AGHME QUALITY CONTROL

AGHME Quality Control (QC) Process

- Two primary sources of ASE measurement error must be evaluated before the result can be considered valid
  - Aircraft true position and the modeled value of the pressure surface
- Accepted quality parameters are built into the ASE processing software to flag likely erroneous ASE values
- Experienced analysts review ASE results periodically to identify remaining large ASE values
- QC has an established watch list of large measurement
  - Subsequent large measures of a singe aircraft on repeated assessments are reported to the operators via the FAA inspector
  - Comparison of multiple aircraft at the same time or by area are used to remove the likely faulted measurement

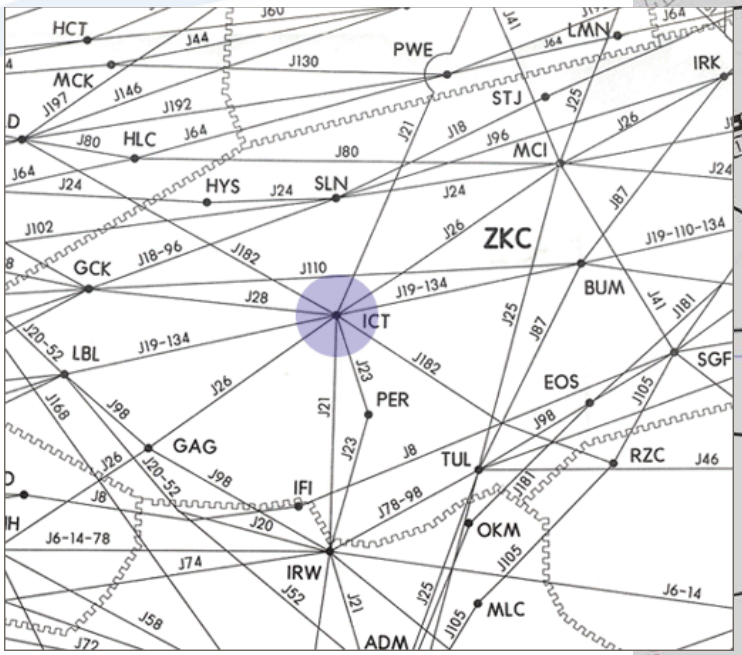
Altimetry System Error (ASE) Process

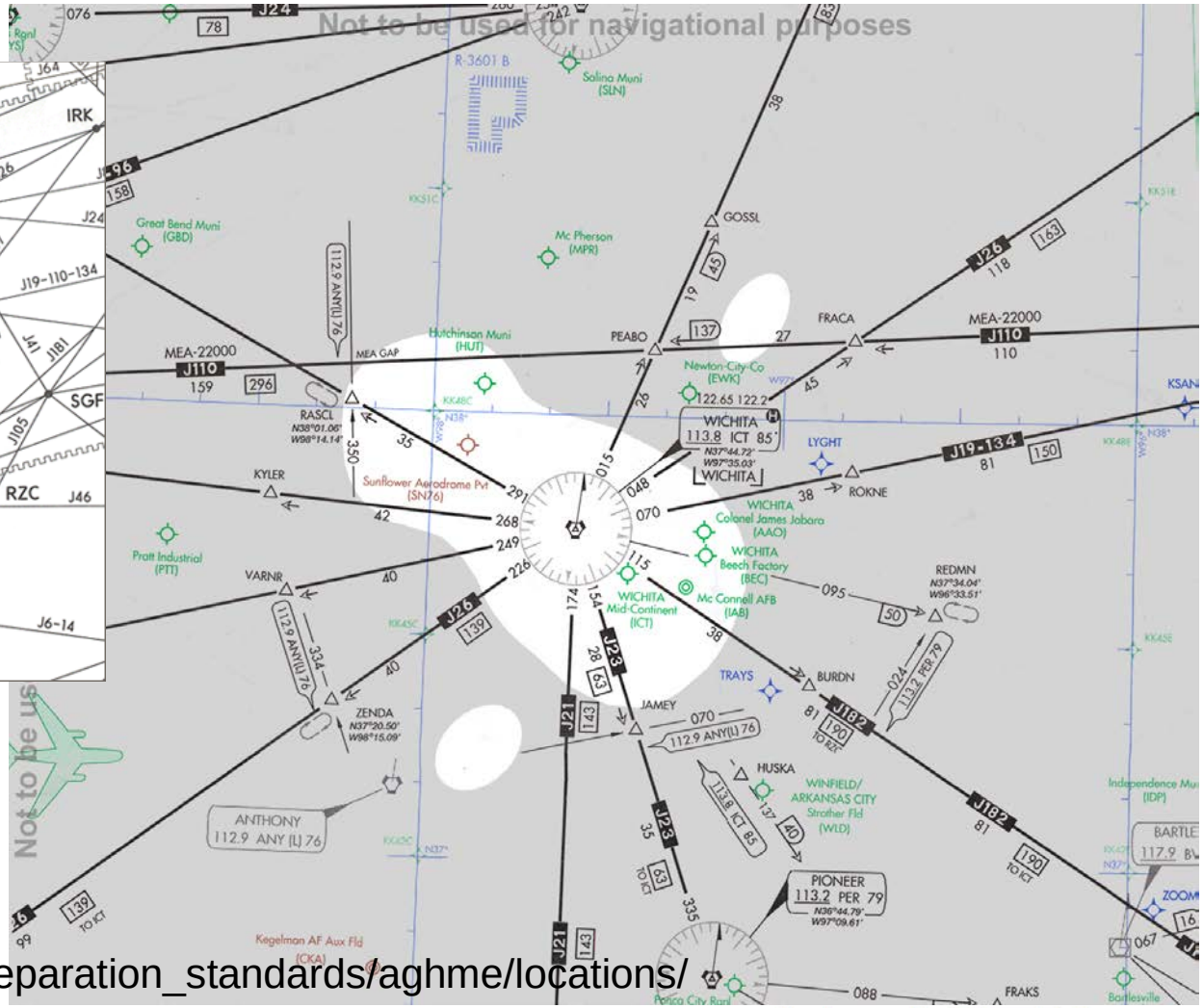
- ASE is determined by comparing the identified true height of the aircraft and the true height of the barometric pressure surface associated with the altimetry measurement
  - The true altitude is currently measured by the Aircraft Geometric Height Element multilateration systems operated by ANG-E61
  - Aircraft that require ASE monitoring that do not fly over one of the AGHME sites can utilize a GPS measurement unit to collect aircraft position as an input to the ASE process
  - ADS-B provides a source of aircraft position data for use in ASE calculations
    - The quantity of data that will be provided by ADS-B will provide unprecedented ability to observe ASE

