

The North Dakota Polarimetric Cloud Analysis and Seeding Test (POLCAST) Research Project

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Objective

Research the use of hygroscopic seeding flares for use in the North Dakota weather modification program.

- Characterization of hygroscopic seeding effects stratified by Cloud Condensation Nuclei (CCN) concentrations using statistical analysis of a randomized experiment.
- Sample environmental and cloud micro-physical properties target clouds.



View from Seeding Aircraft on July 8, 2012



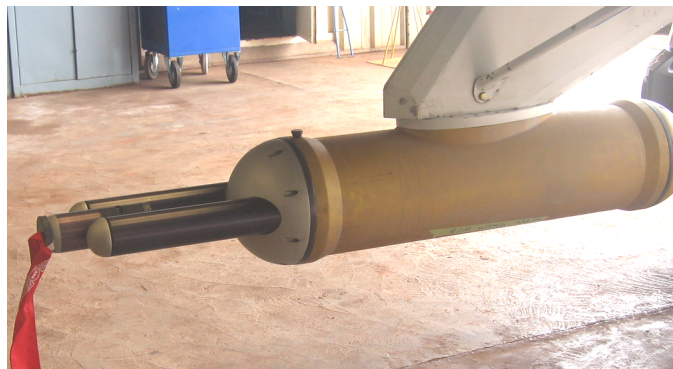
View of Cumulus Cloud on July 12, 2012

Cessna 340 Equipment

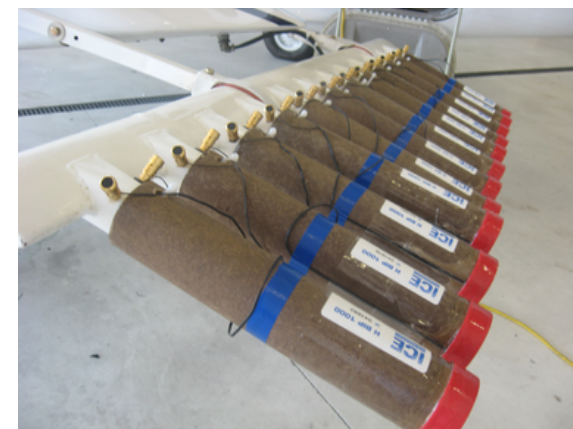
CCN Counter



