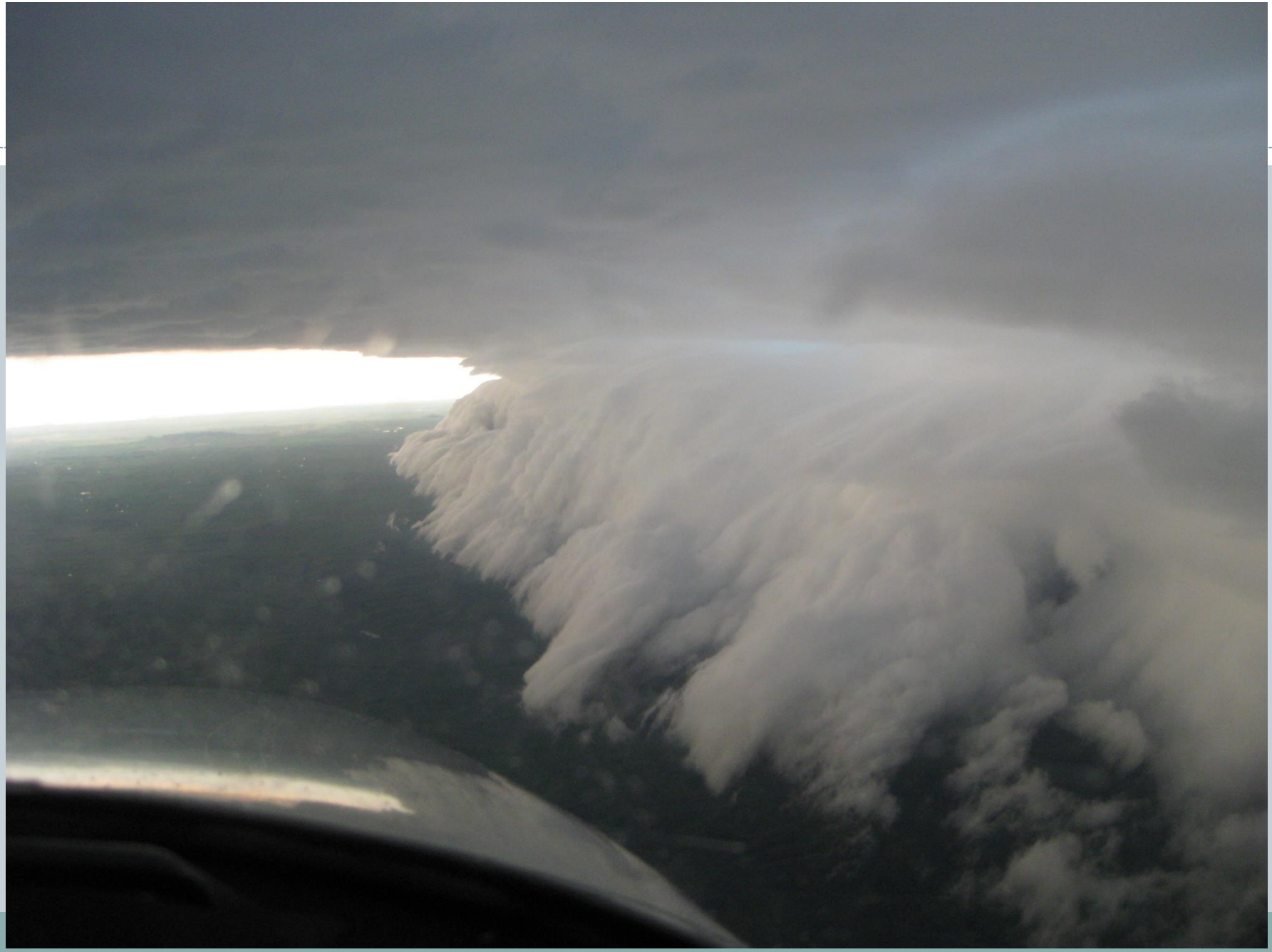
Weather Modification & Research

BY: JONATHAN SEPULVEDA

About Me

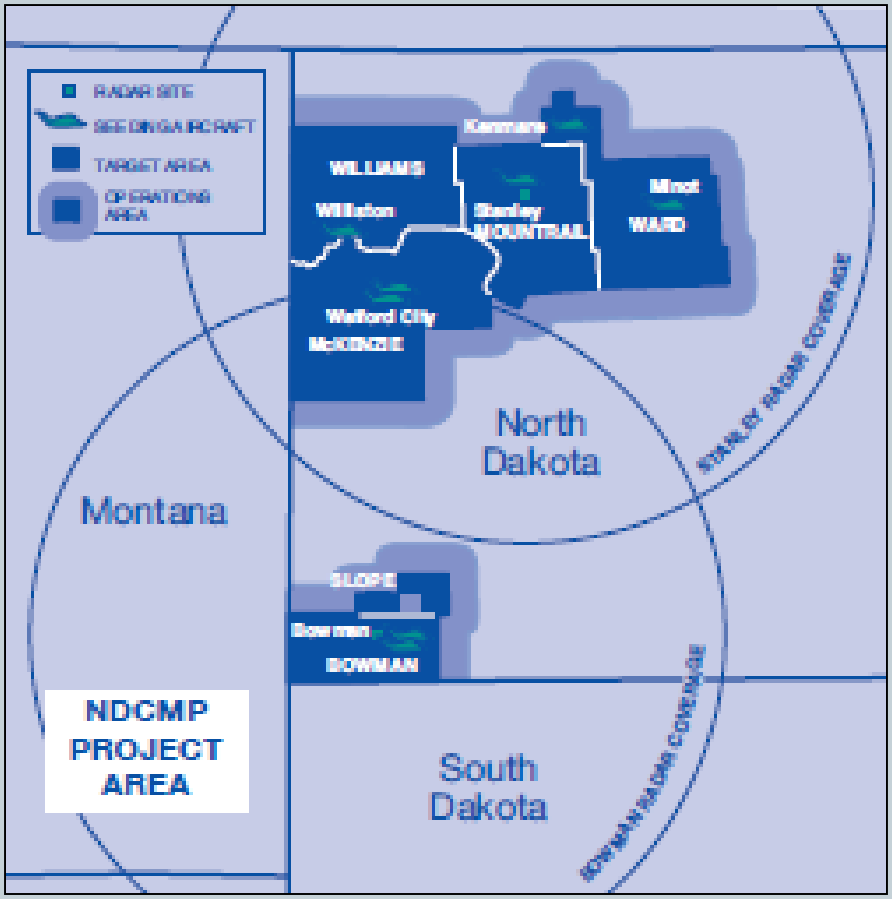
- Always been around aviation
- Started flying in 2001
- Graduated from UND 2010
  - Major: Commercial Aviation
  - Minor: Atmospheric Sciences
- Worked in many different aviation sectors
- Currently ERJ 175 Captain for SkyWest Airlines

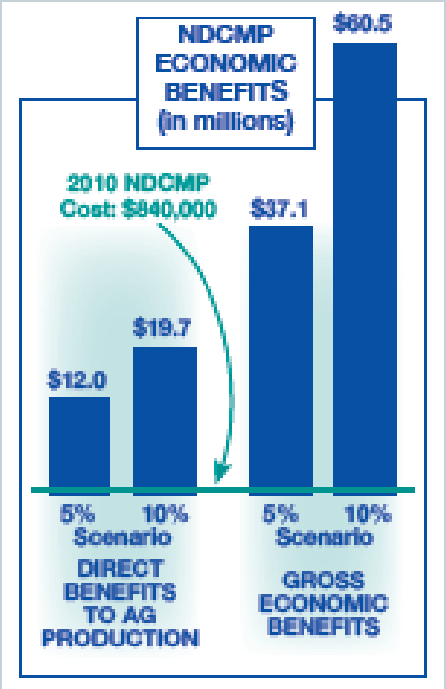
Weather



WX Mod. – Summer 2010

- North Dakota Cloud Modification Project (NDCMP)





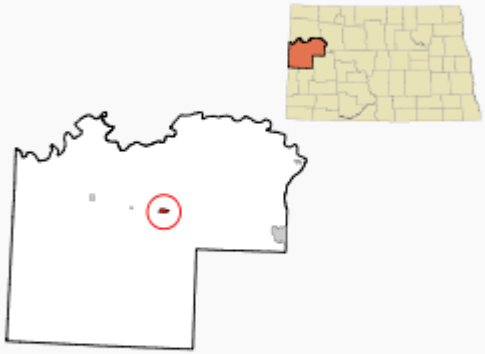
Weather Mod Training

Watford City

Watford City, North Dakota

— City —

Motto: "Come be our guest"