Flight Quality - Geometry

- For ASE to be properly measured by the AHGME, the geometry of the flight path should be aligned with the identified performance area of the system
- This assures that multiple elements of the AGHME station will measure the aircraft range for the altitude calculation

AGMHE Coverage Area: Wichita, Kansas





https://www.faa.gov/air_traffic/separation_standards/aghme/locations/

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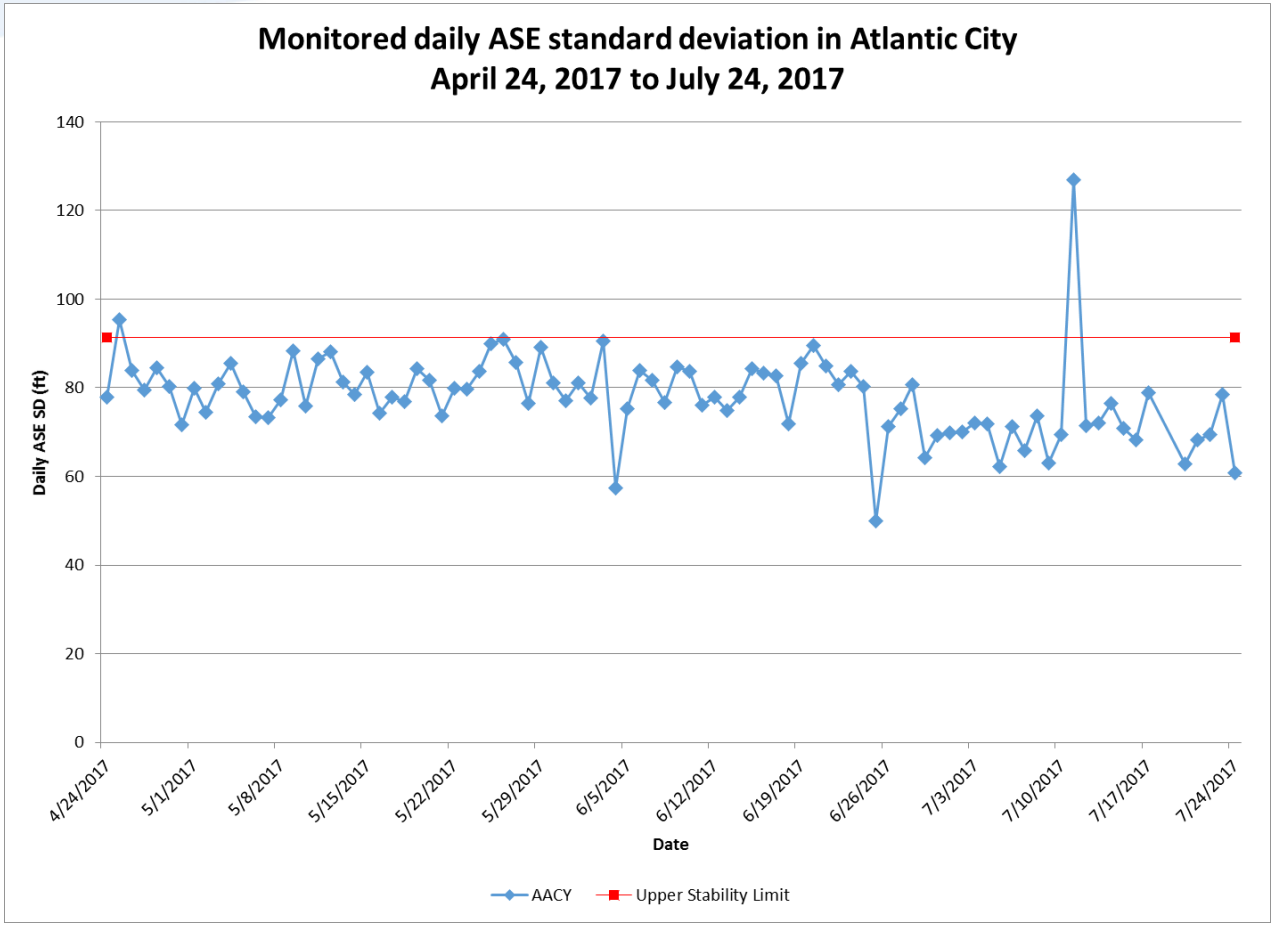
Flight Quality - Dynamics

- ASE is only currently processed when the aircraft is flying straight and level
  - Maneuvers create uneven air flow over the aircraft
- A minimum flight segment of 180 seconds is required
  - Multiple measurements during that time are averaged
  - AGHME data is “geometrically limited” – the flight duration will only be as long as the flight distance over the system
  - ADS-B coverage provides continuous data allowing for multiple independent ASE samples to be collected and compared.