FSSP



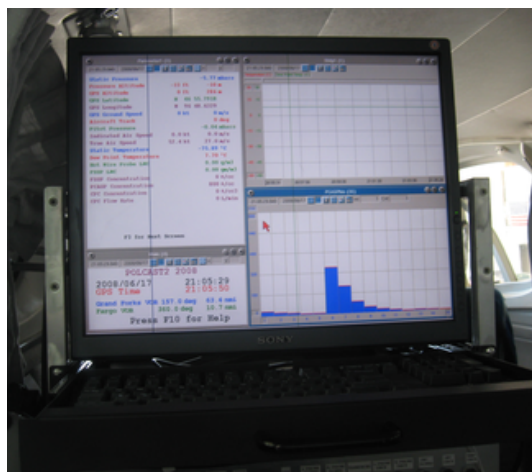
Flare Rack



PCASP



M300 Display



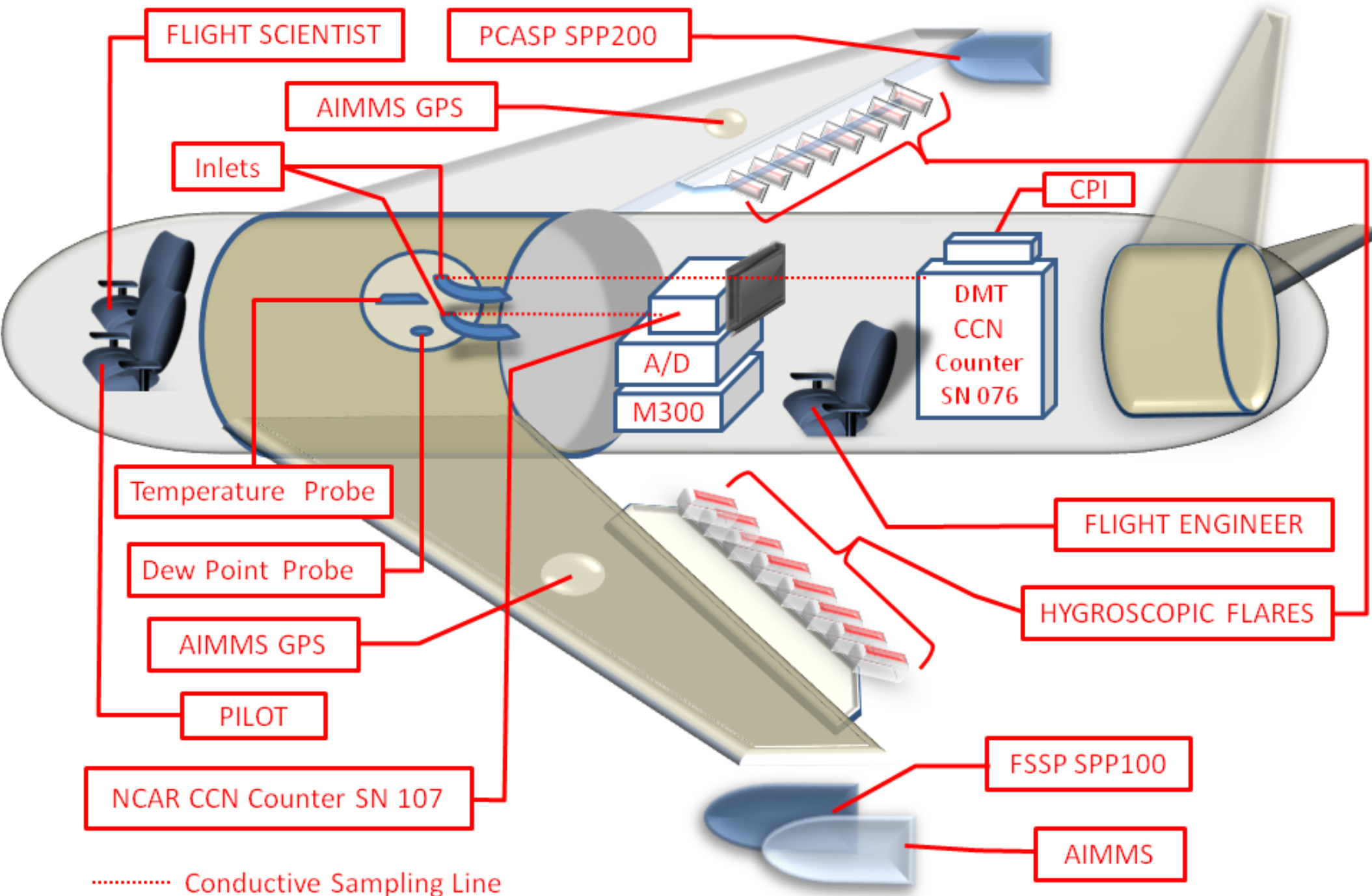
Temperature and Hot Wire Probe



Dew Point Temperature Sensor Head



POLCAST4 CESSNA340 N98585 INSTRUMENT CONFIGURATION



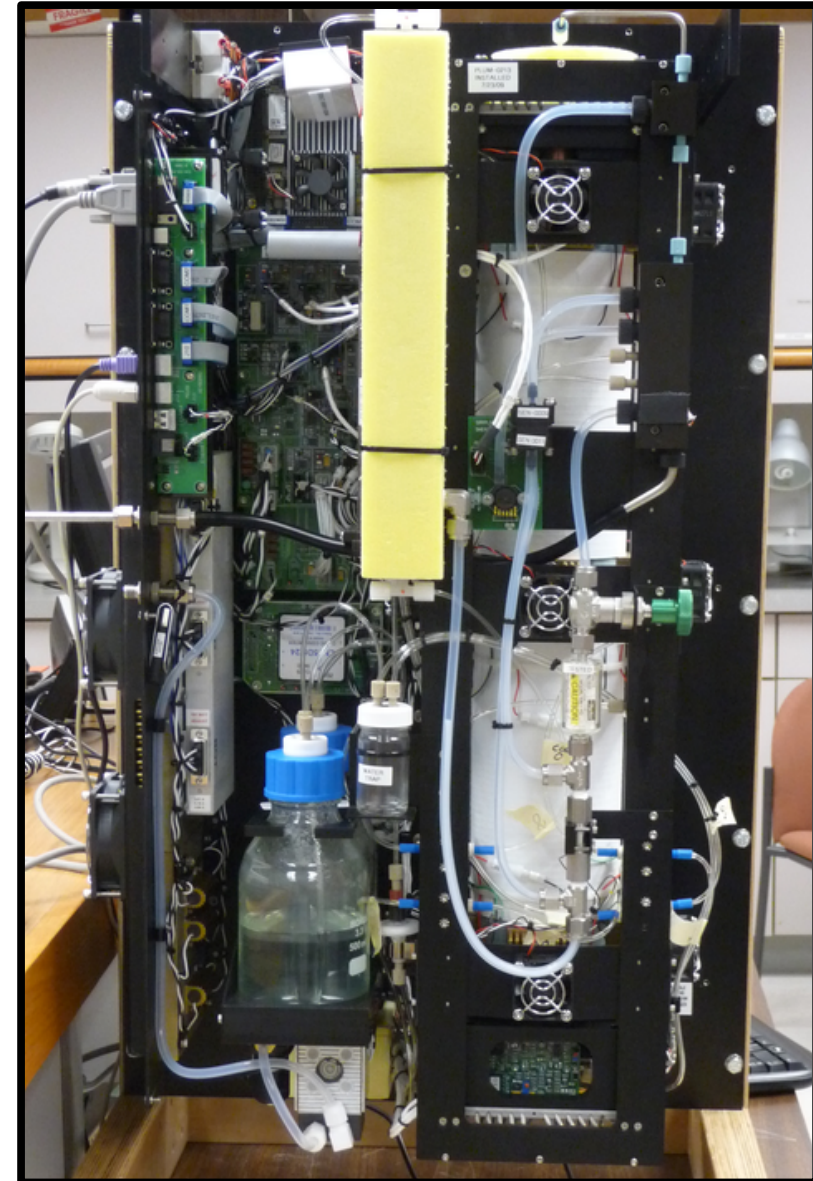
UND NorthPol Radar

- C-band (5 cm wavelength) Doppler radar
- Dual-polarized Antenna Mounted Receiver
- 28 m Antenna Above Ground
- SIGMET IRIS and TITAN Analysis Software
- Operated Mostly in Full-Volume Mode during POLCAST3



Aerosol Importance

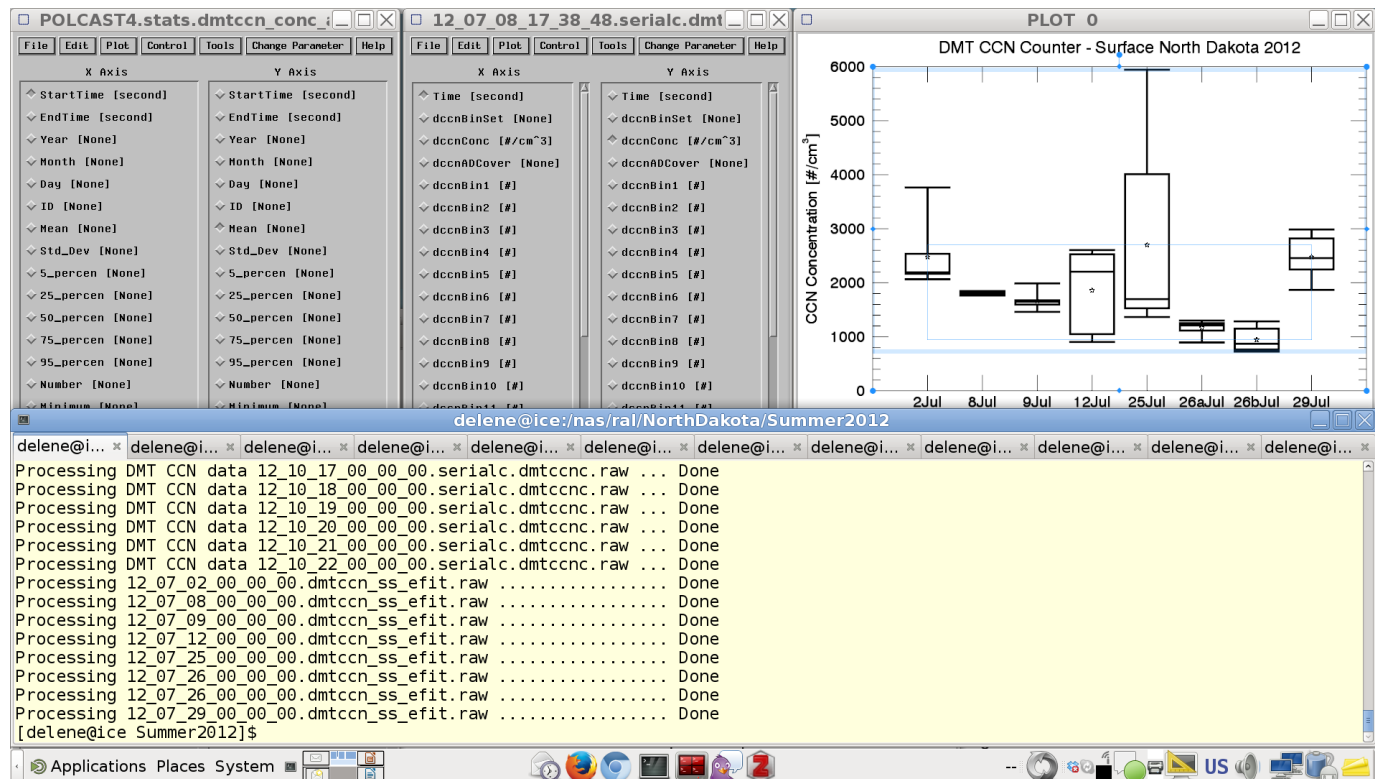
- Scatter and Absorb Radiation
- Media for Chemical Reactions
- **Serve as Cloud
Condensation Nuclei (CCN)**