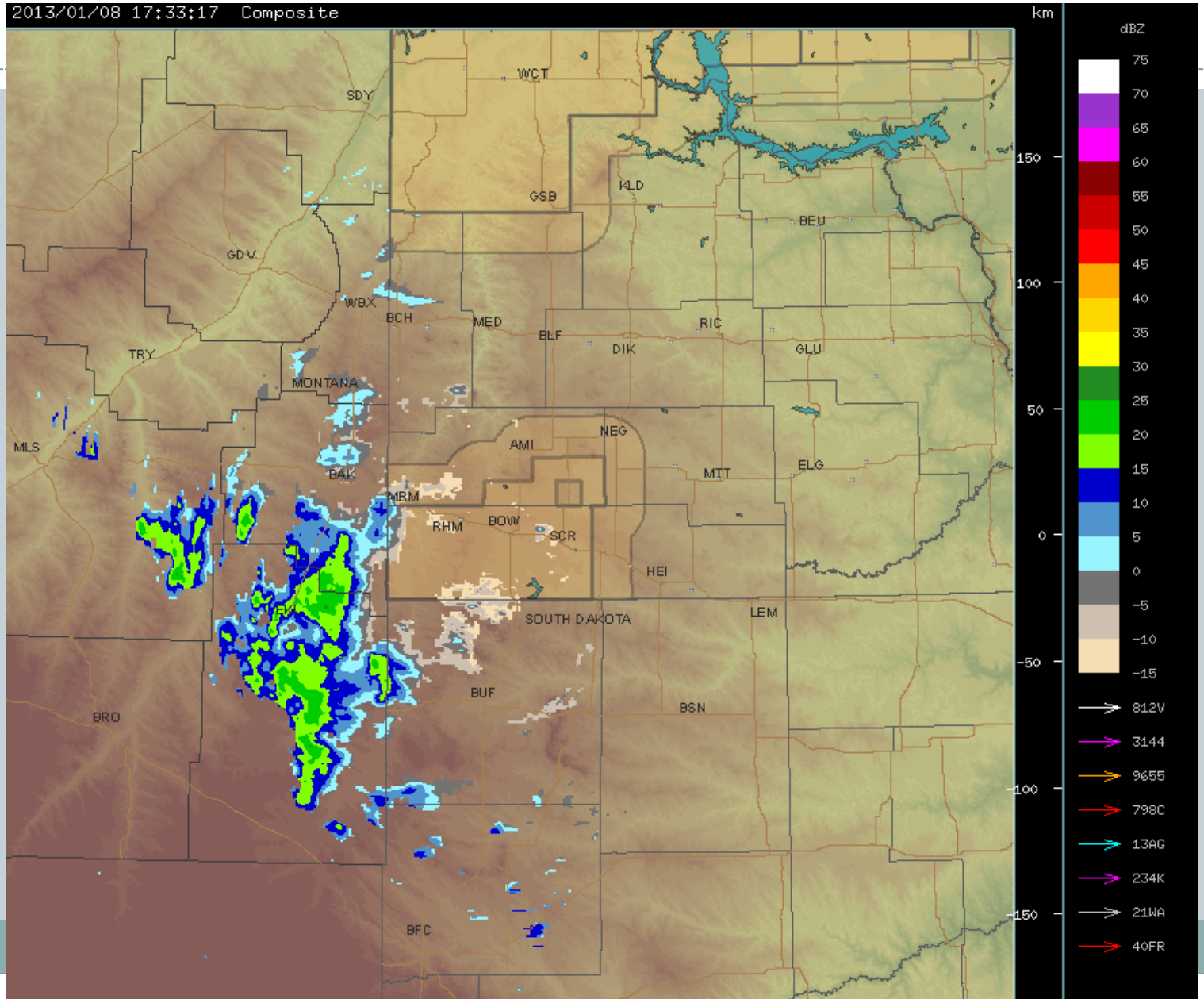


Location in North Dakota

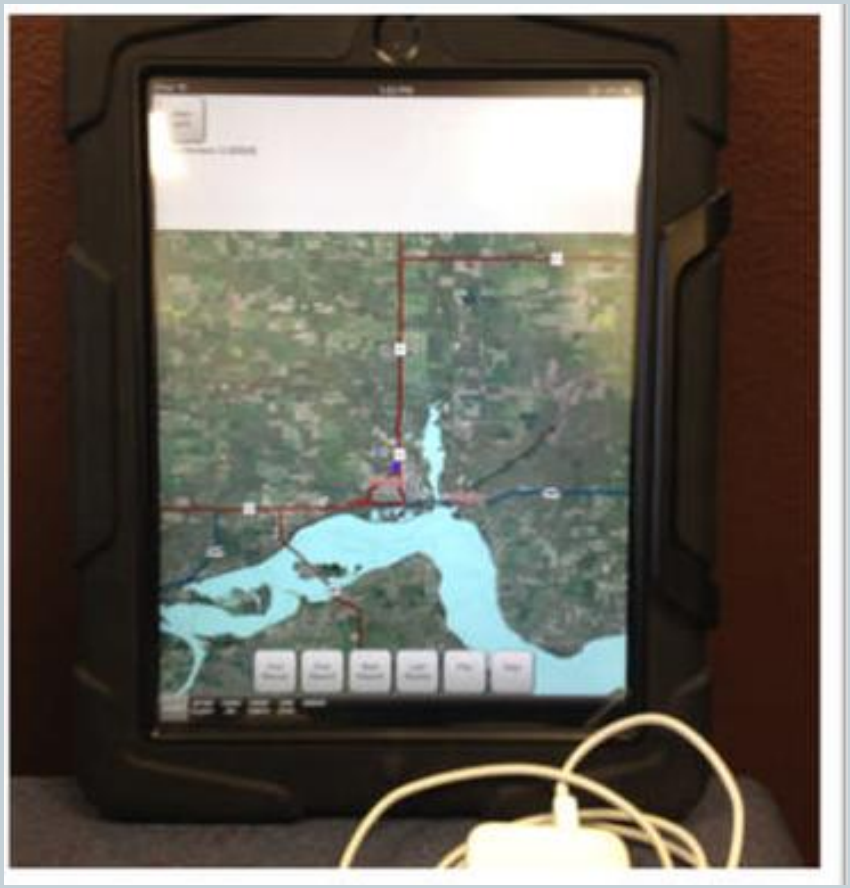
Coordinates: 47°48'9"N 103°16'50"W

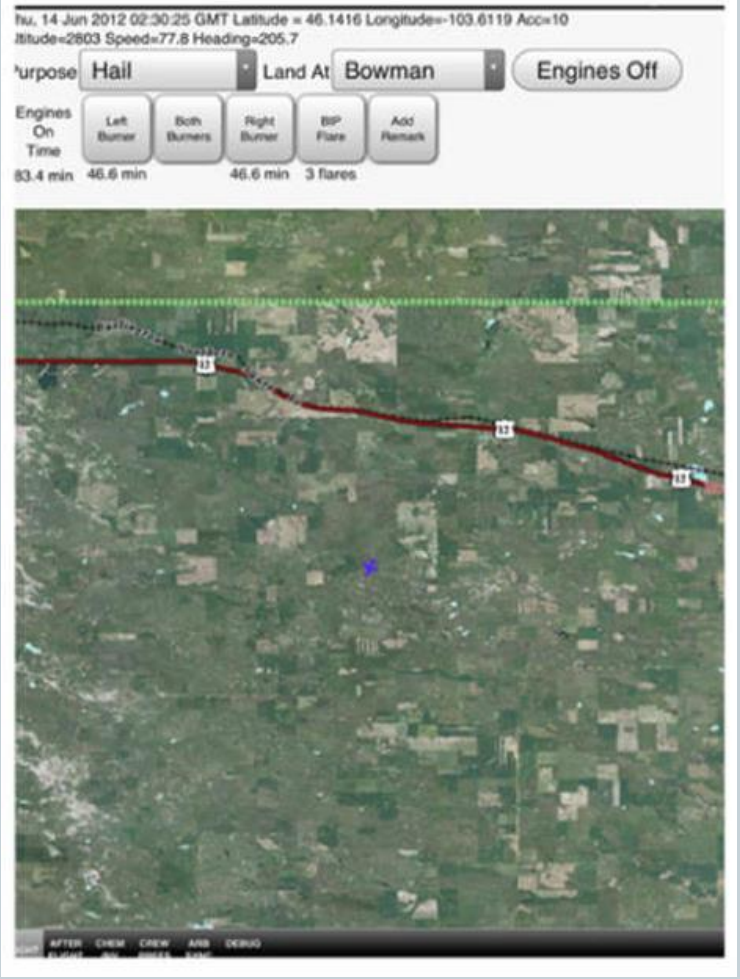
Country	United States
State	North Dakota
County	McKenzie
Founded	
Incorporated	1914
Government	
- Mayor	Kent Pelton
Area	
- Total	1.5 sq mi (1.5 km^2)
- Land	1.5 sq mi (3.9 km^2)
- Water	0 sq mi (0 km^2)
Elevation	2,119 ft (646 m)
Population (2000)	
- Total	1,435
- Density	964.8/sq mi (371.9/km^2)
Time zone	CST (UTC-6)
- Summer (DST)	CDT (UTC-5)
ZIP code	58854
Area code(s)	701
FIPS code	38-83860[1]
GNIS feature ID	1032701[2]
Highways	US 85, ND 23, ND 23 Alt.