Meteorological Data Quality

- Pressure Surface variations that do not match the expected model results will translate into erroneous ASE assessment
- Data evaluation based on the expected values of each sites performance can be used to detect bad MET fit
- A large standard deviation of the ensemble of site ASE measurement is used as a trigger for daily evaluation
  - The QC team can elect to fail all or some of the data

Daily Statistics from Atlantic City



Elevated daily mean or standard deviation triggers QC data evaluation

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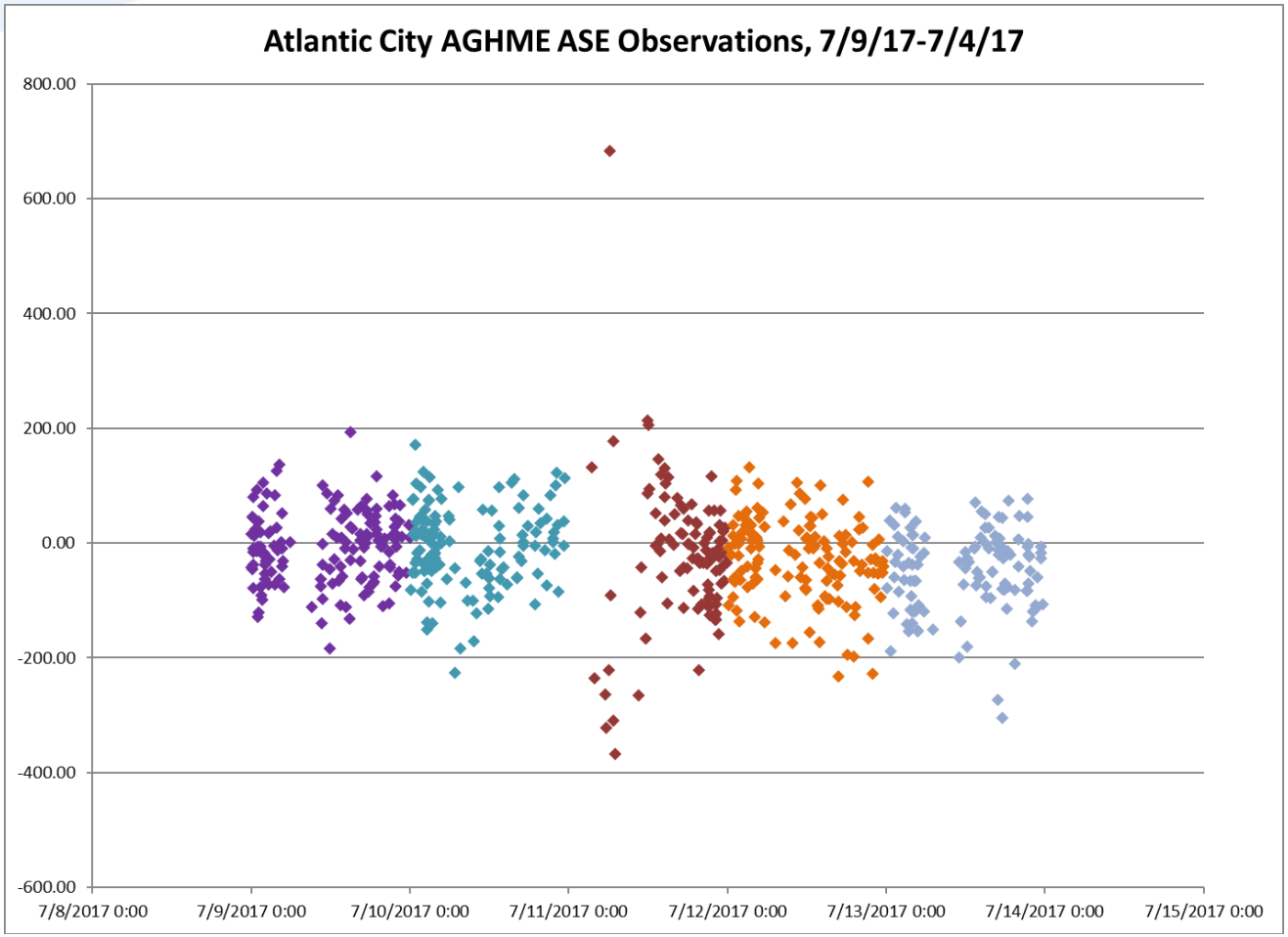
Daily Comparison of Ensemble ASE



The outlier is responsible for elevated daily standard deviation.

Next we examine the outlier.

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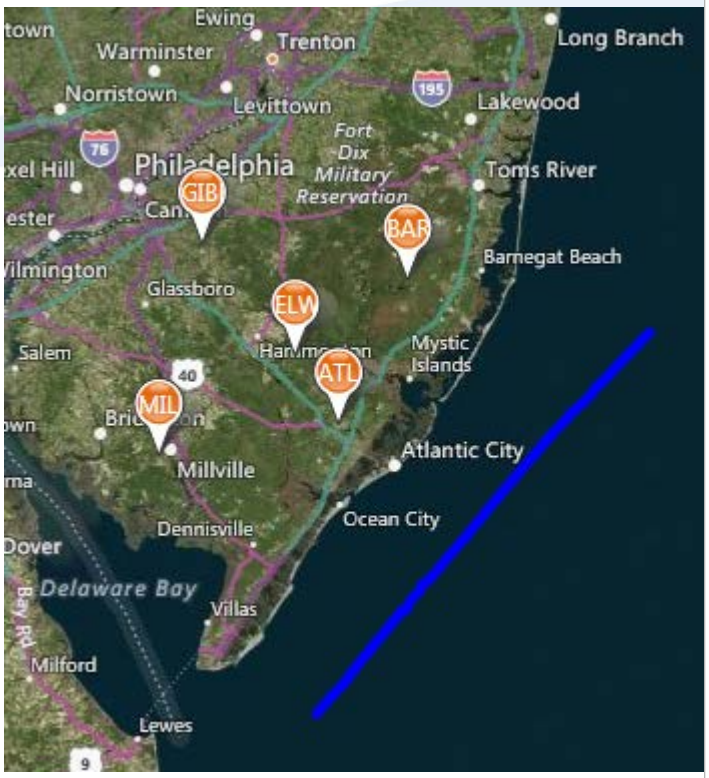