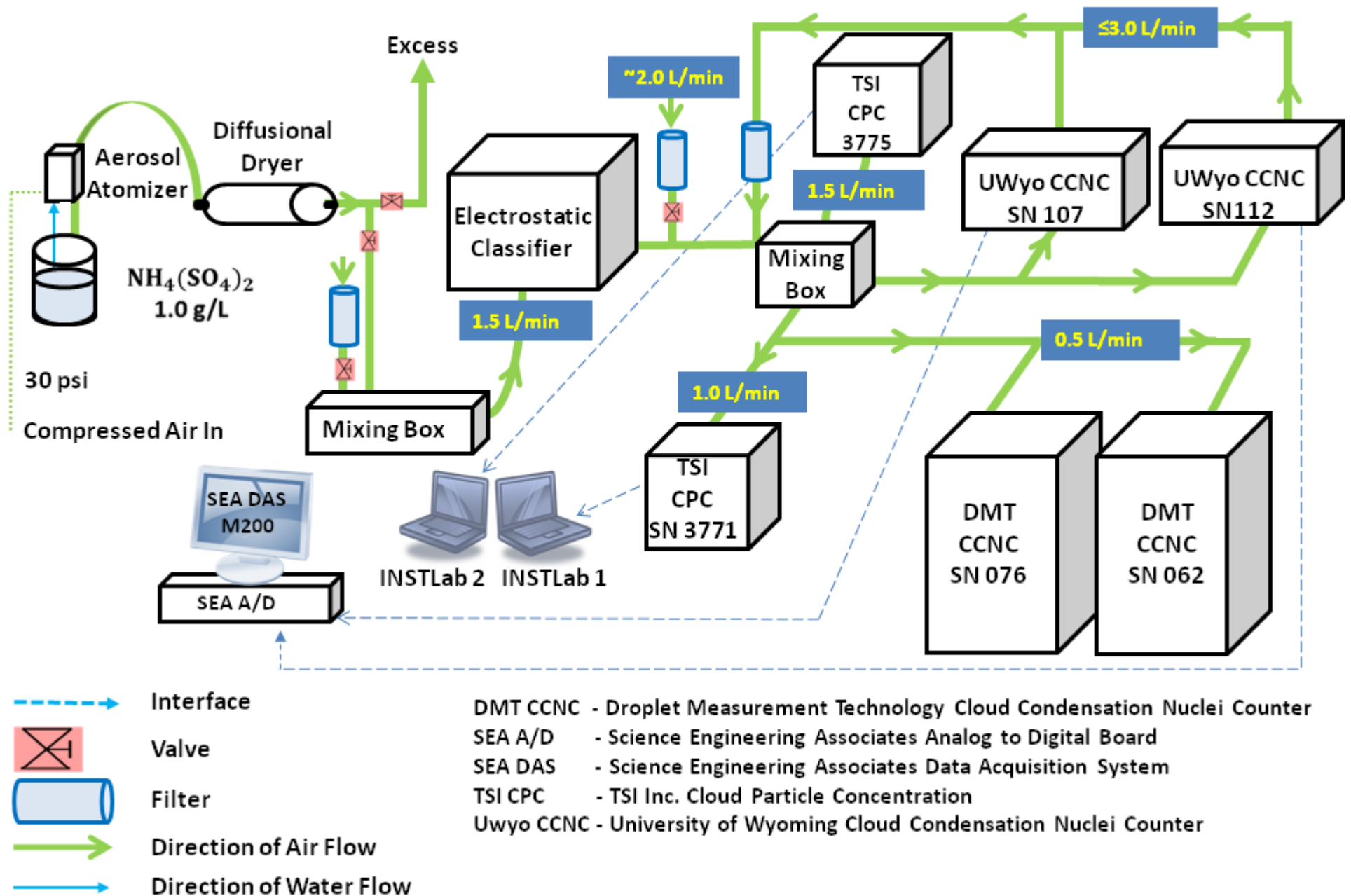
Software

Airborne Data Processing and Analysis (ADPAA)