Bowman RADAR

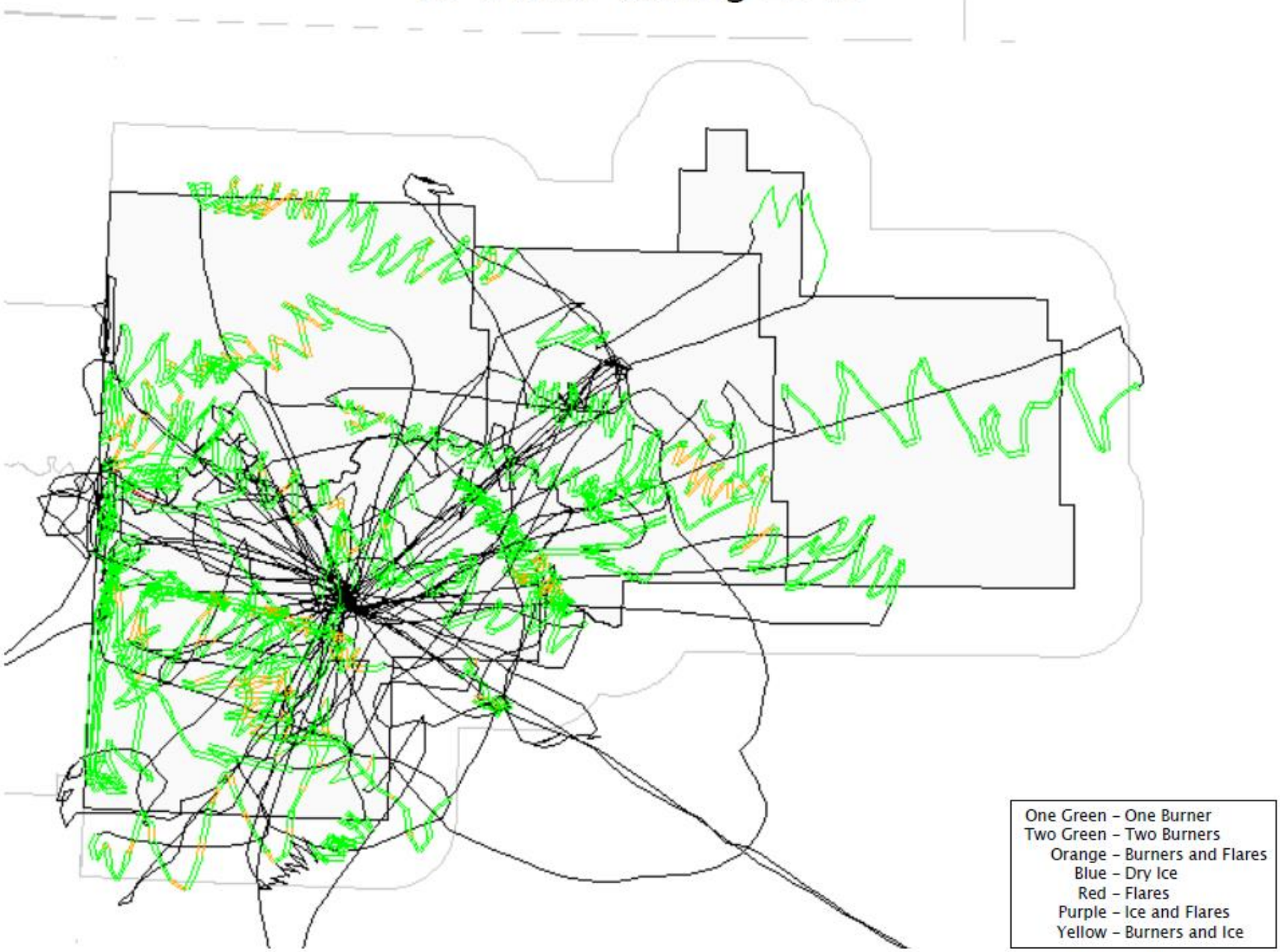


Palm Aircraft Recordkeeping System (PARS)

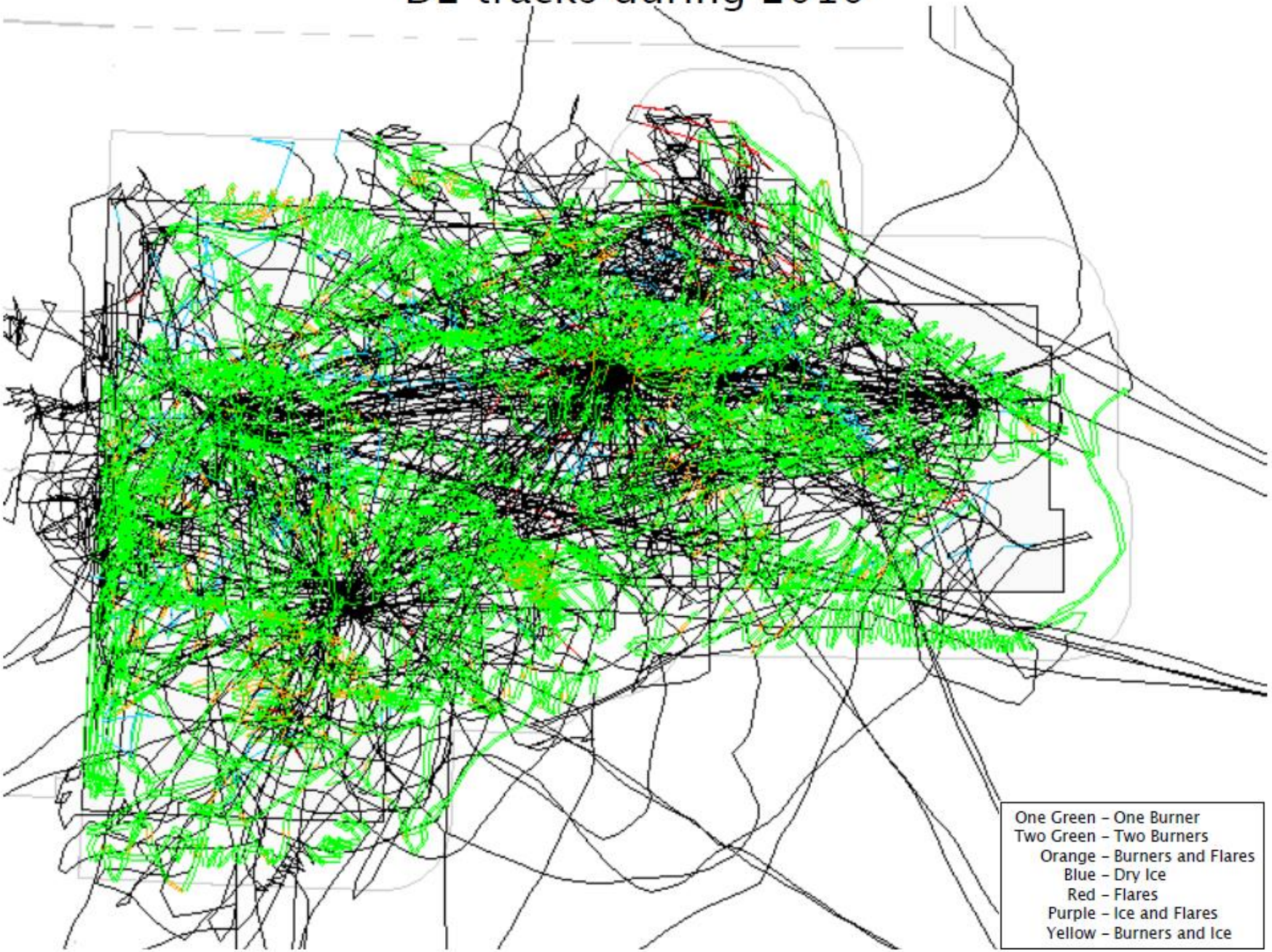




S5 tracks during 2010



D2 tracks during 2010



Daily WX Mod

- Pre-flight aircraft
- Weather Brief at Noon
- Plan day
- Possibly fly
- Mix Chemical

NDCMP Weather Forecast

	District 1		District 2	
Transition (UTC)	0		0	
	First	Second	First	Second
Forecasted Weather	NO SIG	HAIL	NO SIG	HAIL
Confidence Factor	8	7	8	9

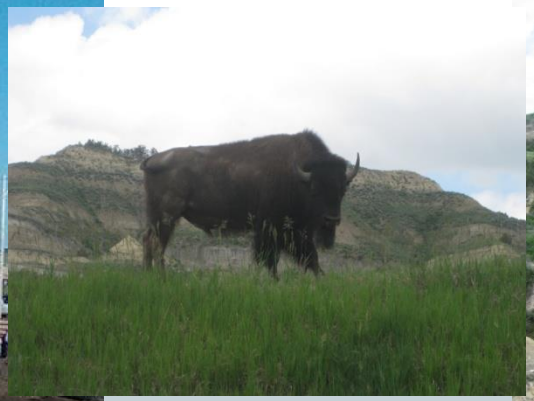
Forecaster: Daniel Brothers

Synopsis

A capped environment should keep any convection suppressed throughout much of the afternoon as W ND heats up. A shortwave in W MT this morning is going to migrate E and should help provide forcing for storms to develop in the vicinity of a cold front that will be moving through E MT and W ND this evening. Convection could start to occur around 00Z, which would put it near the MT/ND border. Instability and forcing are a little better for DII, and combined with the fact that DI is smaller results in a lower confidence for DI. No obvious forcing exists for tomorrow, but a broad upper level trough is creeping eastward and the overall pattern, combined with plenty of moisture suggests that there could be chances every day for the forseeable future.