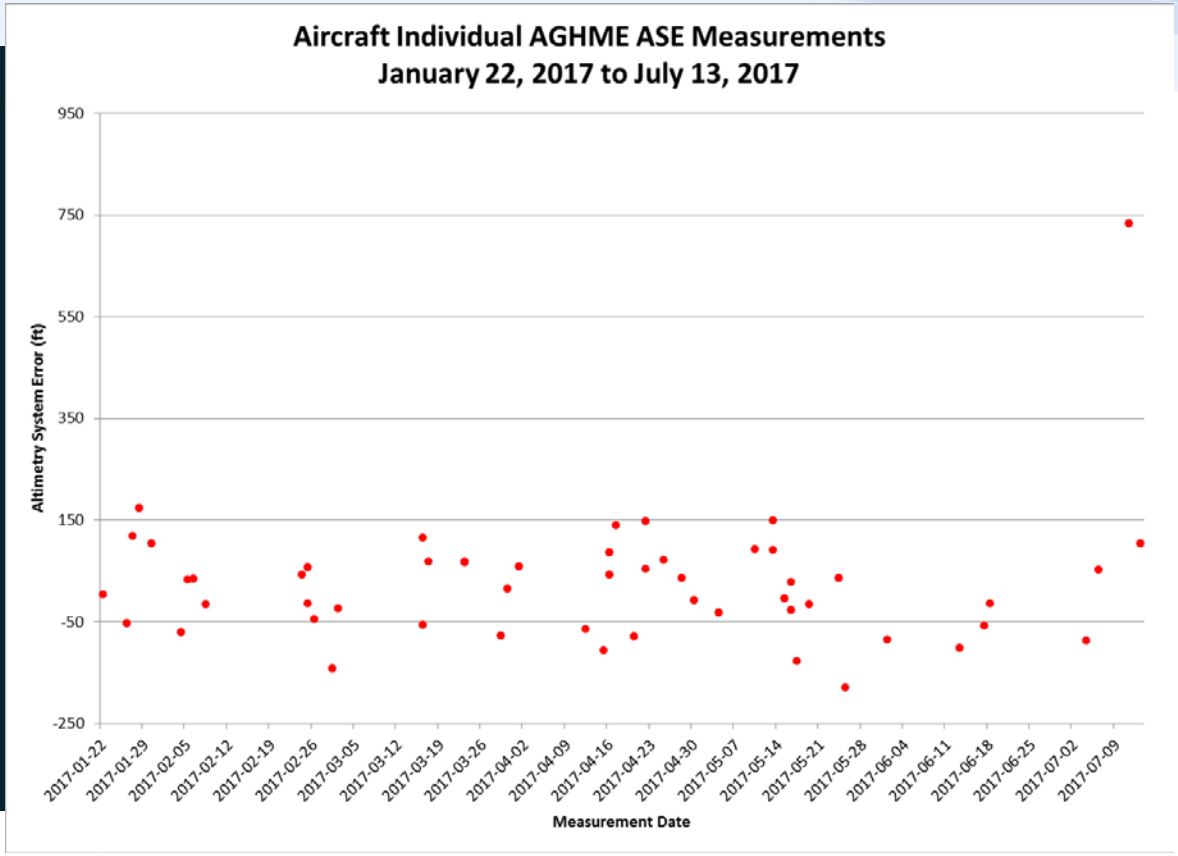

Aircraft is monitored regularly by AGHME systems. The outlier can be rejected as representative of its ASE.

