion)

Chris Davis/Julie Haggerty: "Mesoscale Analysis Using Microwave Temperature Profiler Data"

Glen Romine: "Realtime Analysis and Forecasts with DART"

Ryan Torn: "Real-time Sensitivity Analysis During MPEX"

**3:10 PM Coffee Break**

**3:30 PM** PI Presentations (cont.)

David Dowell/John Brown: “Near-Real-Time Dropsonde Data Assimilation and RAP-HRRR Forecasting”

Jenny Sun: “Impact of Dropsonde and MTP Data on Convective Initiation Using WRFVAR”

Jeff Trapp: “Upscale Impacts of Convection”

Charles Doswell III: “What are supercells for?”

Lance Bosart: “High Plains Convection: Diurnally Varying Mesoscale-Synoptic Scale Interactions over Complex Terrain during MPEX”

Russ Schumacher: MPEX soundings for the analysis and prediction of heavy precipitation

**4:45 PM Mission planning:**

- ....Case selection criteria
- ....Decision-making timeline
- .... Forecast process
- ....targeting strategies, etc.

Retrospective case #1

**6:00 PM** End for the day

**Friday, Dec. 14:**

**8:00 AM Bagels, cream cheese, pastries, etc.**

**8:15 AM Mission planning (cont.):** Retrospective cases #2, #3

**9:30 AM Personnel needs:** staffing, functions, etc.

**10:00 AM Coffee Break**

**10:30 AM Field Catalogue:** (Greg Stossmeister)

**10:50 AM Data and Information Management:** Project data policy, etc.  
(Steve Williams)

**11:10 AM Other observational opportunities:** NWS 18 UTC soundings,  
profilers, mesonets, ARM, etc.

**11:30 AM Education and Outreach**

**11:50 PM Timeline to Operations:** Operations Plan, etc.

**12:30 PM Workshop ends**

# Mesoscale Predictability Experiment (MPEX)

Morris Weisman (PI), Jeff Trapp, Chris Davis, Glen Romine (CO-PIs)

15 May – 15 June 2013

Dropsonde, MTP and d-value observations to better characterize the upstream sub-synoptic and mesoscale structure of the troposphere prior to convective outbreaks

10 IOP days:

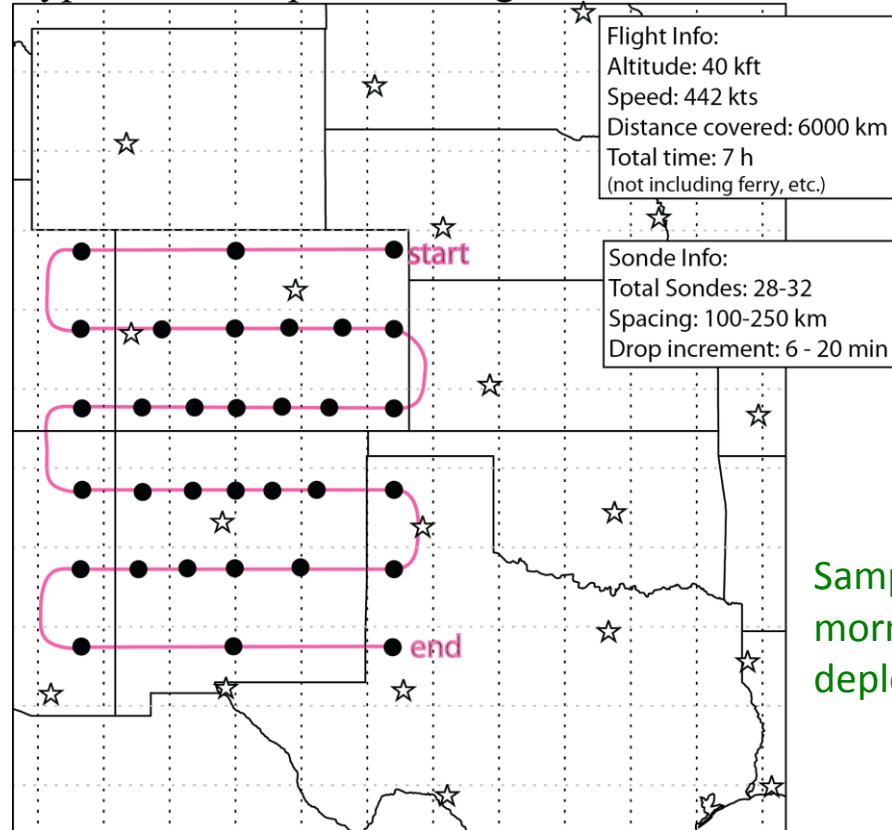
Early Morning GV Flights:

~0900 – 1500 UTC

~ 40 kft (28 kft acceptable)

Overall Goal: improve 6–24 h downstream convective forecasts

Type D-R: Dropsonde - Regional



Sample morning deployment...