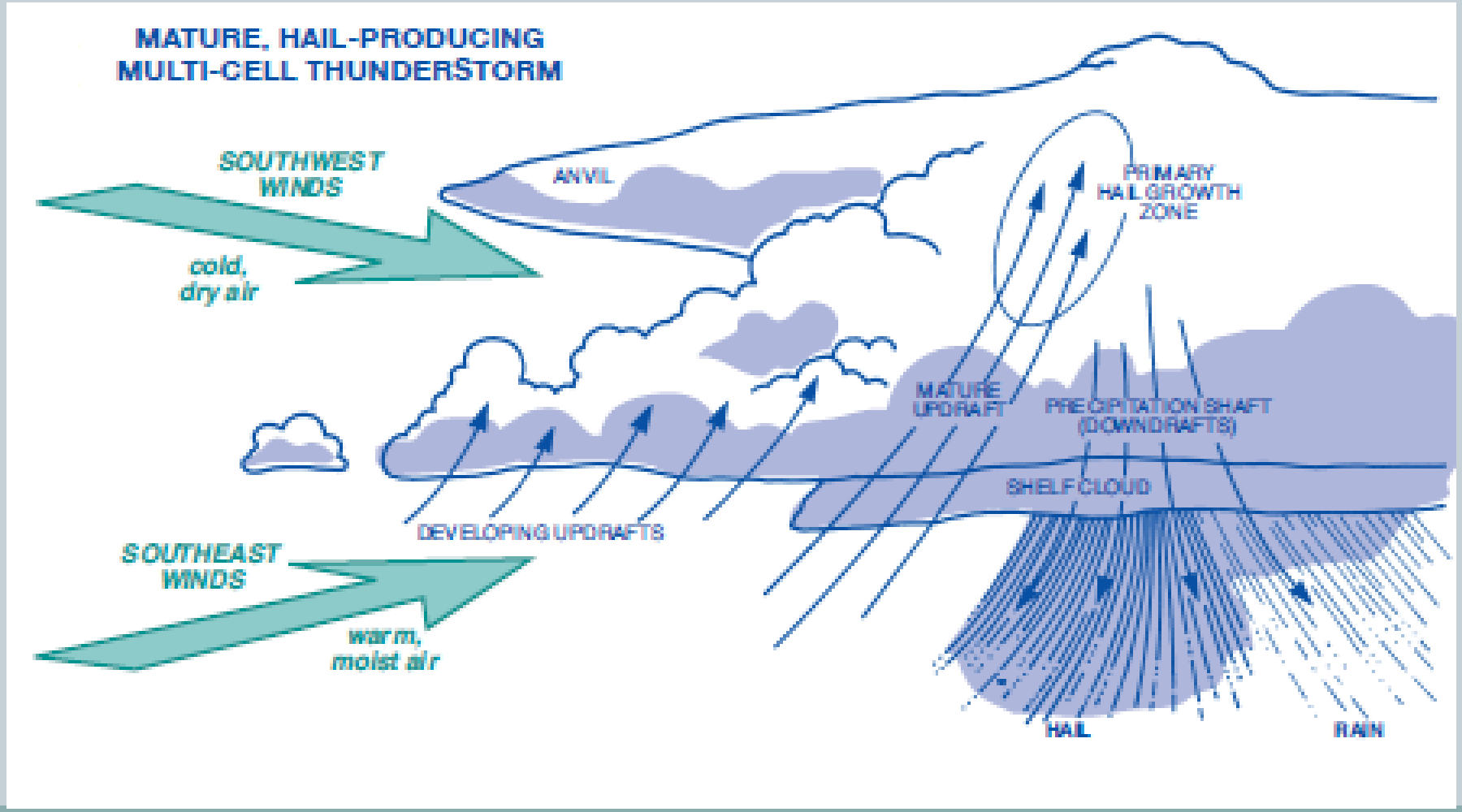
7/2/10

WX Mod. – NO SIG



Base Seeding Equipment

WX Mod – Missions



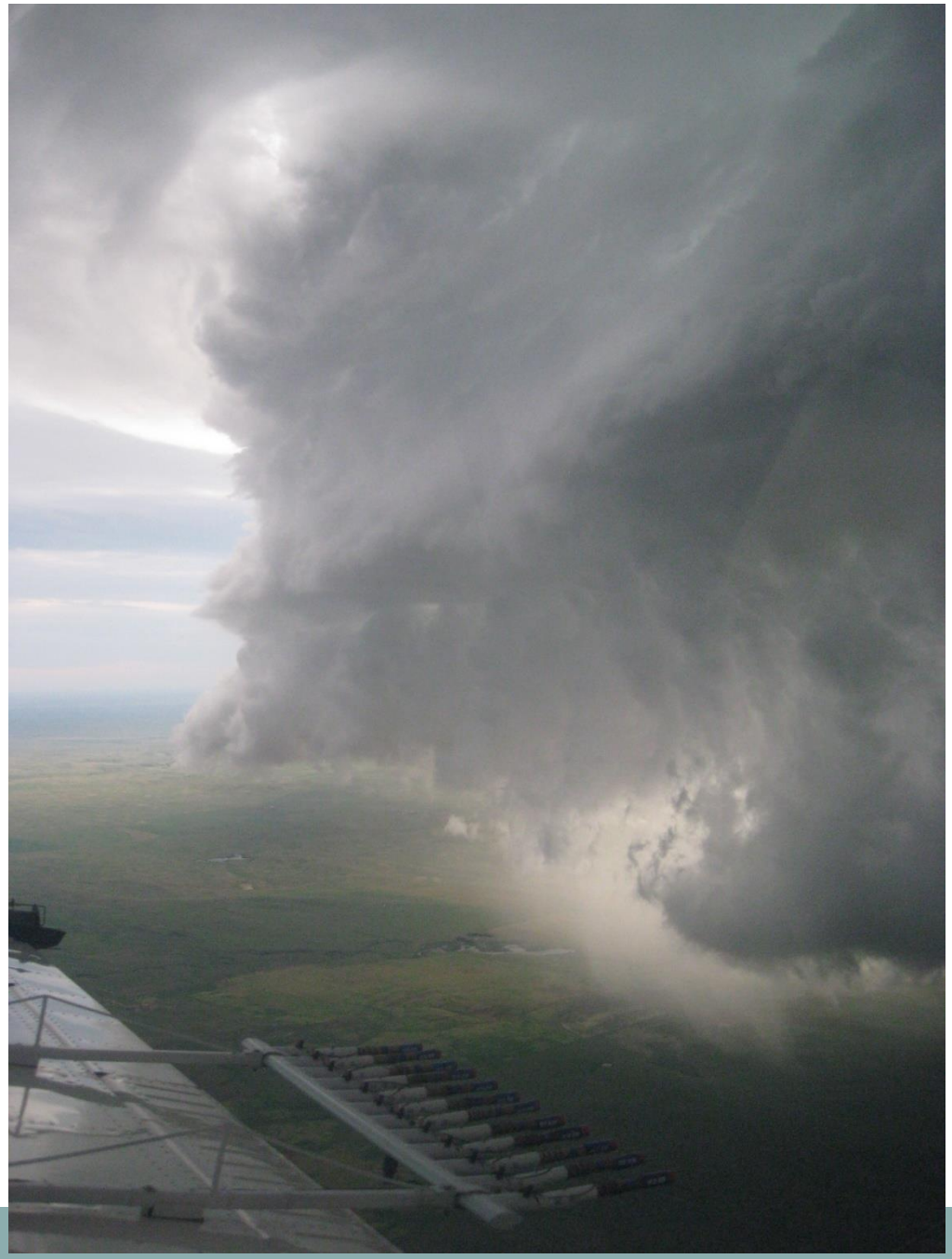
Base Seeding

FLYING UNDER THE DEVELOPING STORM

Base Seeding Aircraft

Piper Seneca

Cessna 340



Top Seeding

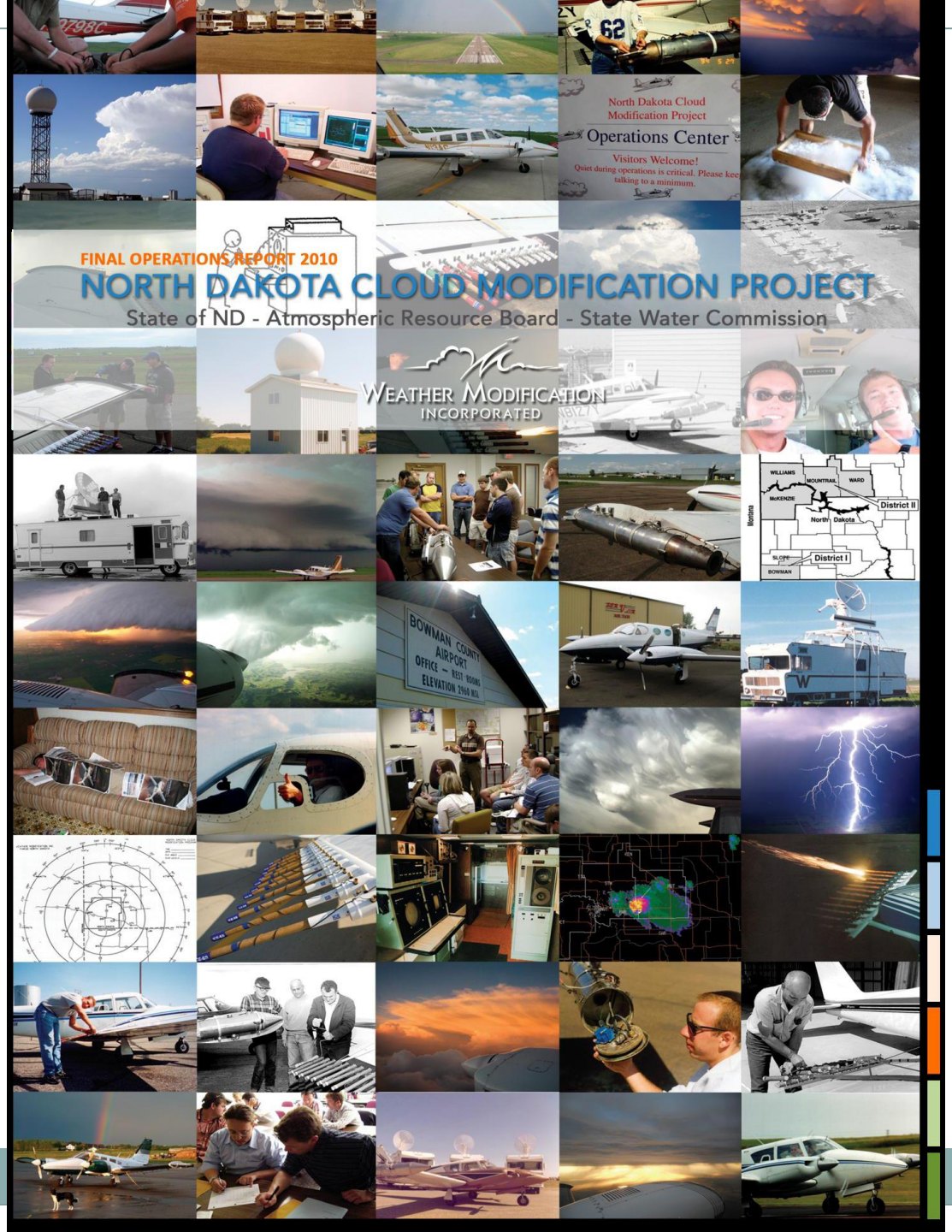
FLYING THROUGH THE DEVELOPING STORM

Top Seeding Aircraft

Piper Cheyenne

Top Seeding Equipment


N-234K


North Dakota Cloud
Modification Project
Operations Center
Visitors Welcome!
Quiet during operations is critical. Please keep
talking to a minimum.
FINAL OPERATIONS REPORT 2010
NORTH DAKOTA CLOUD MODIFICATION PROJECT
State of ND - Atmospheric Resource Board - State Water Commission
WEATHER MODIFICATION
INCORPORATED
WILLIAMS
MOUNTRAIL
WARD
McKENZIE
District II
North Dakota
Montana
SLOPE
BOWMAN
District I
BOWMAN COUNTY
AIRPORT
OFFICE
ELEVATION 2940 MSL

NDCMP

Pilot Internship Program

Duties

The Pilot Internship Program (PIP) includes the following areas of involvement and responsibility:

- Duties of a regular crew member, both on the ground and in the air
- Record keeping of all seeding events, times, and chemical expended
- Maintenance of seeding equipment and materials
- General aircraft maintenance
- Conduct of seeding missions according to project guidelines
- Visual surveillance of the weather
- Representing the project to the public
- Other duties as required to meet project objectives

Requirements

Selection criteria for the PIP includes:

- Ratings: must have multi-engine commercial instrument rating completed by April 30.
- Motivation: class attendance, extra credit work, and overall enthusiasm for fieldwork.
- GPA: Must complete two semesters of classes (AtSc 250 and AtSc 251).
- Flight hours: total and multi-engine time.
- Related work experience.
- Successful completion of an interview.
- Attendance at Ground School.