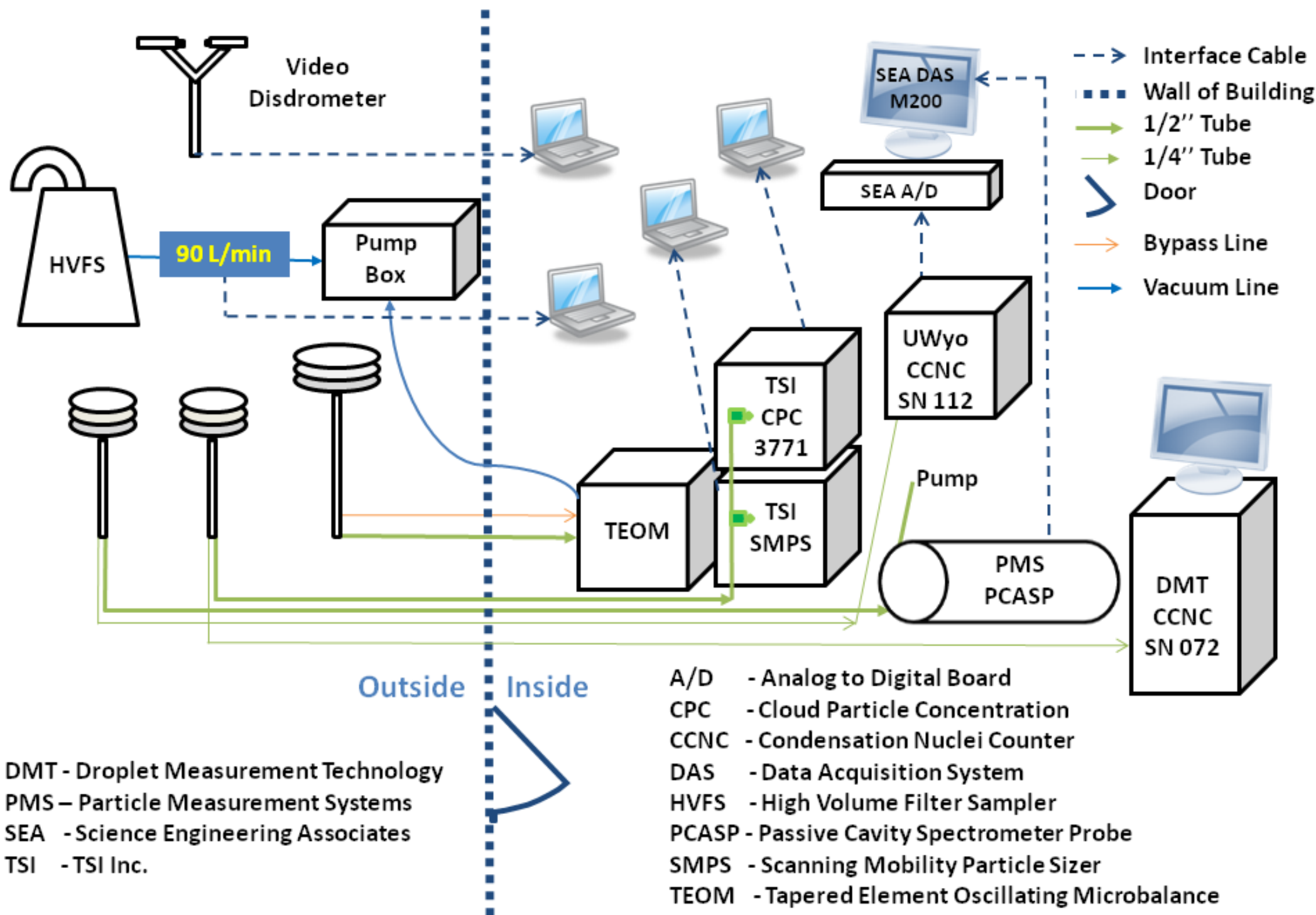
- Open-source software
- Quality control and assurance checks
- Contains a compilation of scripts that can be used on a variety of airborne instruments by different users
- Allows for direct comparison of data sets