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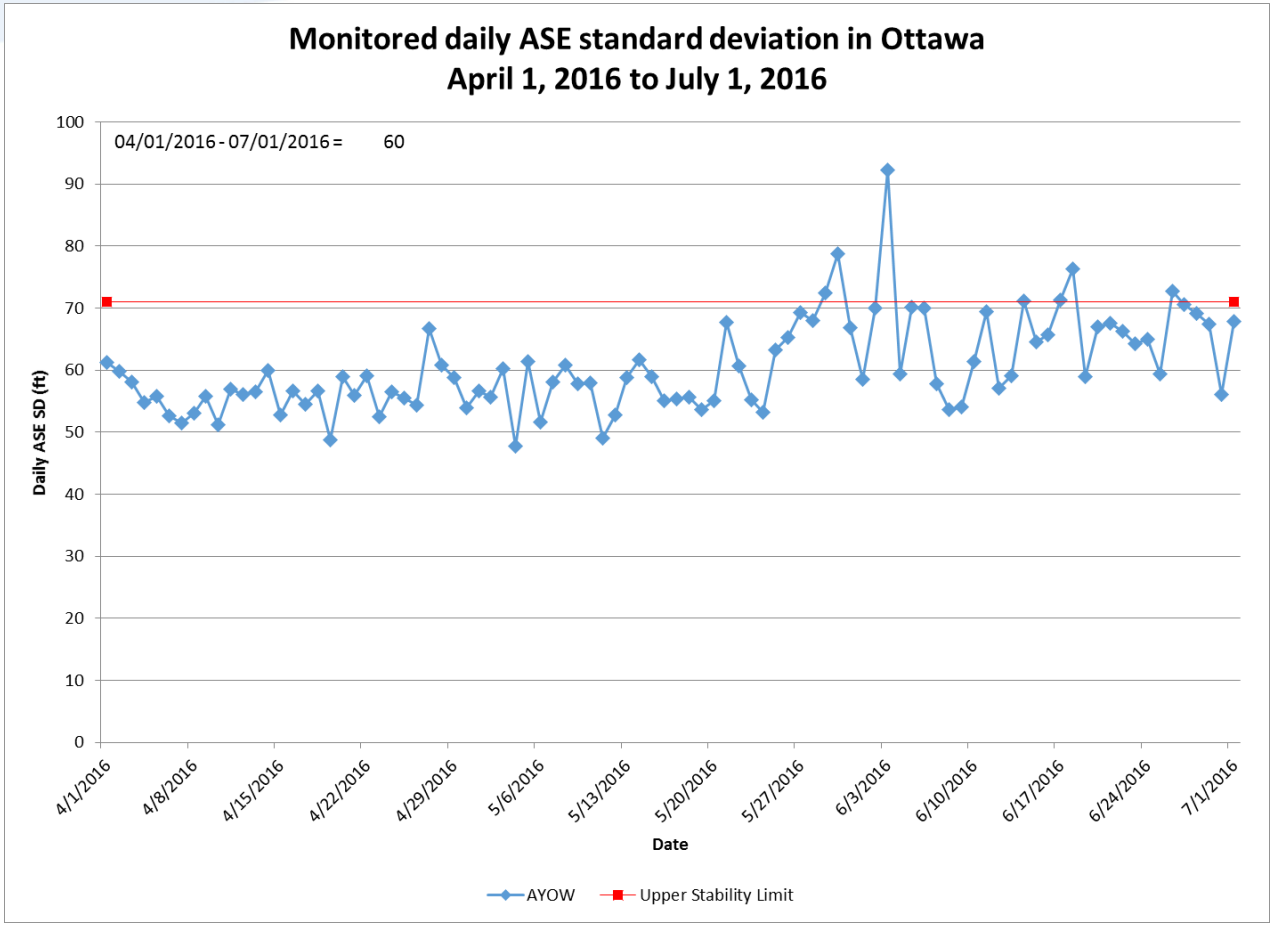
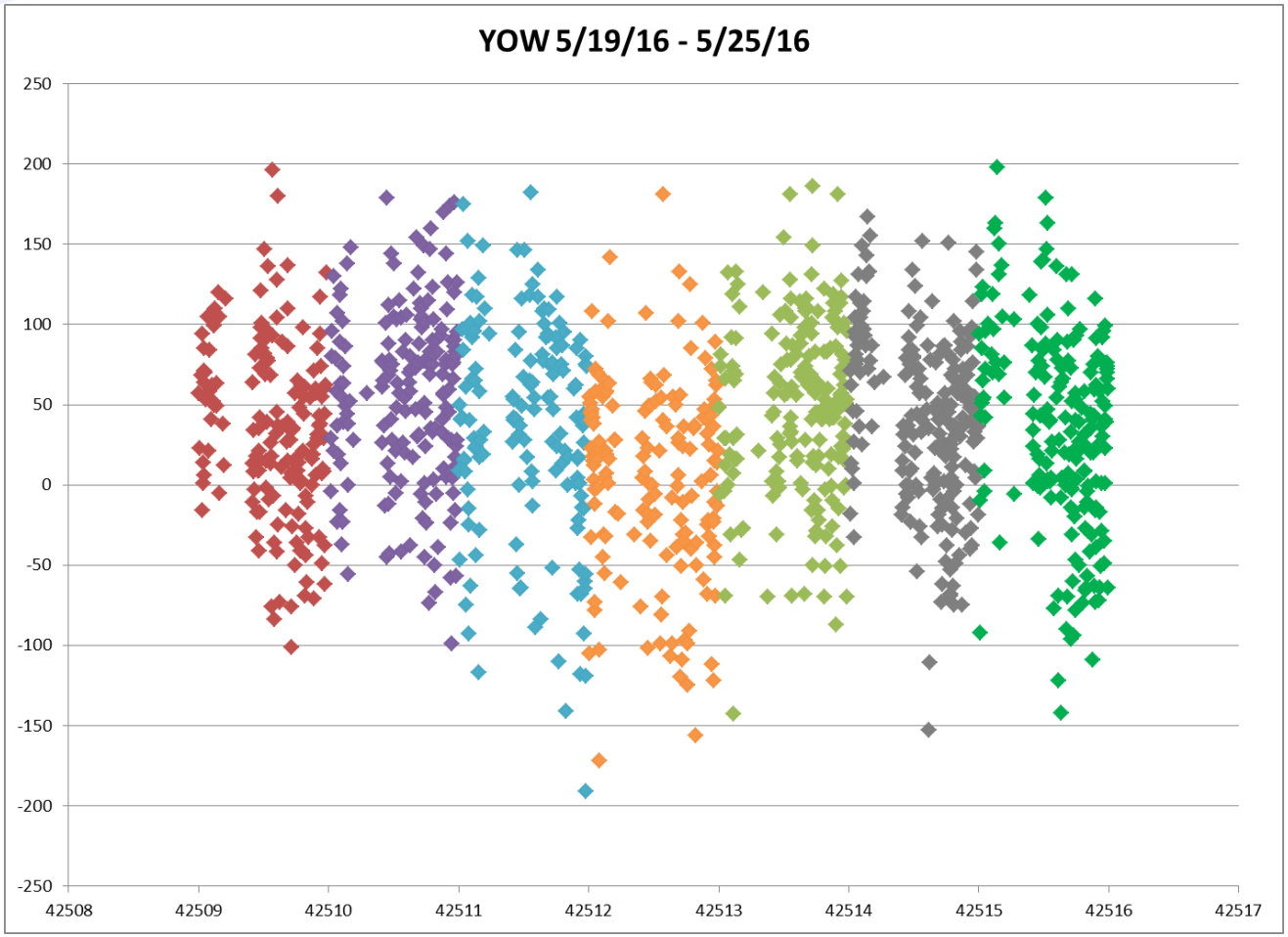
Daily Statistics from Ottawa



Daily Comparison of Ensemble ASE



May 22, shown in orange, had a significantly lower ensemble bias likely due to met data issues