Benefits

- Pay is $11 per hour.
- You will gain valuable experience flying in inclement weather, multi-engine piston and multi-engine turbo-prop flight hours.
- You will have a chance to hone your flying, decision-making, teamwork, communication, and public relations skills.
- Nine intern co-pilots are selected each summer.
- We provide help finding housing.

Need to Know?

The NDCMP is a 24/7 project for 92 days, or longer, and ongoing communications are vital. However, we understand our interns need to leave the project early to return to school. You determine your last day of work on the project.

Each intern is assigned a Supervisor/Mentor who offers guidance, inside information, encouragement and general counsel. An "always-available" policy gives you access to individuals at any time day or night for answers to questions, to accept feedback, and help with project objectives.

Getting Started?

Be sure to sign up for AtSc 250 Introduction to Weather Modification (fall) and AtSc 251 Advanced Weather Modification (spring) classes.

If you have questions, please contact Kelli Schroeder with the ND Atmospheric Resource Board at 701-328-2789 or *kjschroe@nd.gov*.

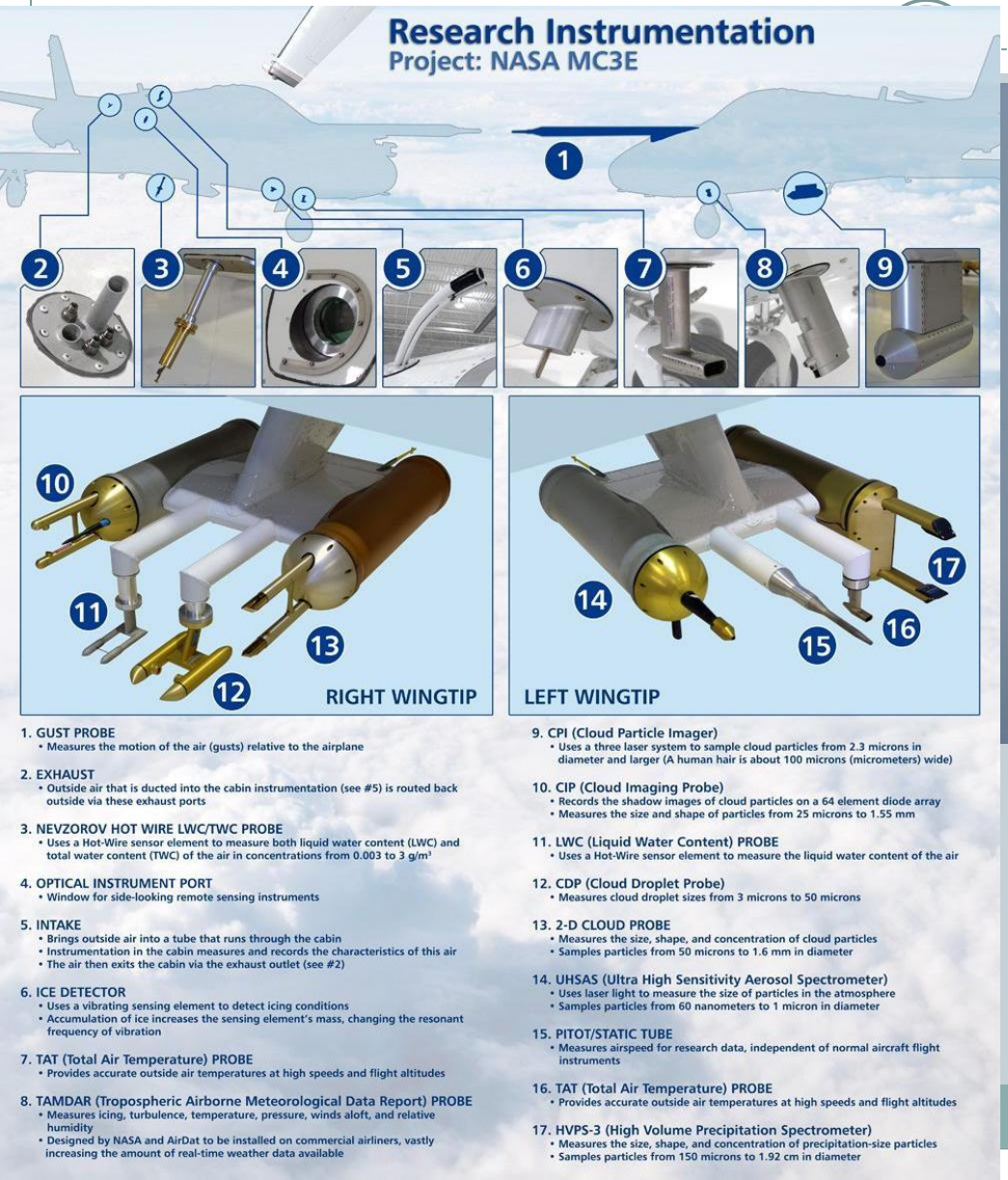
For more information about the North Dakota Cloud Modification Project, direct your web browser to *www.swc.nd.gov/arb* and click on ND Cloud Modification Project.

Research Captain and Instrument Tech.