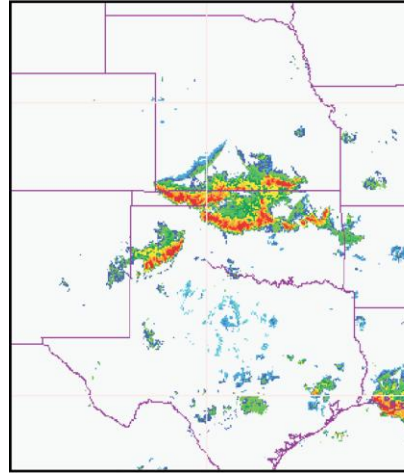
## Motivation:

Explicit convective forecasts are very sensitive to uncertainties in the initial state.....

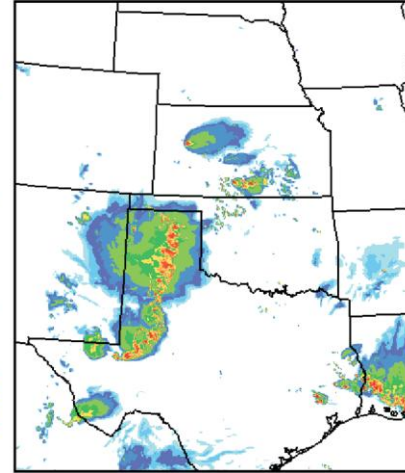
(On this day, GFS produces best forecast...)

20 June 2007 03 UTC

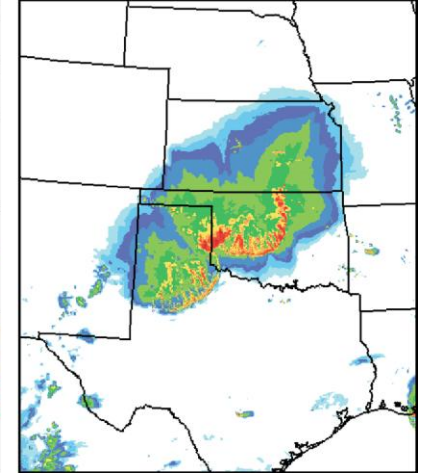
a) Observed Reflectivity



b) NAM analysis: 15 h Forecast

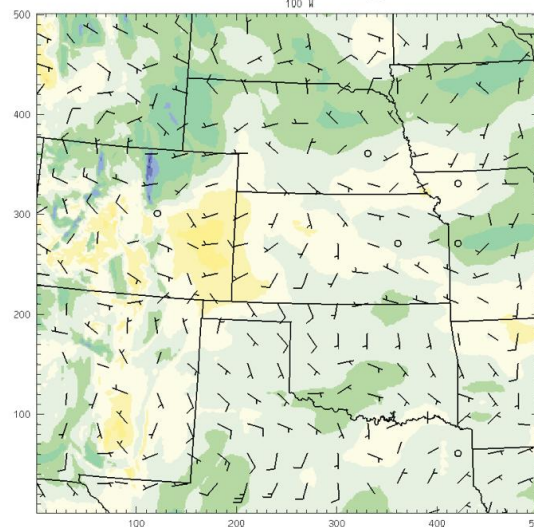


c) GFS analysis: 15 h Forecast

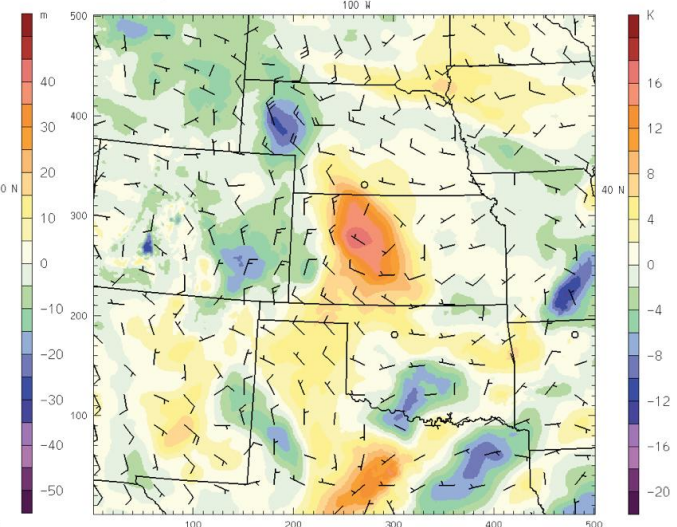


Analysis differences are often at scales not sufficiently represented by the operational network....