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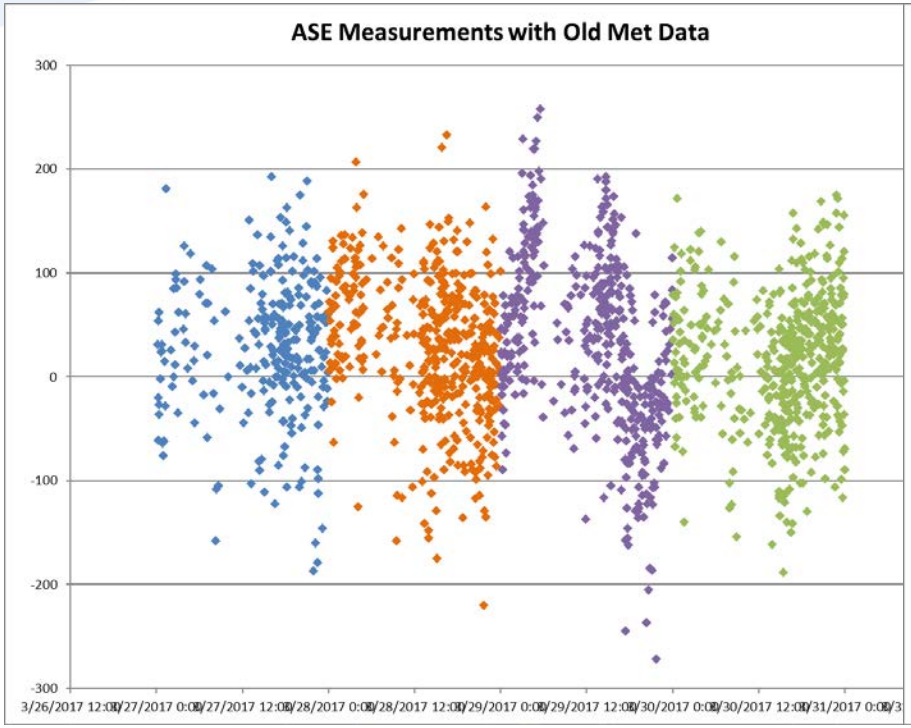
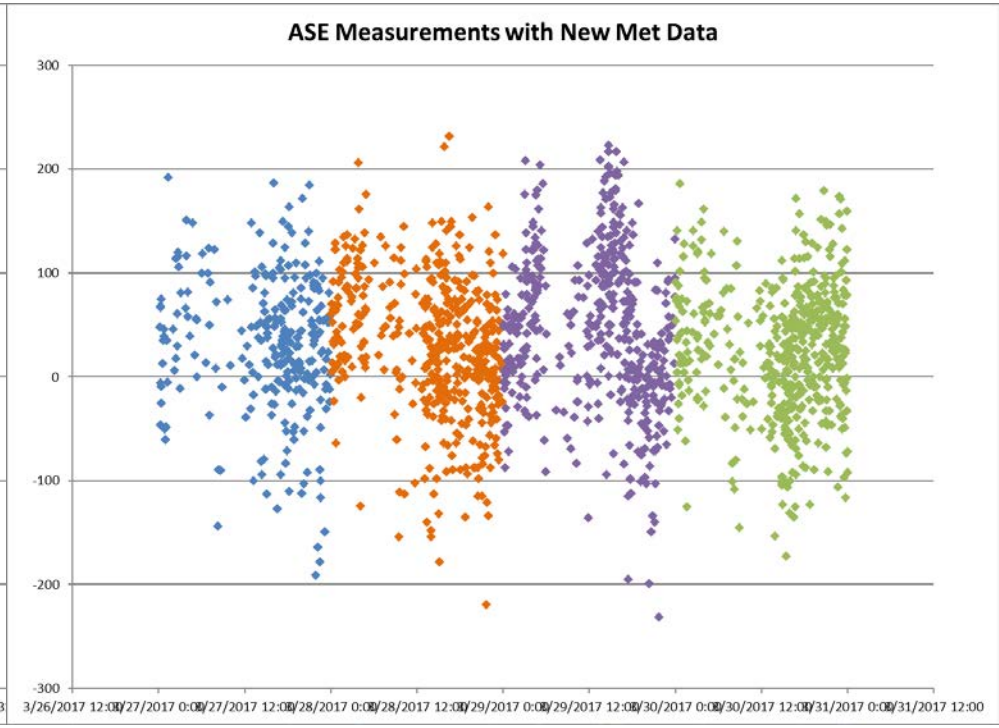
Improvement to Met Data





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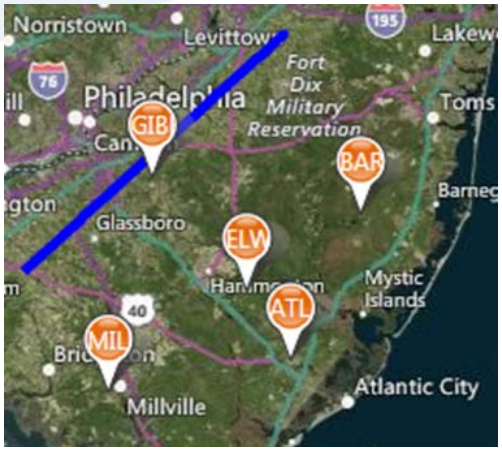
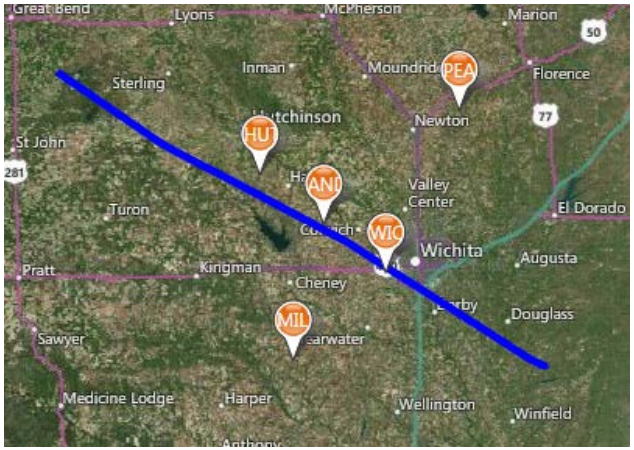
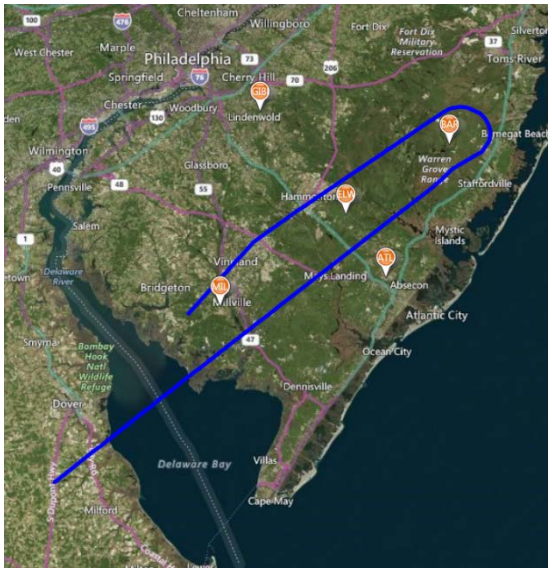
Recent AHGME Flight Inquiries