Weather Cessna Citation II

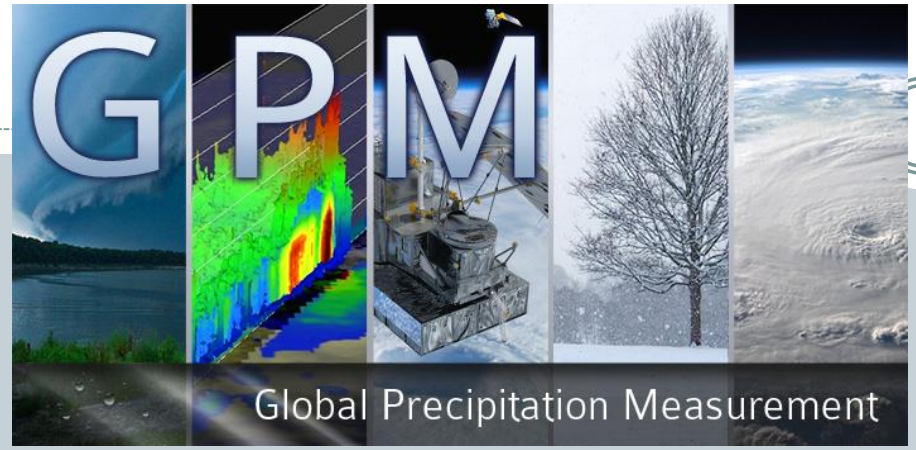
Interior

Instrumentation

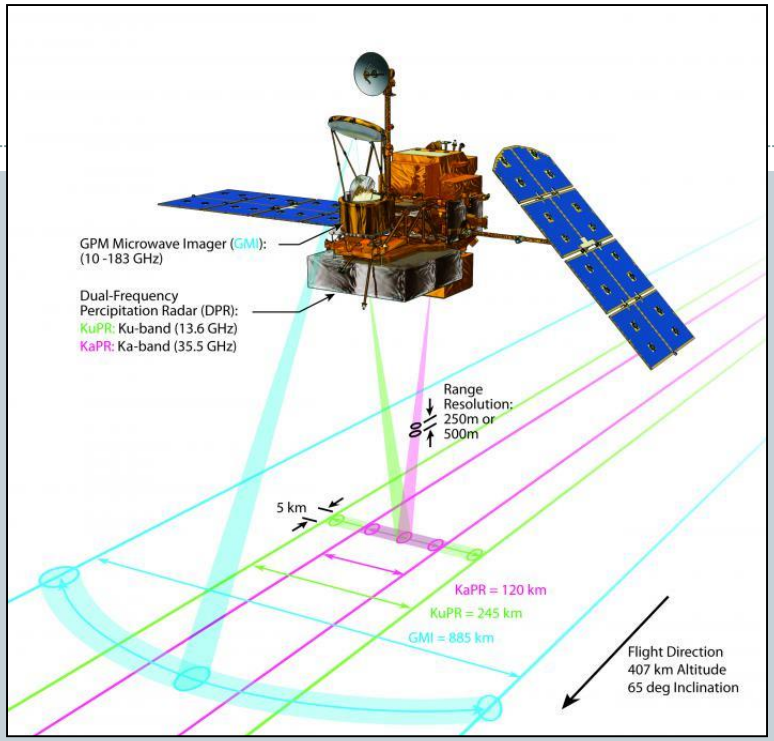


Icing Research

Thunderstorms



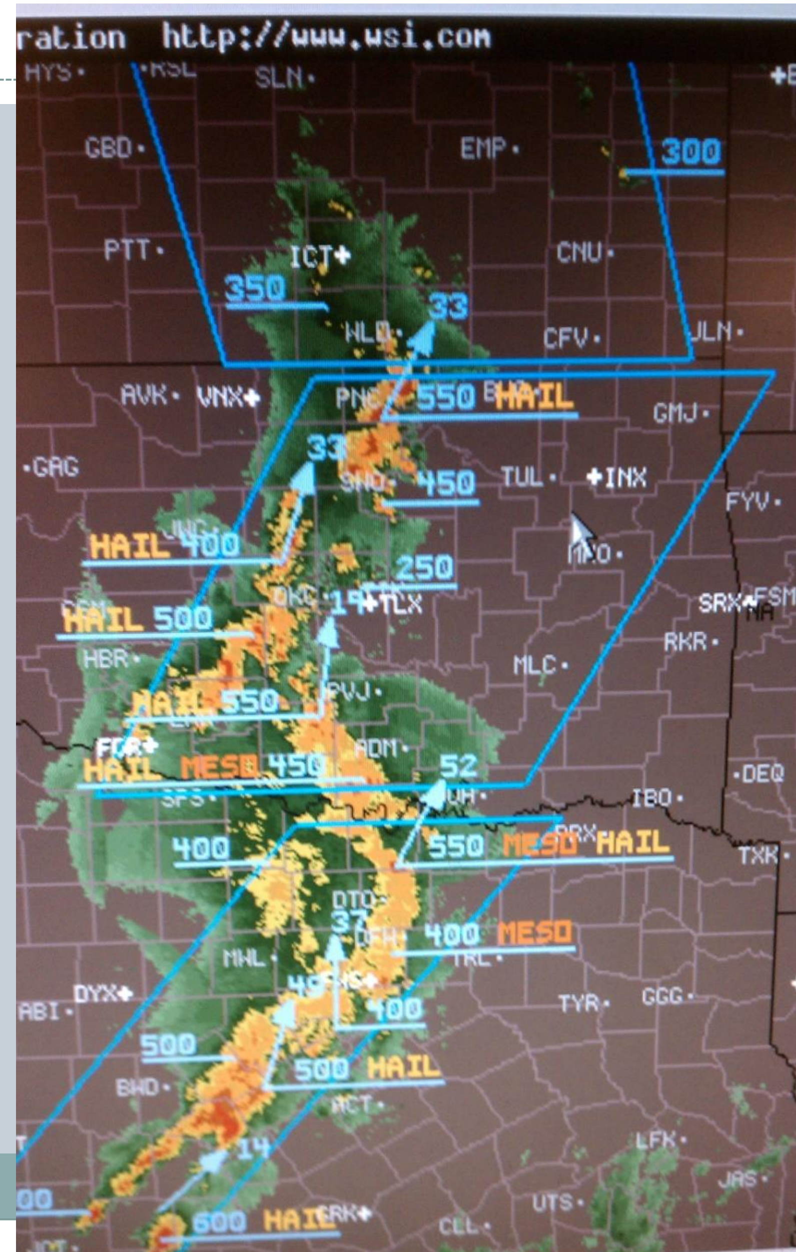
- The Global Precipitation Measurement (GPM) mission is an international network of satellites that provide the next-generation global observations of rain and snow.



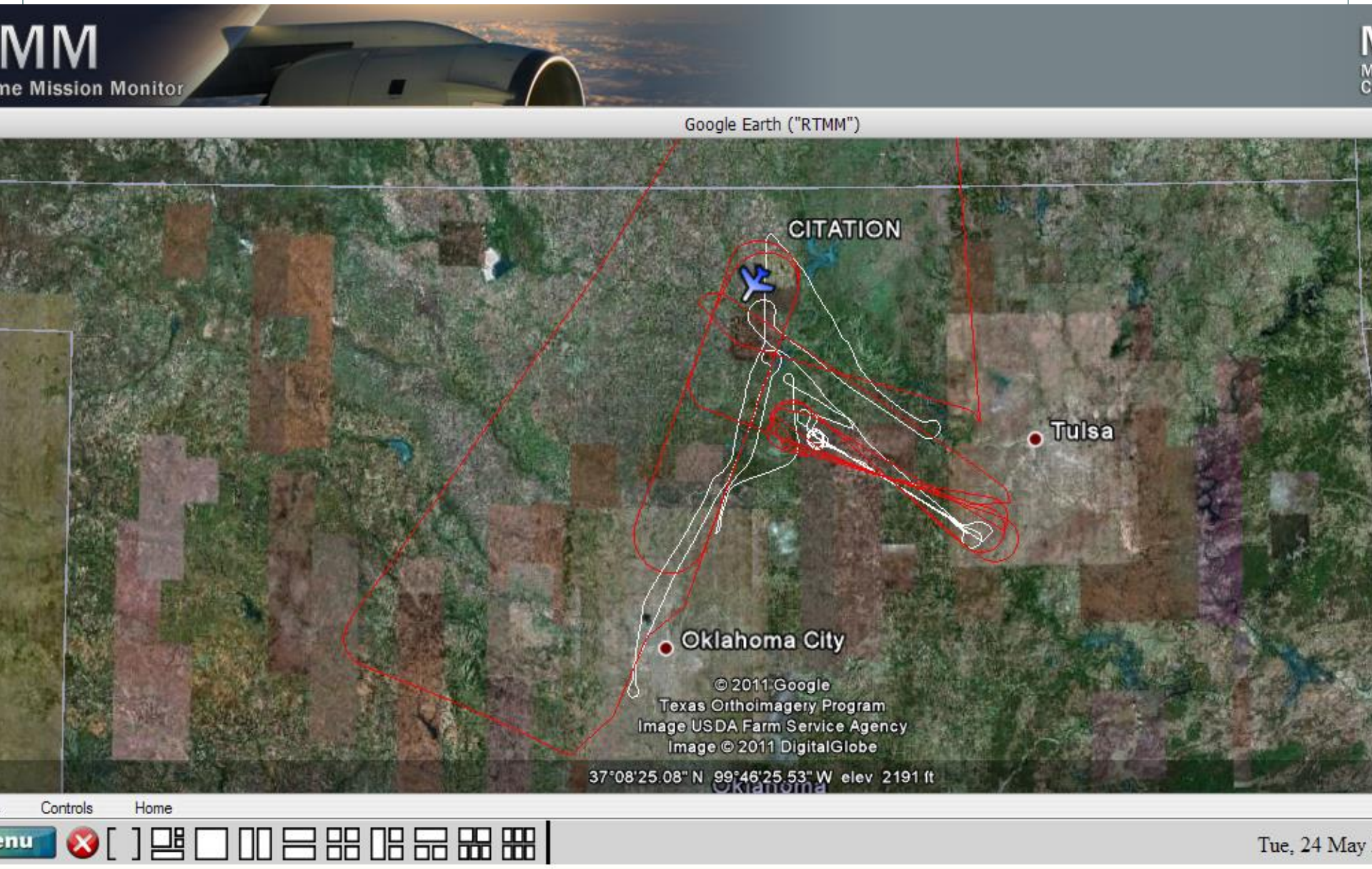
NASA GPM


NASA Global Precipitation Measurement Mission and Department of Energy ARM Program
MC3E
Mid-Latitude Continental Convective Clouds Experiment

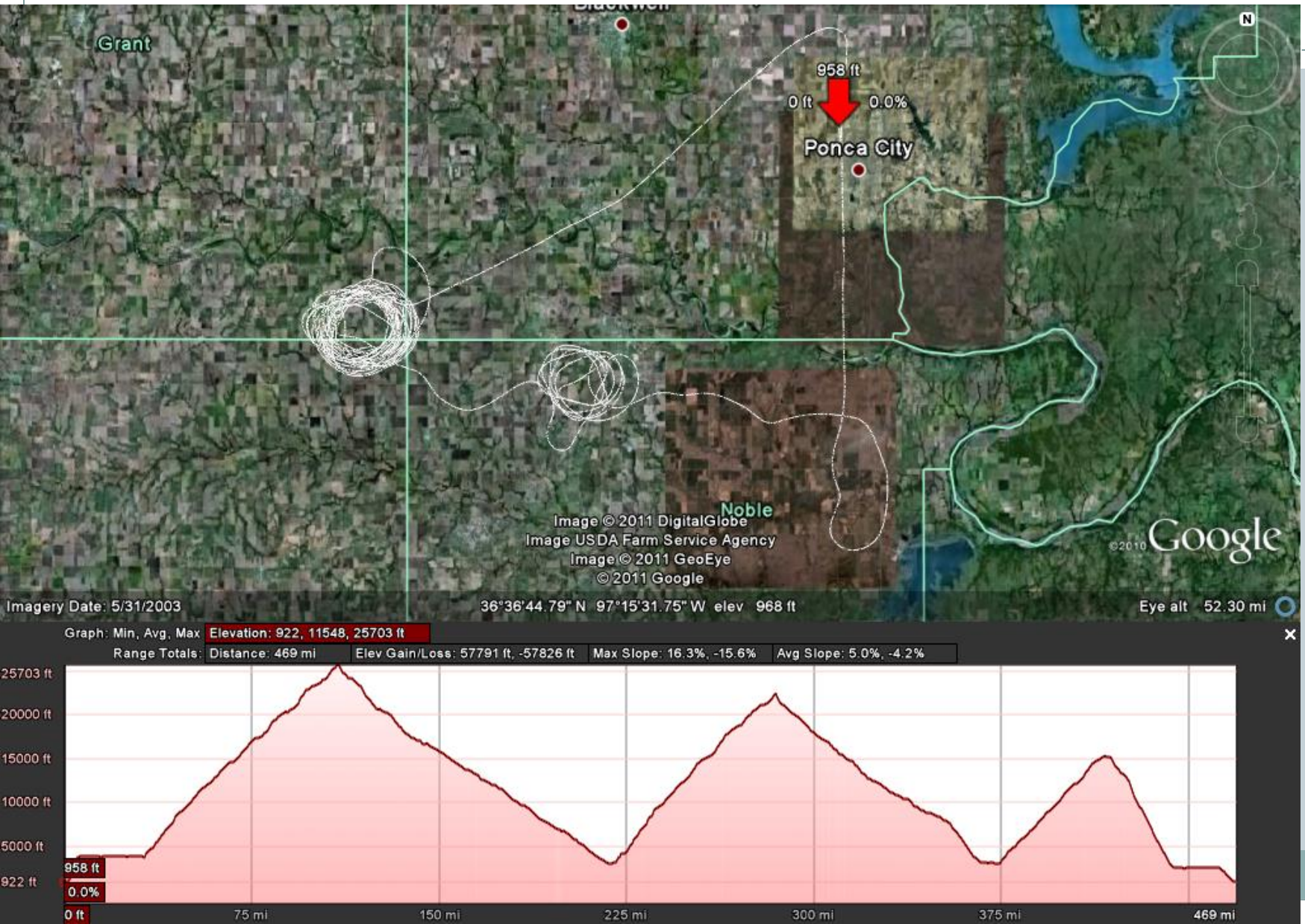

AVIDYNE
BRT
PWR
0.0°
Radar ON
Radar Test
Radar Standby
Radar Off
Mode WX
Scan Normal
Control MODE
20NM
WX ON
Brg Tilt
Map Radar Trip Nrst Aux Page Range


ration http://www.wsi.com
HAIL 400
HAIL 500
HAIL 550
HAIL MESO 450
550 MESO HAIL
400 MESO
500 HAIL
600 HAIL