a) GFS-NAM 500 hPa heights

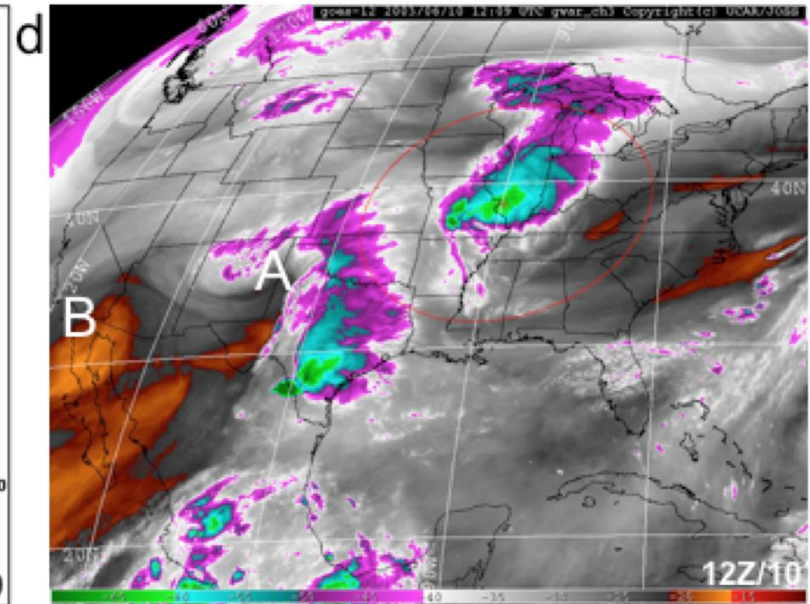
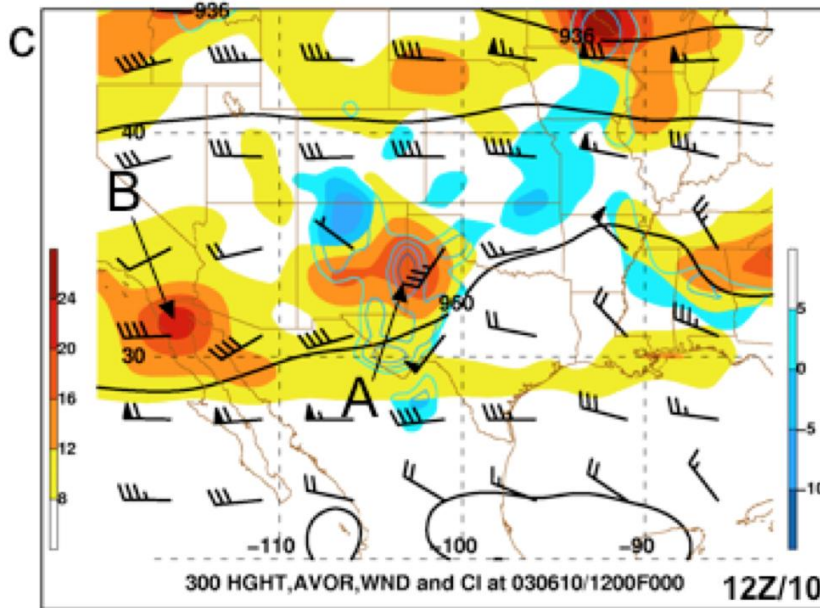


b) GFS-NAM 700 hPa  $\theta_e$



Wind, Theta-e, Height differences

On some days, upstream sub-synoptic features such as A,B are missed completely by the operational network, especially over the sparsely observed intermountain region...