Atlantic City ASE 259 SD 39	Wichita ASE 210 SD 6	Atlantic City ASE -14 SD 21

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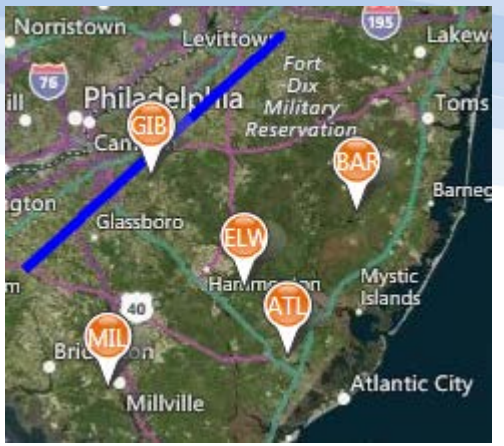
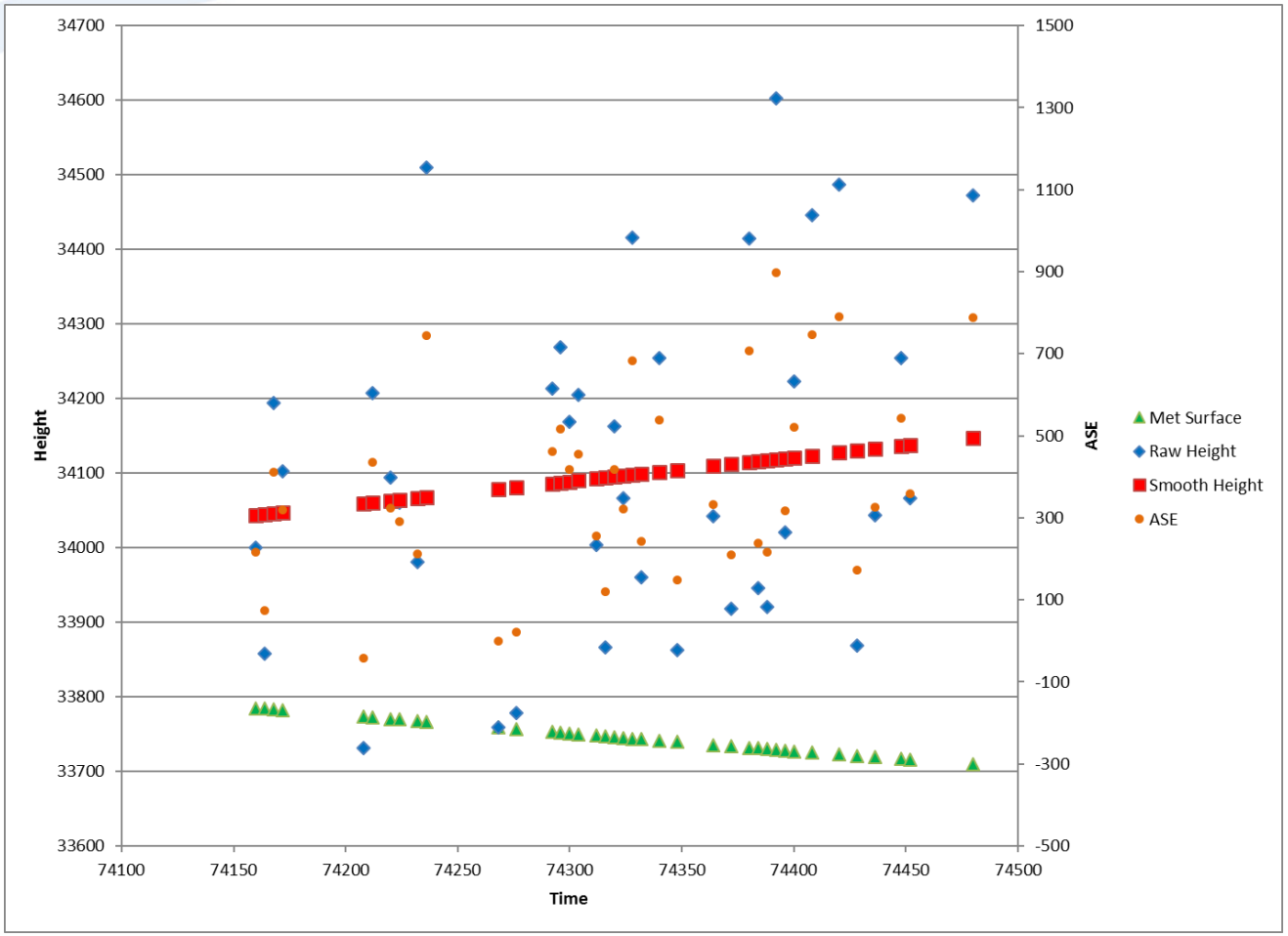
Atlantic City AGHME Flight





Aircraft flew far from the center

300 Second duration

Poor MET/Aircraft surface agreement due to the aircraft or the flight track?