CCN Counter Lab Calibration Setup

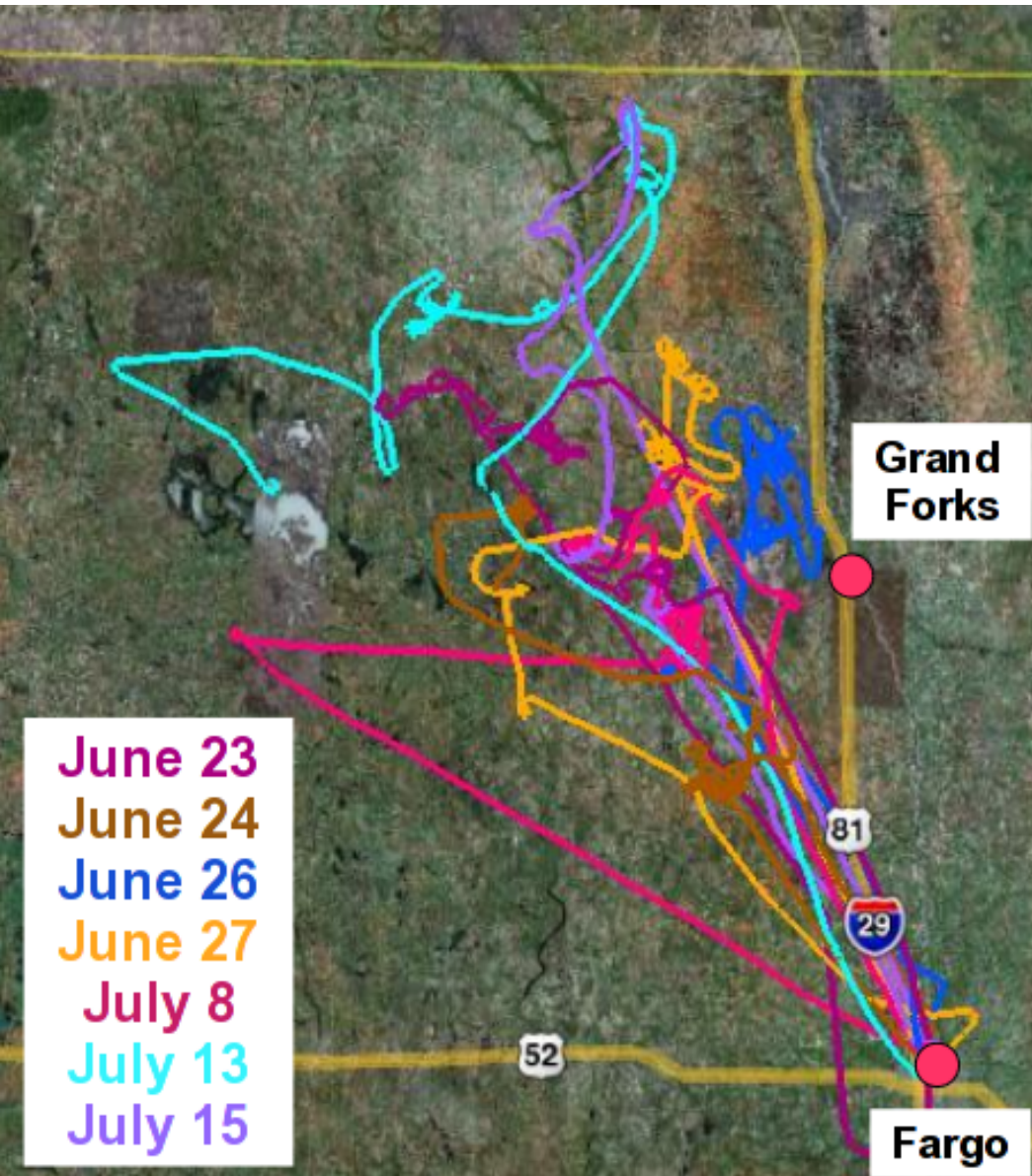


POLCAST4 Surface Measurements: Clifford Hall 601

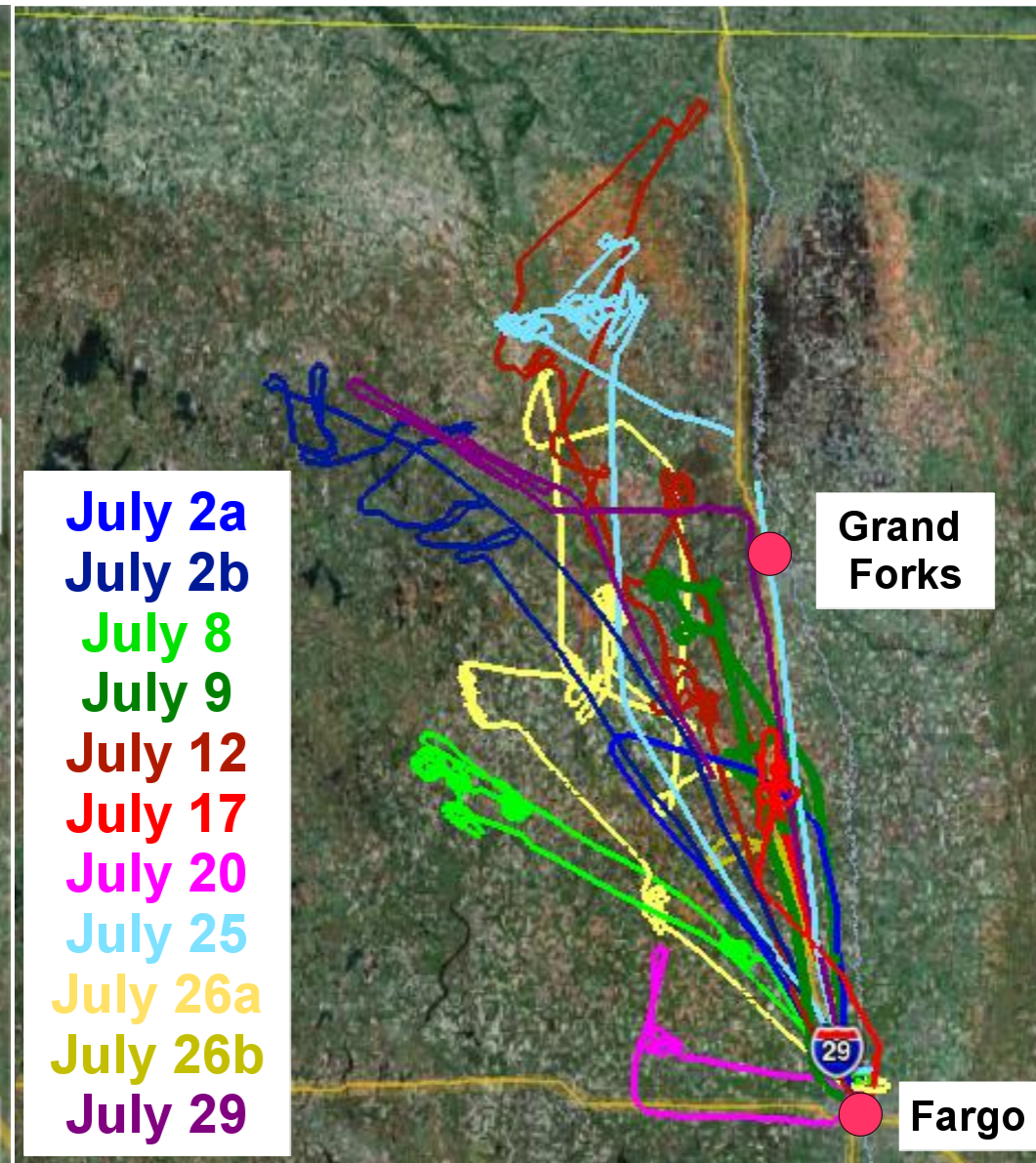


Flight Tracks (rastros de vuelos)