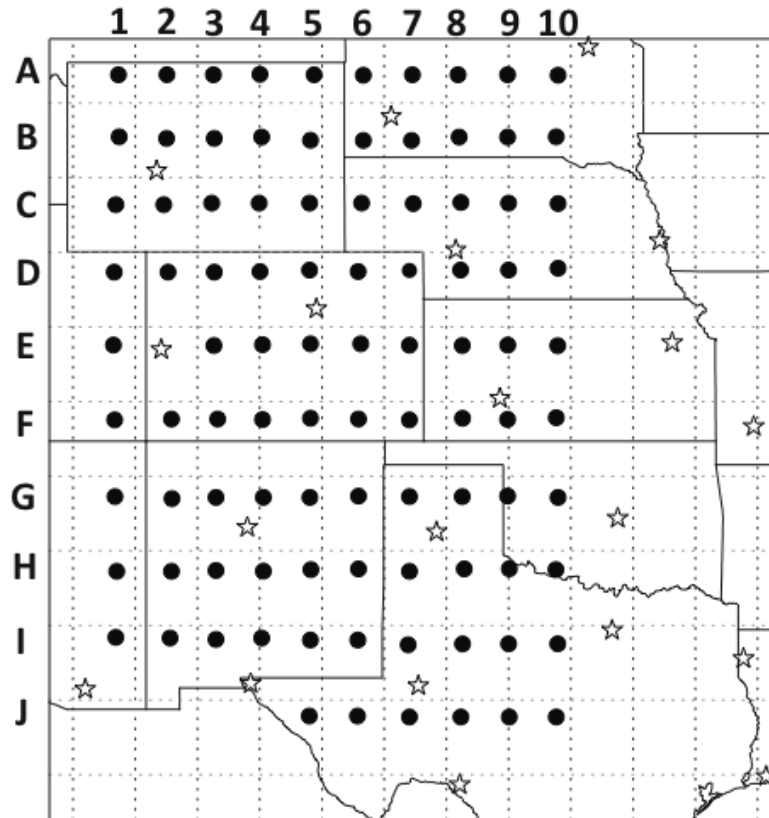


10 June 2003 12 UTC

**MCS A was missed by operational models**

# Drop sites each day will be chosen from a pre-vetted set.....

MPEX: Possible Morning Dropsonde Locations



When will we have to submit a flight plan?

How much flexibility will we have to modify that plan “on the fly”?

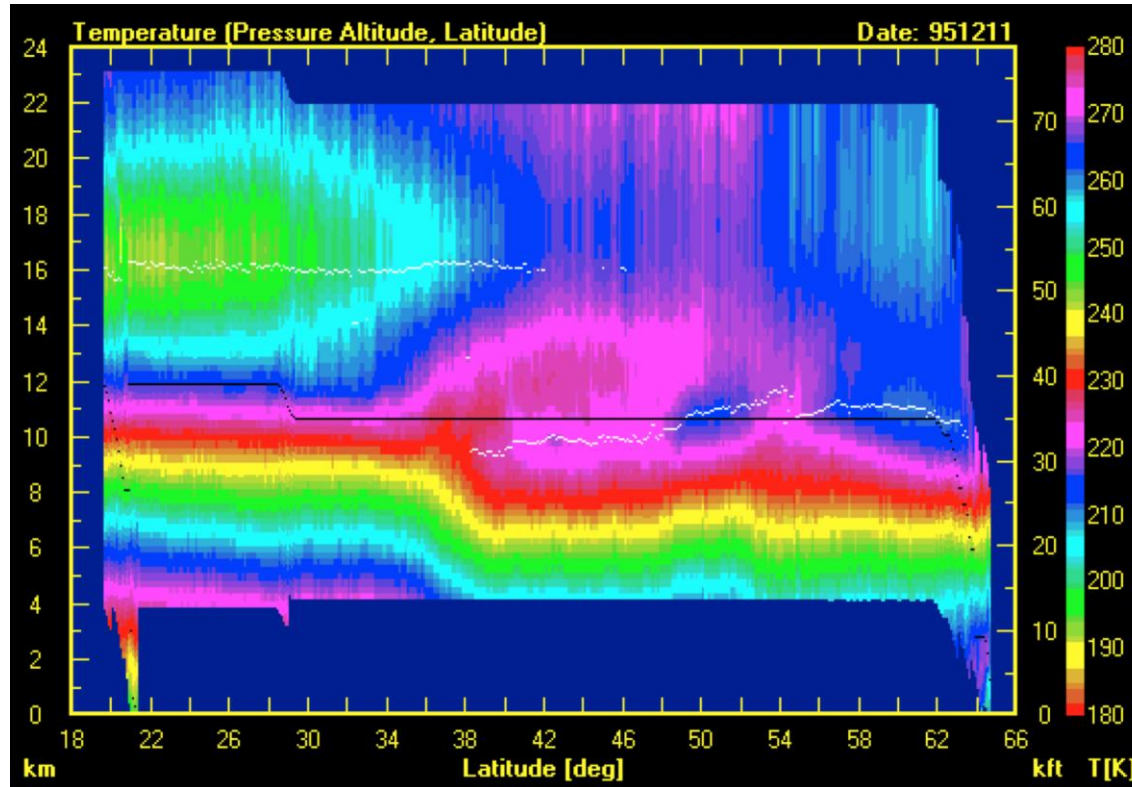
How many days in a row can we fly?

Is there any chance for 1 or 2 afternoon flights?