Flight Tracks

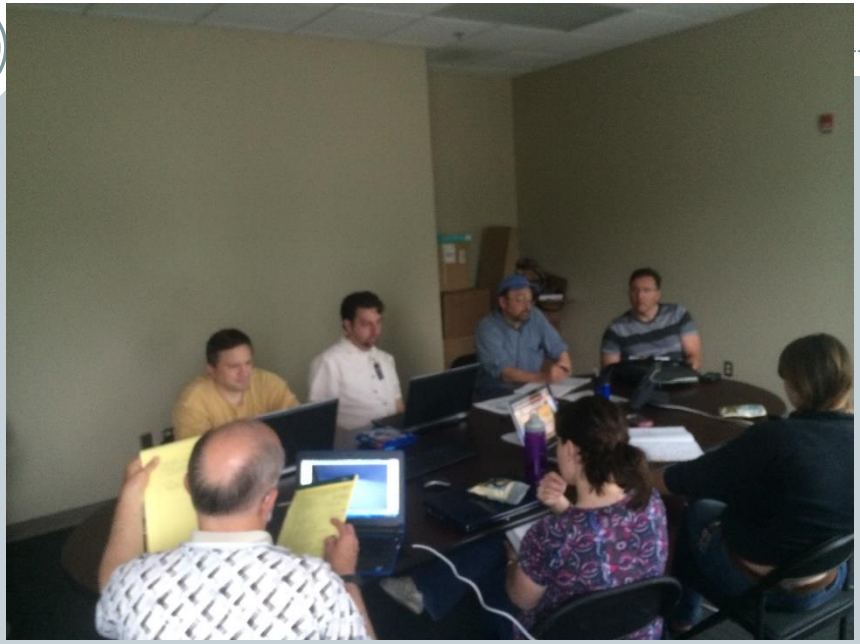


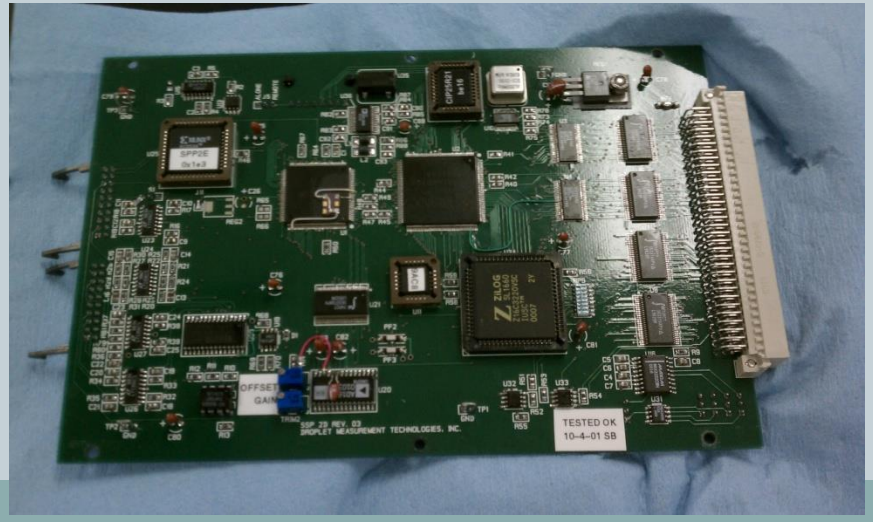
Flight Tracks

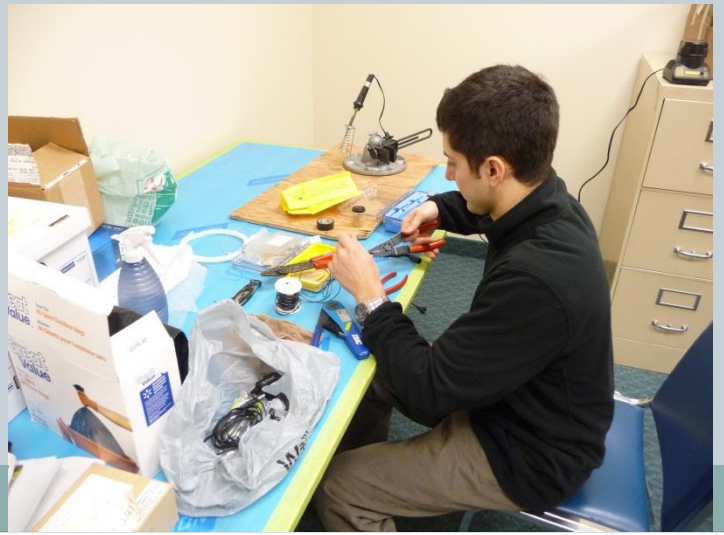



NASA

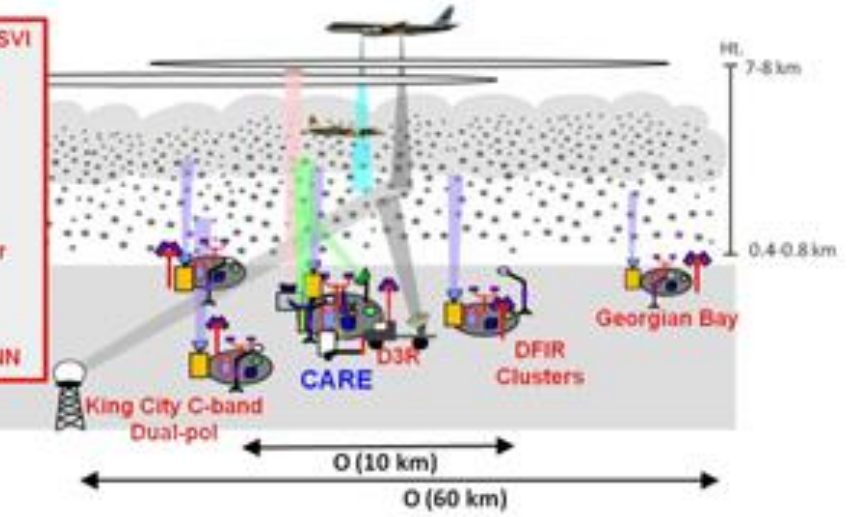
Other Work Duties







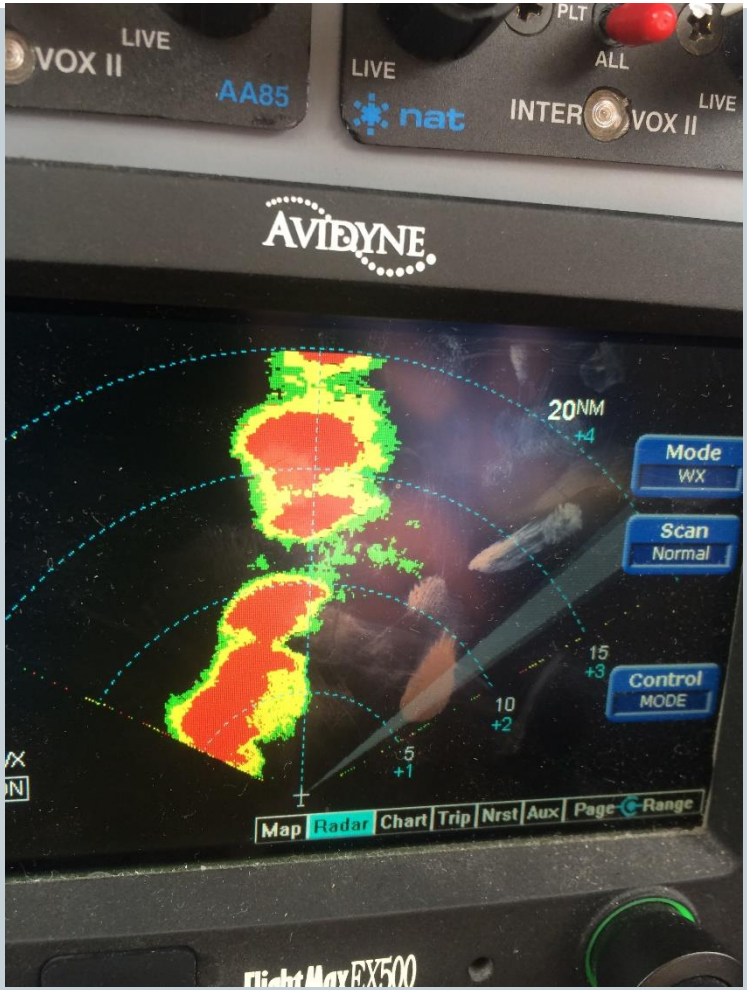
PSD:		2DVD, Parsivel, POSS,SVI
Radar:		Ka/Ku,X,W(2),MRR
SWER:		Pluvio, Hot Plate
SWE/Depth		L-Band + γ-sensor
ε: (Land/Snow)	x	10-89 GHz Radiometer
Aircraft:		DC-8, Citation
Radiometer:		ADMIRARI, EC, UBONN



RTMM
Real Time Mission Monitor

GCPEX
GPM Cold-season Precipitation Experiment

Google Earth ("RTMM")