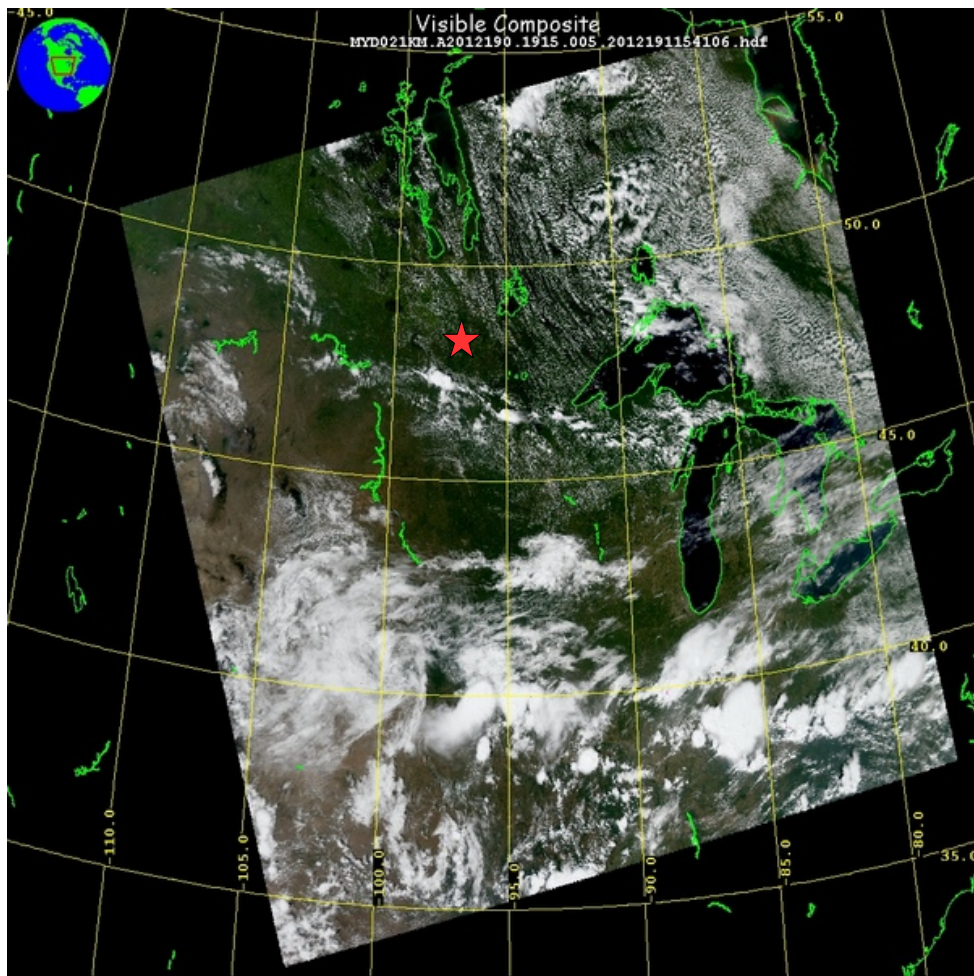
2010 POLCAST3



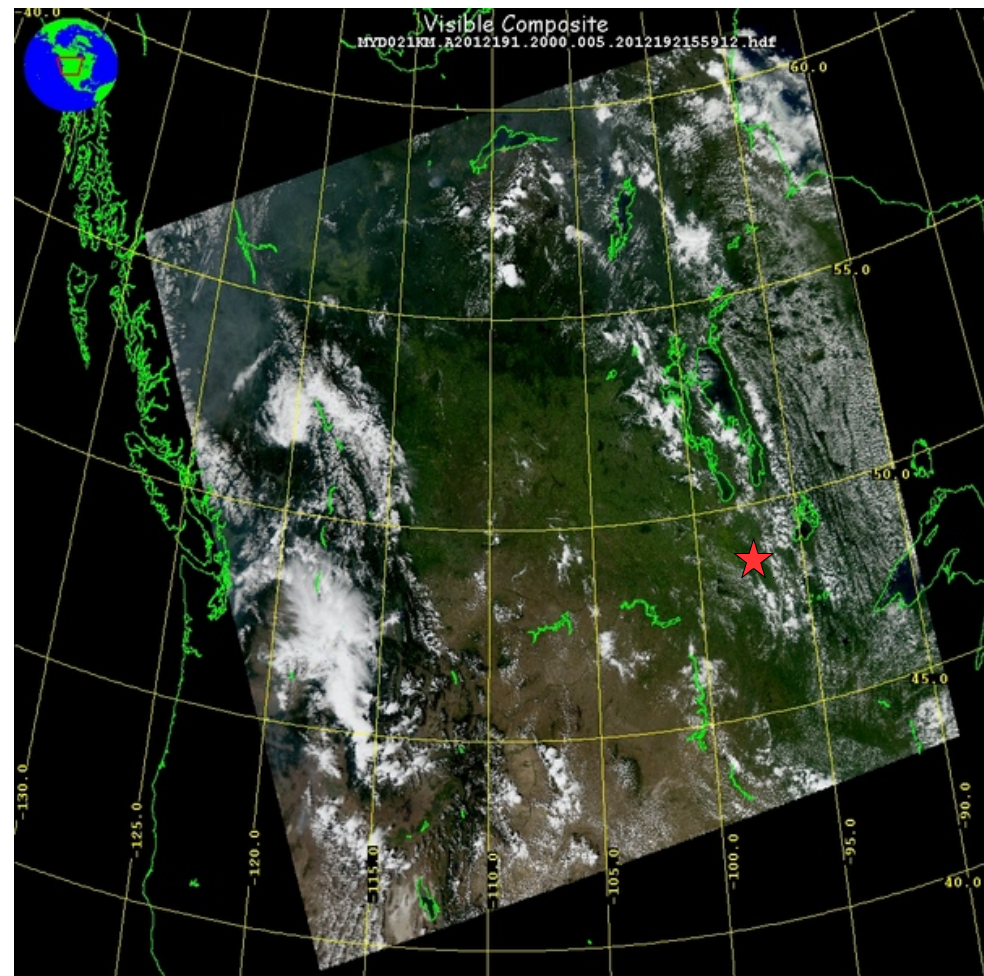
2012 POLCAST4



MODIS Visible Images



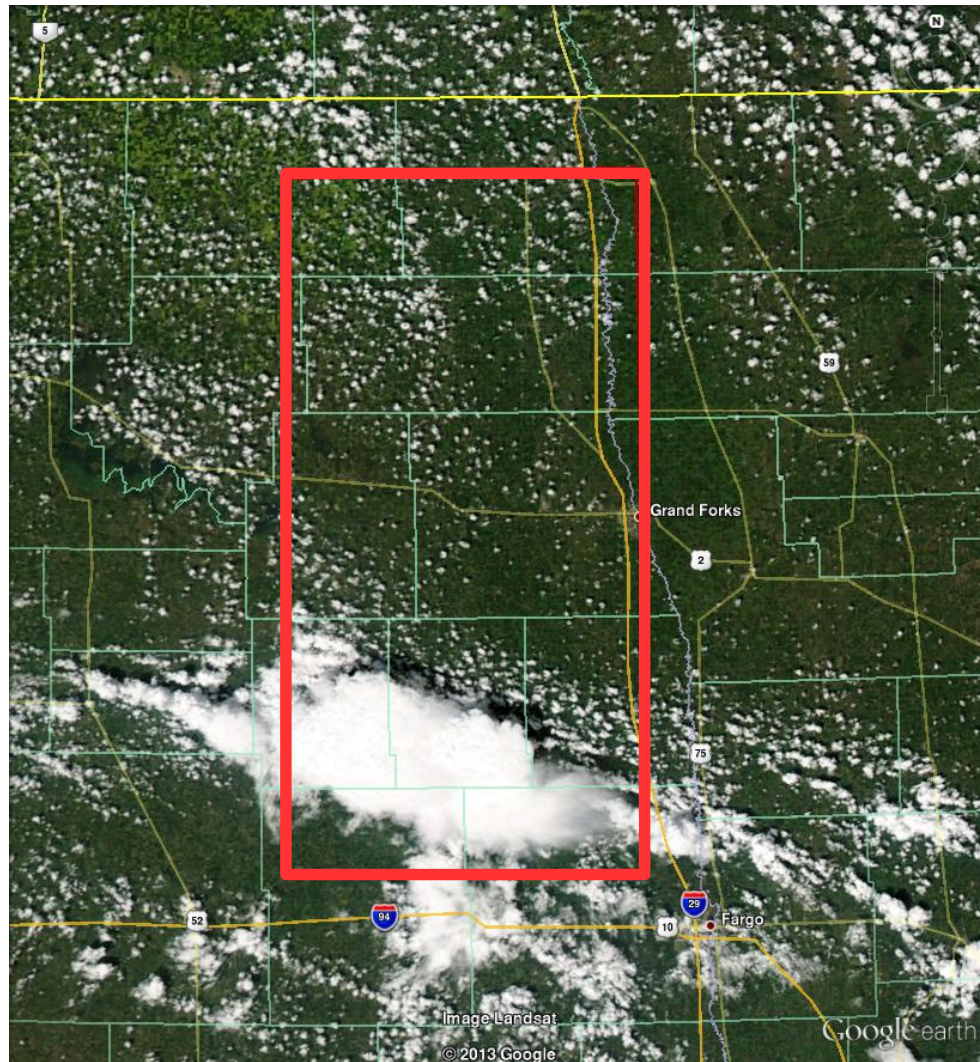
July 8, 2012



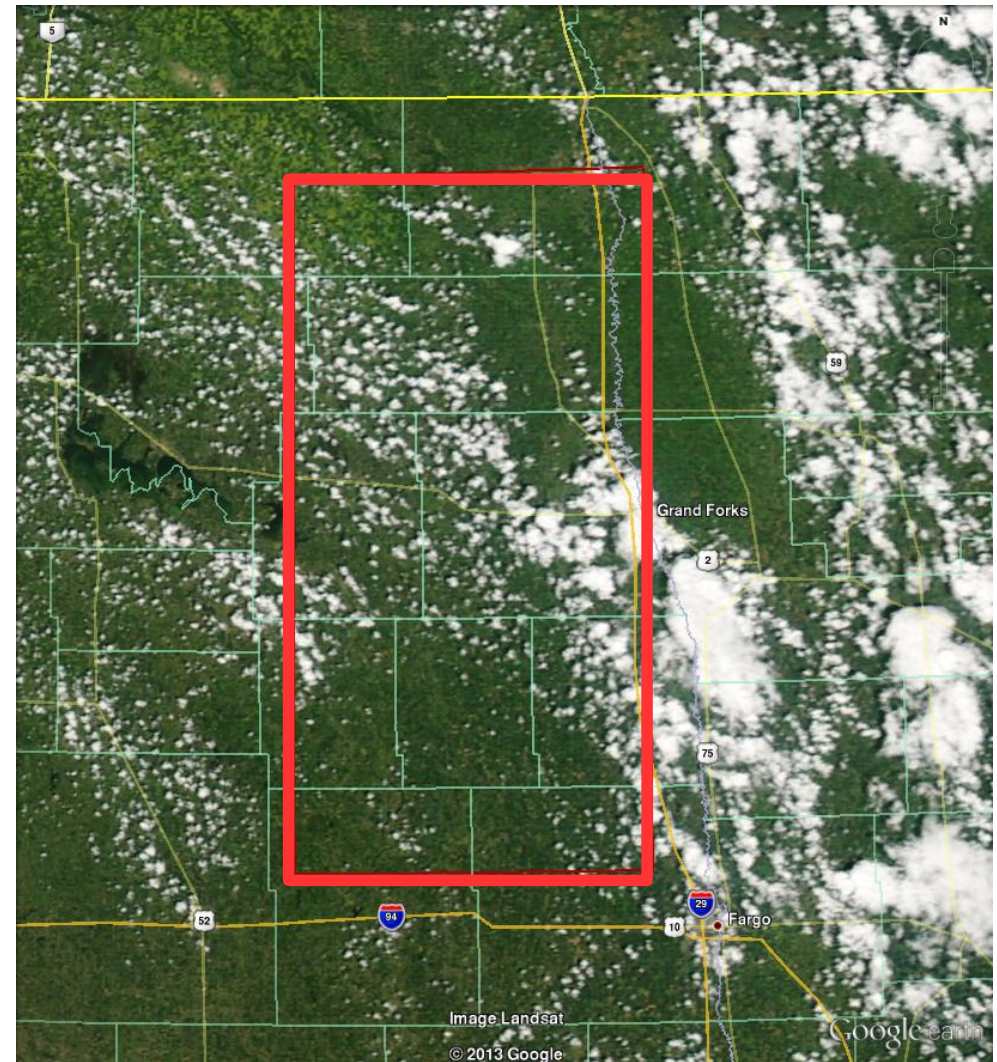
July 9, 2012

★ **Grand Forks, North Dakota**

North Dakota Project Area

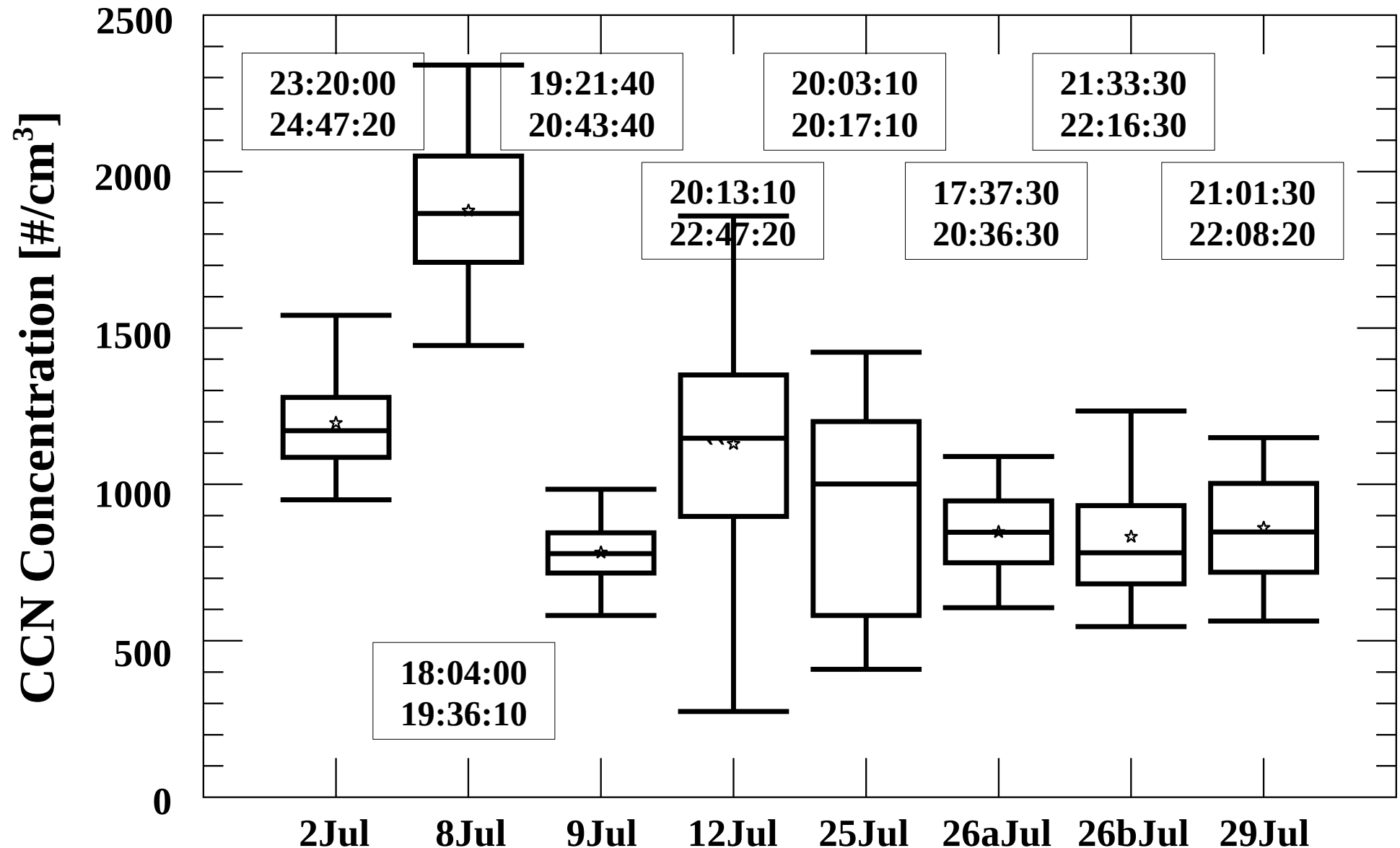


July 8, 2012



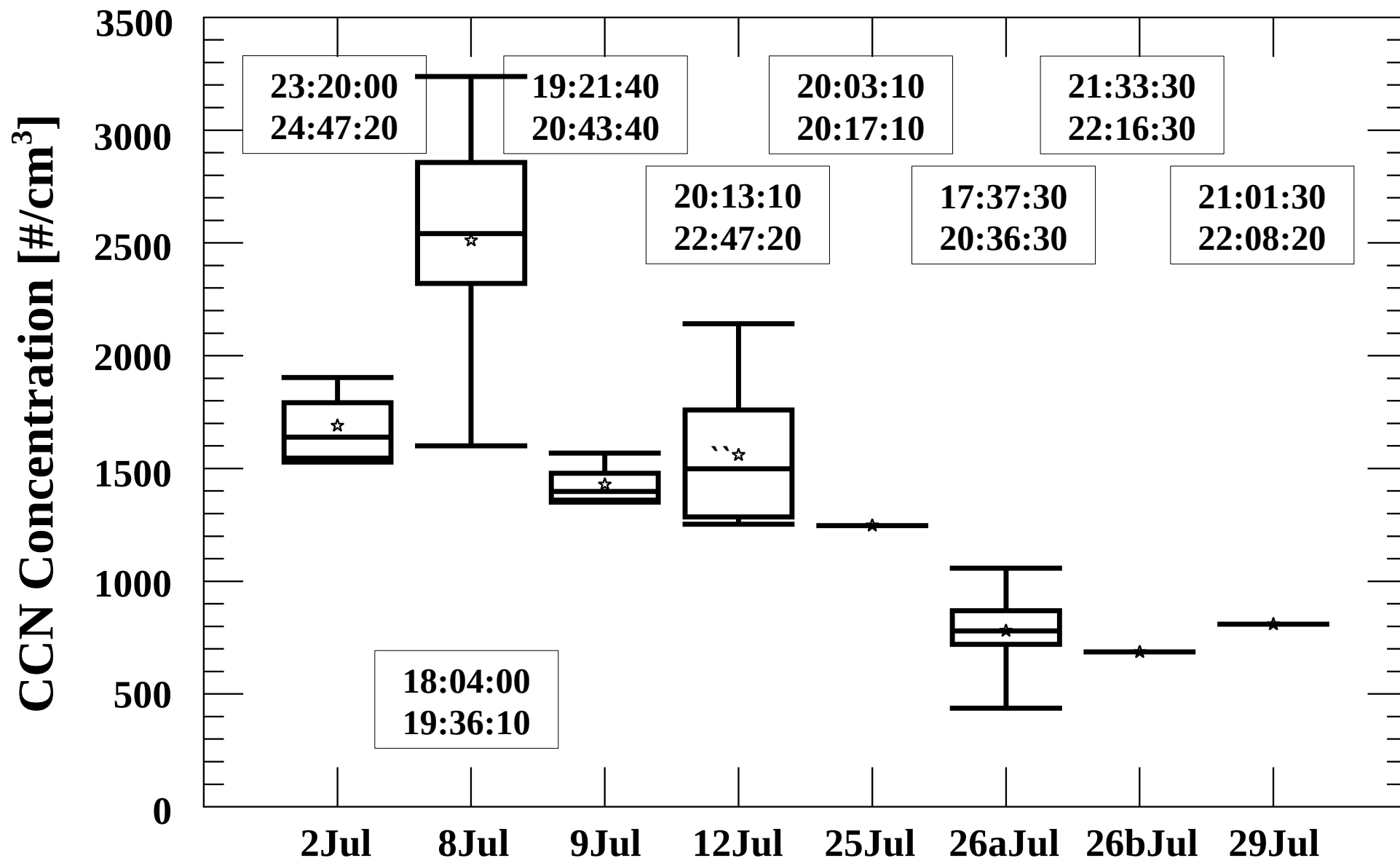
July 9, 2012

UWyo Cloud Base – North Dakota 2012



Statistical distributions near cloud base of 30 s, 0.6 % ambient supersaturation Cloud Condensation Nuclei (CCN) adjusted to standard temperature and pressure. Measurements are using the University of Wyoming (Uwyo) CCN counter. Star symbols are means, horizontal line is the 50th percentile, top of the box is the 75th percentile, bottom of the box is the 25th percentile, and the top and bottom of the whiskers are the 95th and 5th percentiles, respectively.

DMT Cloud Base – North Dakota 2012



Statistical distributions near cloud base of 30 s, 0.6 % ambient supersaturation Cloud Condensation Nuclei (CCN) adjusted to standard temperature and pressure. Measurements are using the Droplet Measurement Technology (DMT) CCN counter. Star symbols are means, horizontal line is the 50th percentile, top of the box is the 75th percentile, bottom of the box is the 25th percentile, and top and bottom of the whiskers are the 95th and 5th percentiles, respectively.

Conclusions

- Field project conducting in 2006, 2008, 2010 and 2012.
- Aerosol, Cloud Condensation Nuclei and cloud base temperature measurements indicate that the environment is feasible for hygroscopic seeding.

Future Work

- Publication of the measurements results.
- Analysis of randomized seeding cases.

Questions