\*\*Still waiting for FAA Letter of “No Objection” ..... Also, 40,000 vs 28,000 ft.....



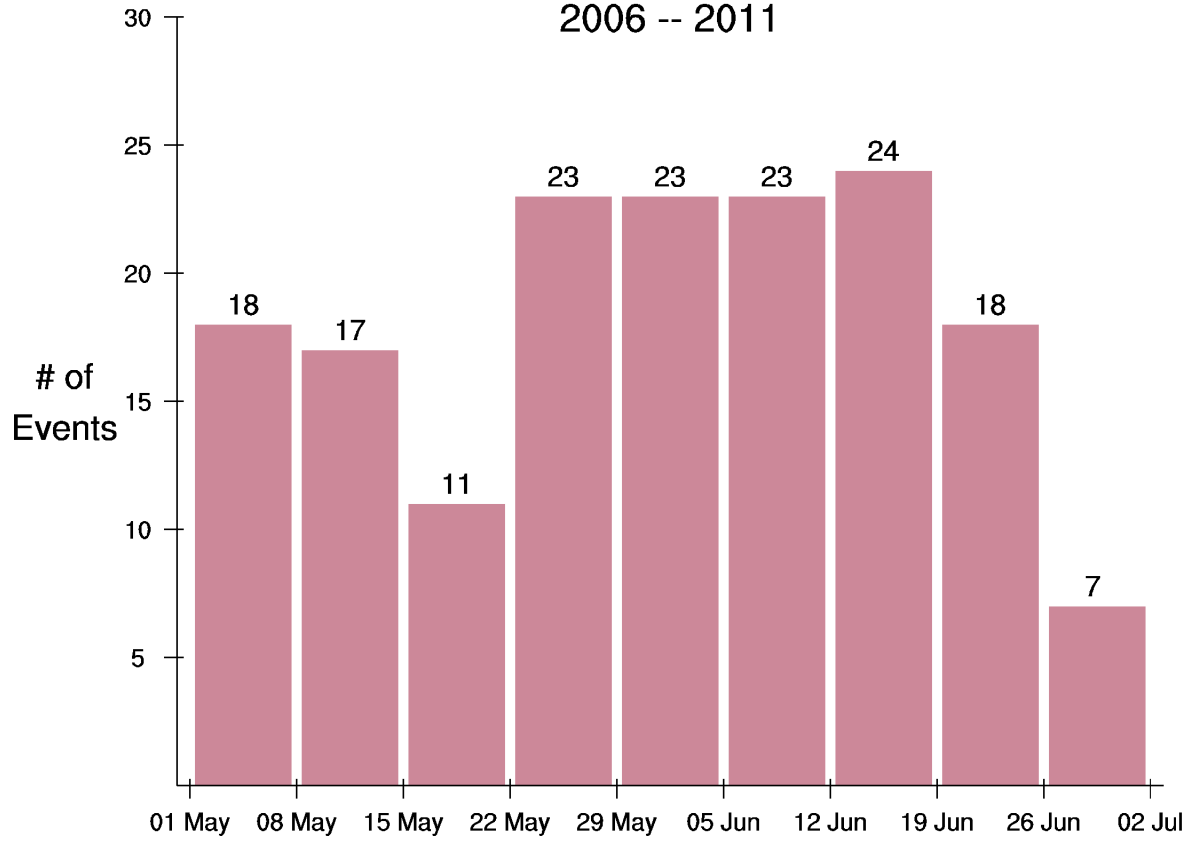
# Microwave Temperature Profiler (MTP)