LIVE
VOX II
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AVIDYNE
20NM
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Normal
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Control
MODE
10
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Map
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Chart
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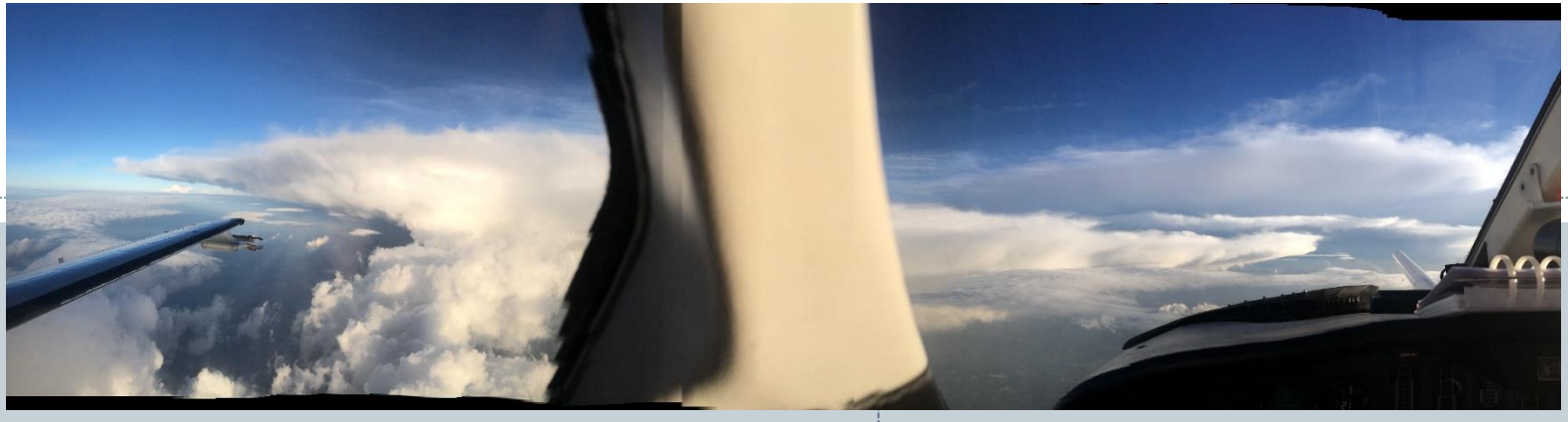
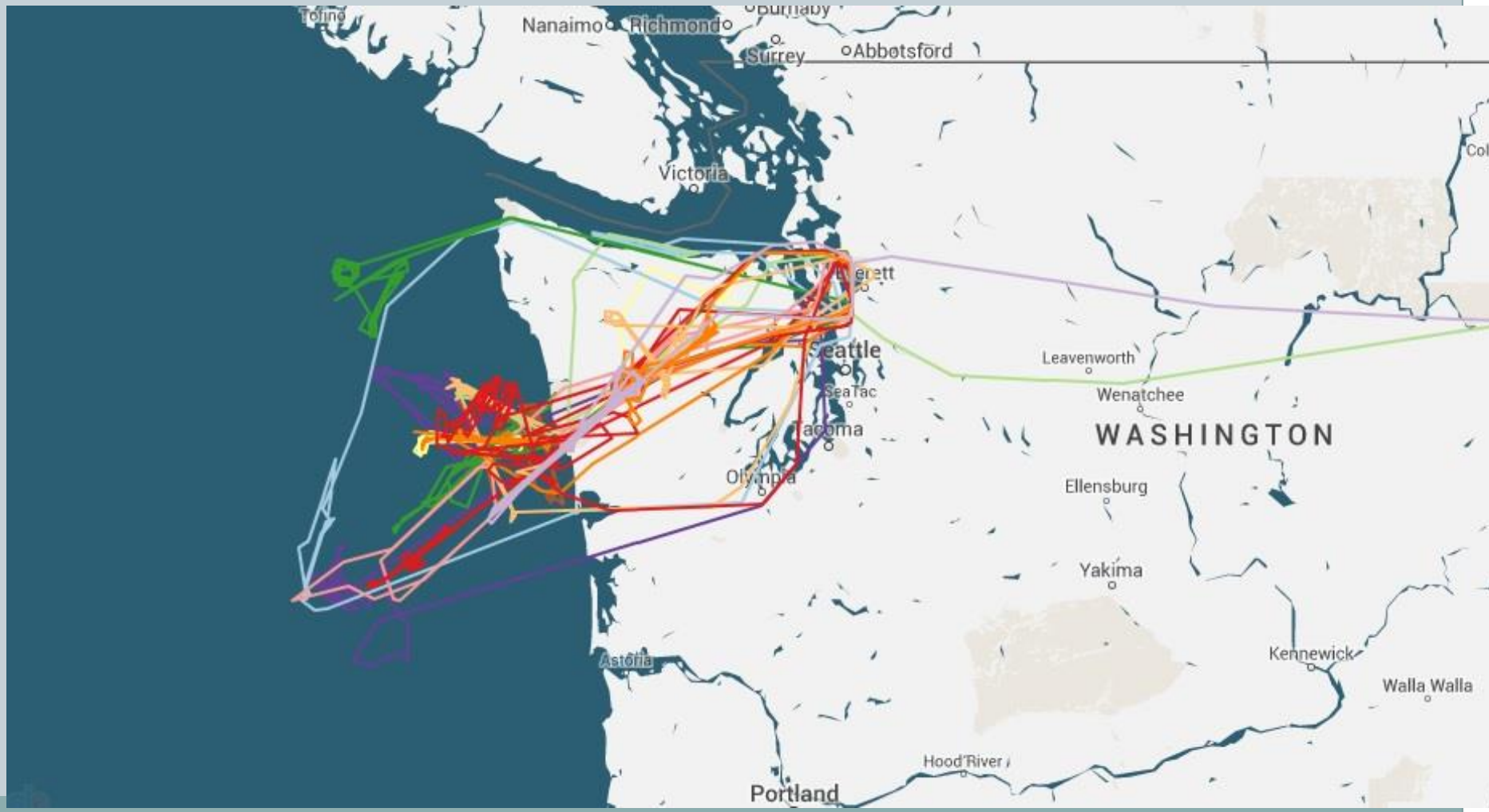
Page
Range
FlightMax EX500


NASA Global Precipitation Measurement Mission
NASA
IPHEx
Integrated Precipitation and Hydrology Experiment 2014



https://vimeo.com/user15334505
https://vimeo.com/user15334505

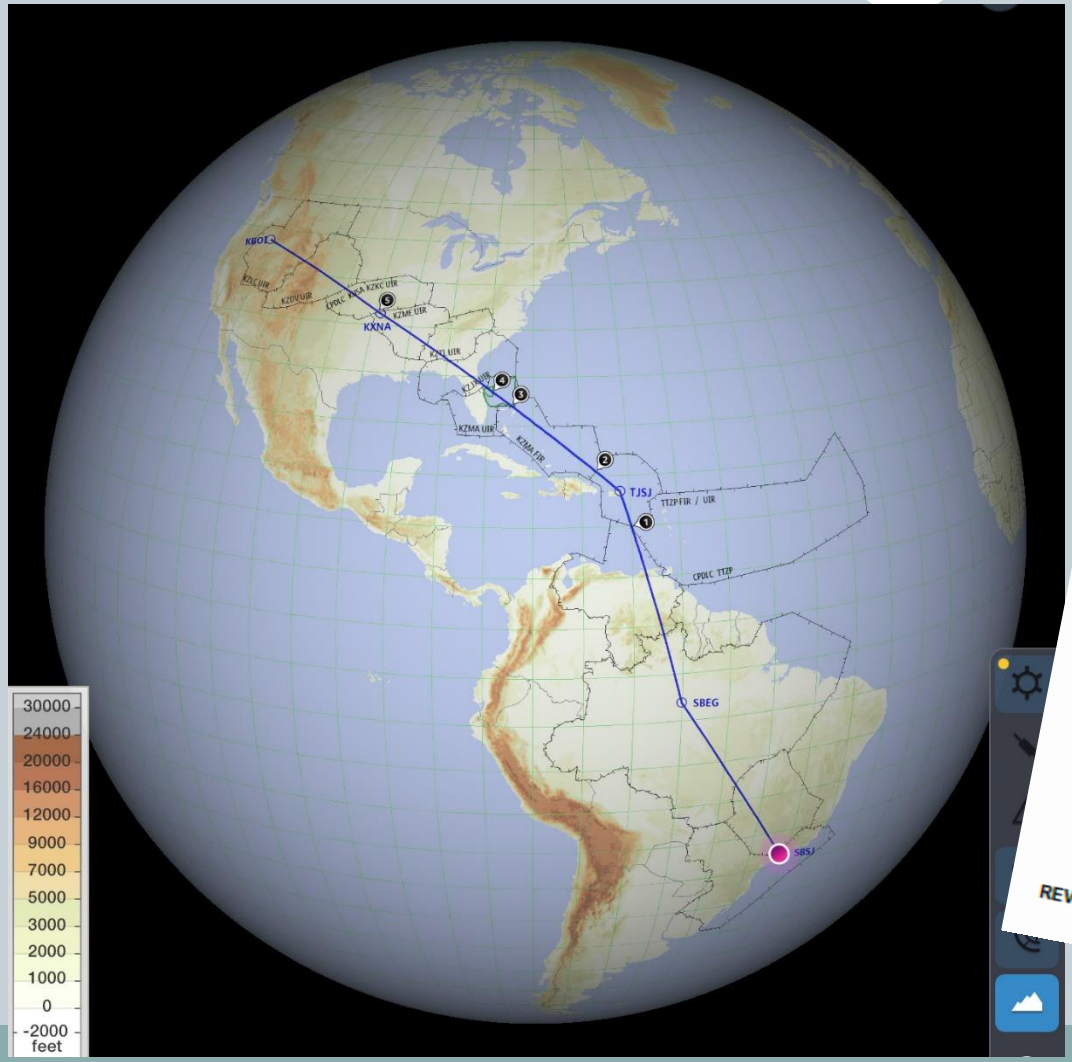
All OLYMPEX Flights



Research Projects

- NASA
  - Research Pilot Field Campaigns:
    (GPM) Global Precipitation Measurement
    (MC3E) Mid-latitude Continental Convective Clouds Experiment
    (GCPEx) GPM Cold-season Precipitation Experiment
    (IPHEx) Integrated Precipitation Experiment
    (OLYMPEX) Olympic Mountain Experiment
    (LD-CAP 1) Limited Deployment - Cooperative Airspace Project
    (LD-CAP 2) Limited Deployment - Cooperative Airspace Projectsee less
  - Instrument Tech Field Campaigns:
    (ORACLES 1) ObseRvations of Aerosols above CLouds and their intEractionS
    (ORACLES 2) ObseRvations of Aerosols above CLouds and their intEractionS
- Other Companies
  - BF Goodrich
  - Ophir
  - Weather Modification
  - UND Atmospheric Science Grade SNOWunD

New Aircraft Delivery



Thank You

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