\*Also D-value mapping: accurately maps height of a pressure surface

# Severe Events in MPEX Domain

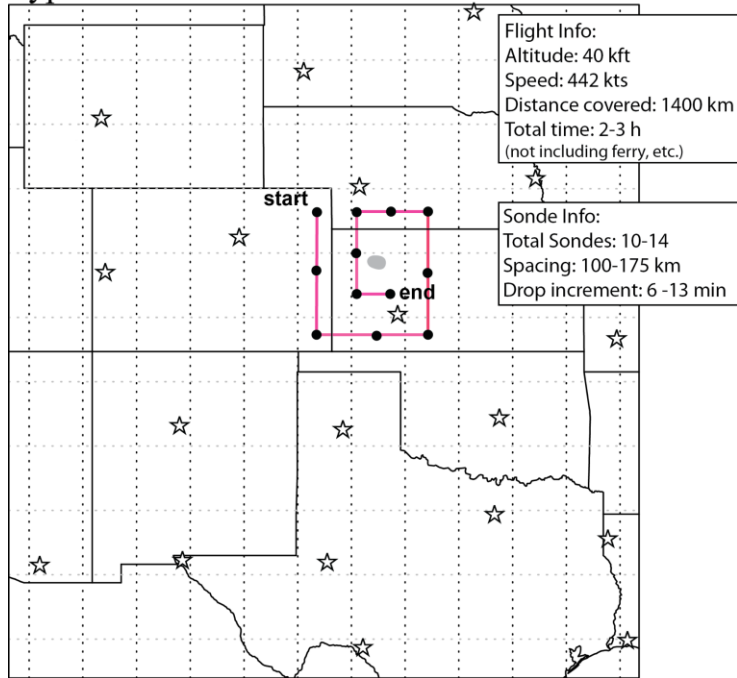
2006 -- 2011



# Afternoon Upsonde Observations:

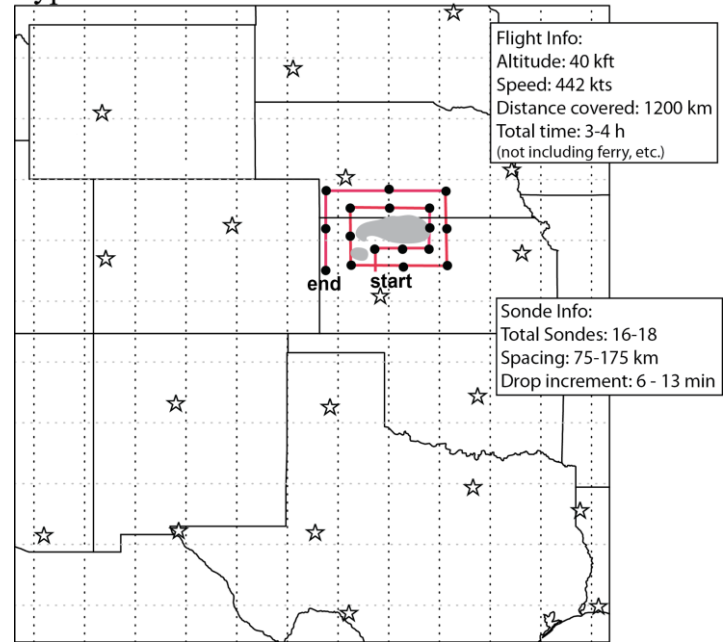
Re-sample pre-convective environment:

Type C-A: Convective



Sample post-convective impacts:

Type C-B: Convective

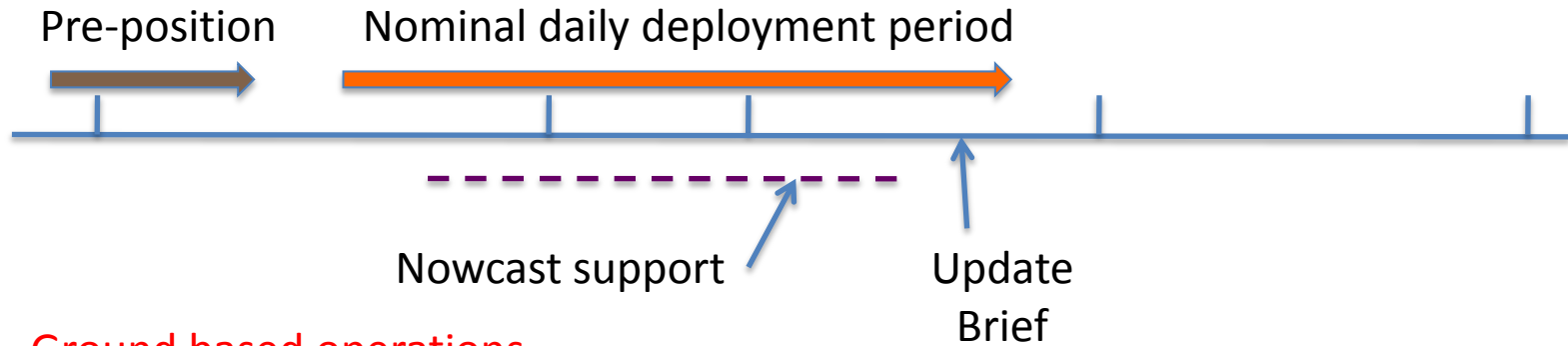
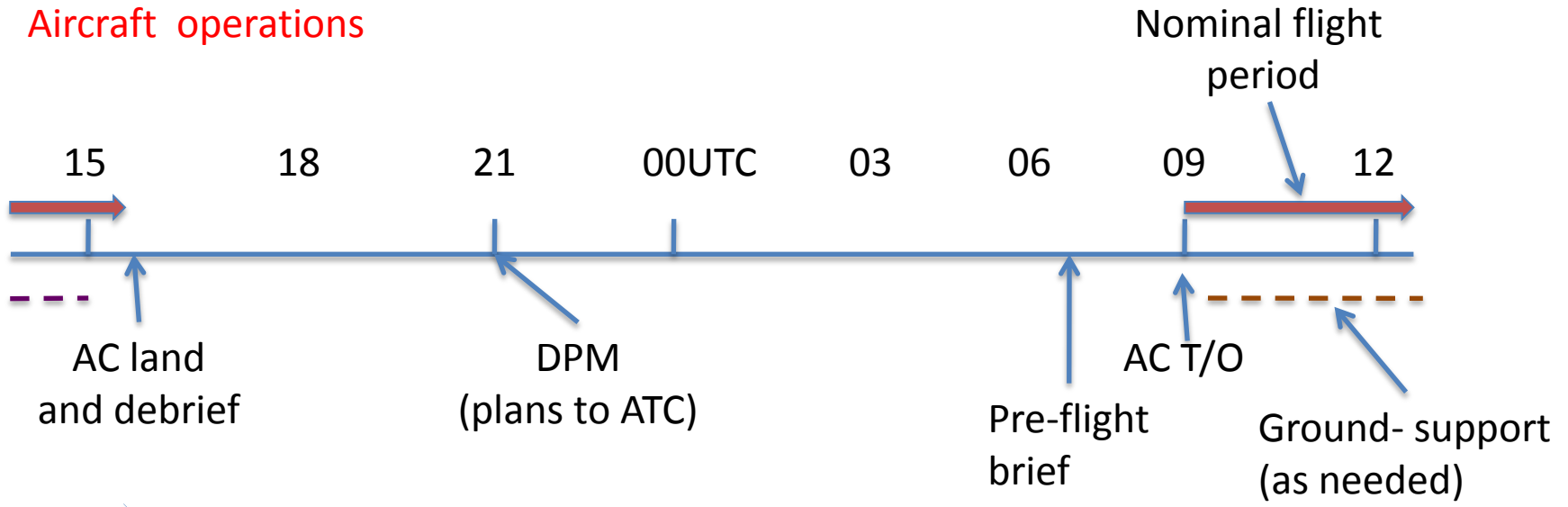


## Draft Decision-making Timeline:

- 8:00 am – 9:00 am: Final decision for upsonde deployment
- 9:00 am- 10:00 am: Flight lands from previous mission (debriefing?)
- 11:00 pm – 3:00 pm: Forecasting for next day's mission
- 3:00 pm – 4:00 pm: Briefing, go/no-go decision for next flight  
(depending on when flight plans need to  
be submitted, pilots informed, etc.)
- 12:00 am – 1:00 am: Forecast/dropsonde update for current mission
- 1:00 am – 1:30 am: Pilot briefing
- 3:00 am: Take-off

# MPEX Daily Operations Planning/Deployment Timeline

## Aircraft operations



## Ground based operations

## Case Selection Criteria:

....Significant convection being forecast within MPEX region during the afternoon or overnight (perhaps more isolated and/or supercellular for upsonde operations?)

....Forcing for convection tied to mid-to-upper-level “feature” propagating in from southwest-northwest

...Uncertainty noted in model/human guidance

## Targeting Strategies:

**Priority 1:** good regional coverage (since we really don't know what we are looking for)

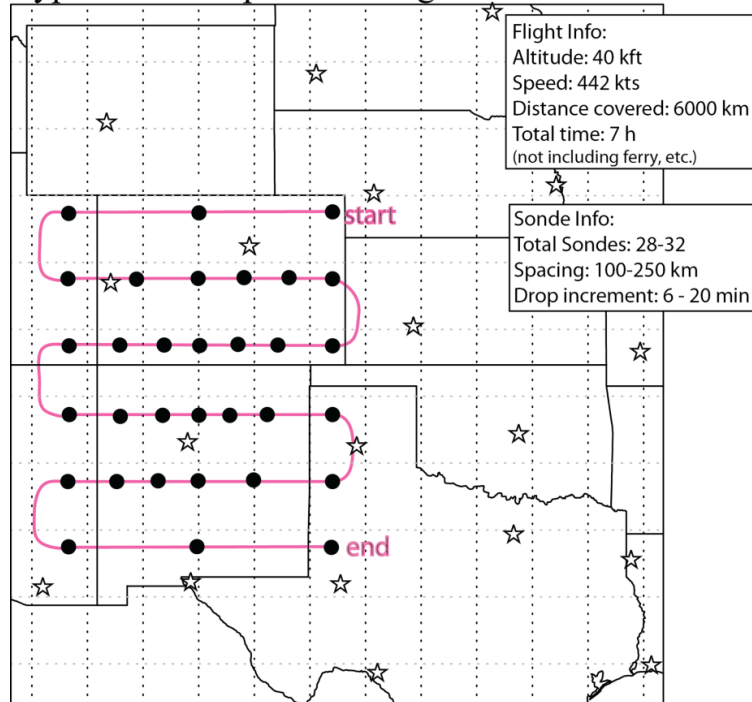
**Priority 2:** enhanced coverage on specific features, based on....

- ....model-suggested “sensitive” regions
- .... features evident from satellite
- ....features observed during flight
- .... general intuition

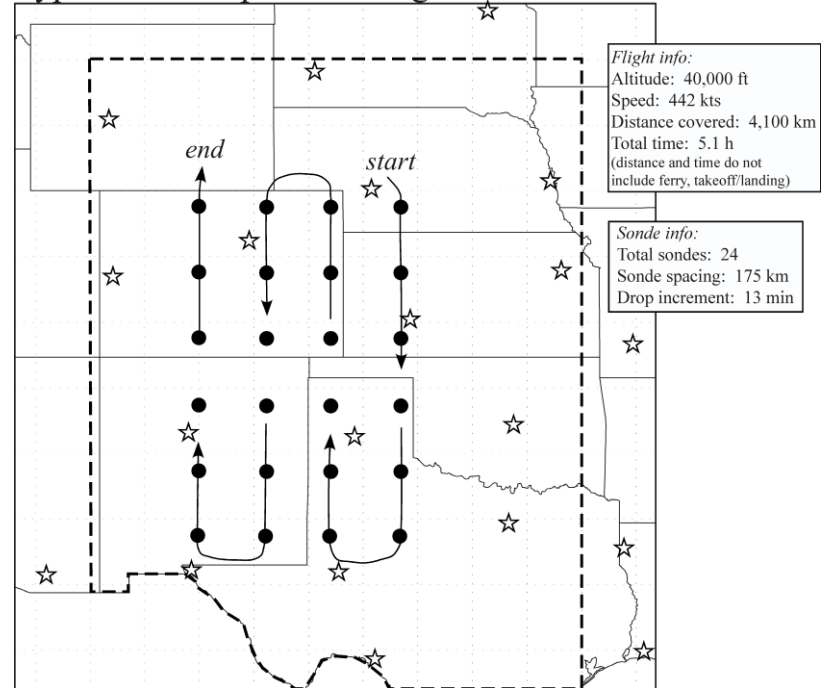
# Possible Flight Strategies:

- .... East-to west legs (good X-section across mountains)
- ....North-south legs, beginning on the east side
  - ... expands effective observational domain westward
  - ....minimizes potential FAA conflicts along the Front Range)
- ....North-south legs, beginning on the west side, etc.

Type D-R: Dropsonde - Regional



Type D-R: Dropsonde - Regional



## Staffing needs:

Operations Directors: daytime/nighttime

Mission Scientists: daytime/nighttime

Mission Antagonist: 24 h duty cycle

Forecasting team: dropsonde operations, upsonde operations

Nowcasting: support aircraft ops (~1:00 am – 10:00 am)

Dropsonde quality control (realtime): 2 people?

Upsonde crews...



## Scientific Issues/challenges/concerns:

- ...dealing with asynchronous observations
- ...tuning assimilation systems to “accept” higher resolution observations
- ....separating out mountain-wave type signals
- ....Identifying the critical upstream regions (upstream for upper-level features is not necessarily upstream for lower-level features, etc.)

## Logistical Issues:

- ...getting “sufficient” resolution (e.g., is 75, 150 km sufficient?)
- ...MTP limited to mid-to-upper troposphere: e.g., won’t sample the CAP, etc.
- ...Obtaining sufficient observations east of the mountains  
(18 UTC NWS soundings, ARM site, Profilers, surface mesonets etc.?)
- ...coordination with upsonde teams
- ...multiday operations?

## Summary/Action items:

...FAA Approval.... mid Feb.....can we fly...where

....no afternoon drops but MTP ?

...working groups: forecasting and modeling

....need to know who/when/what

....order sondes (?) and helium

....continue retro studies

....ECMWF

....Ops Plan.... April 1

## Summary/Action items: (cont)

Field Catalogue working group

Training for quality control

Ops center (AWIPS?)

Realtime model forecasts May 1

May 10... Formal briefing

May 15.....it all begins

Meetings: updates