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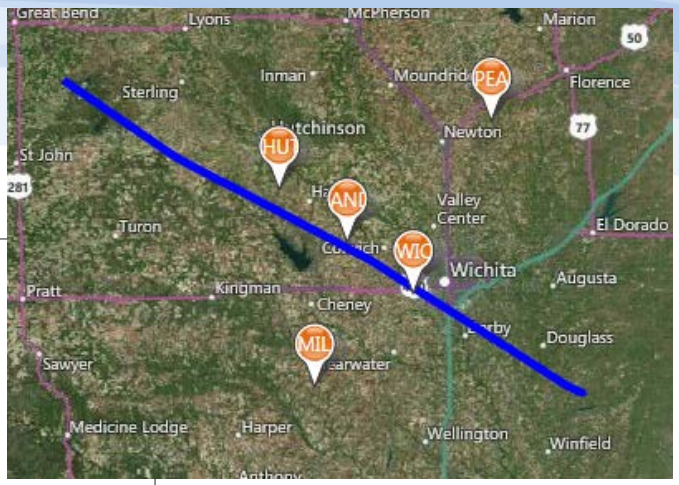
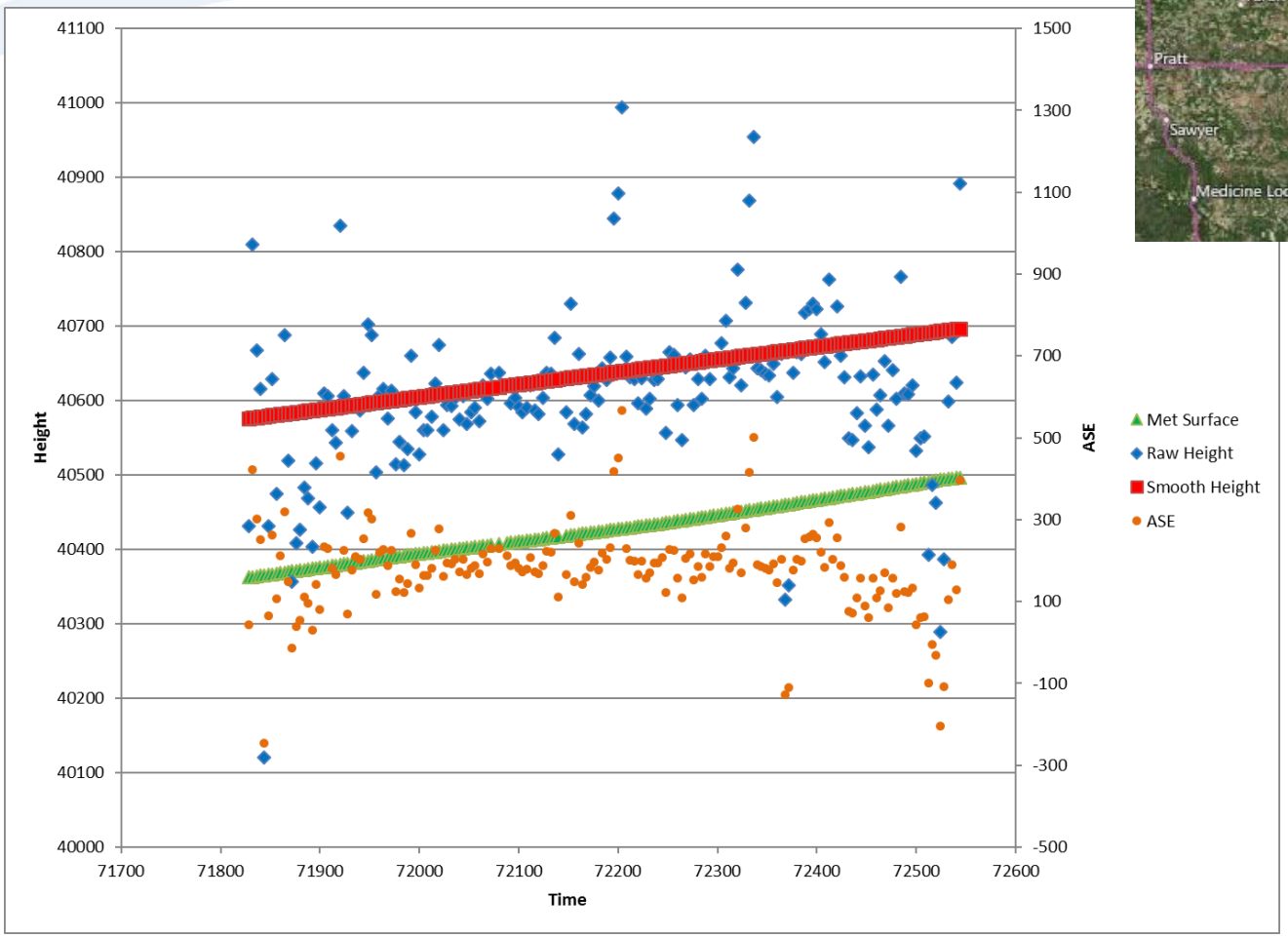
Wichita AGHME Flight





Preferred track

1,000 Second Duration

Good MET/Aircraft surface agreement confirms 210 ASE

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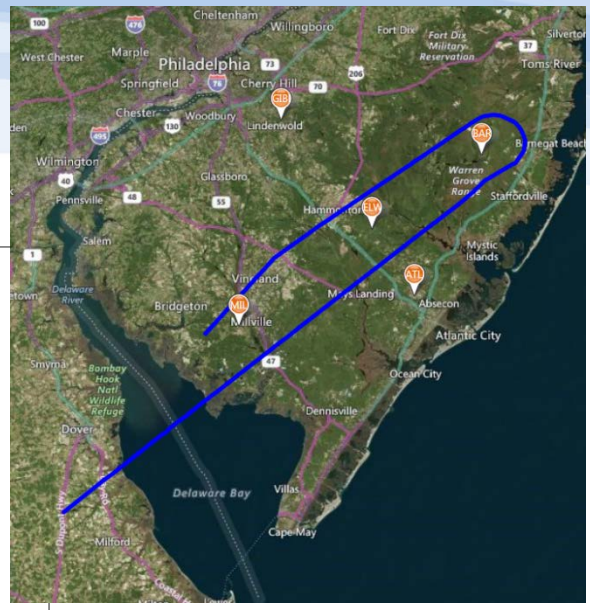
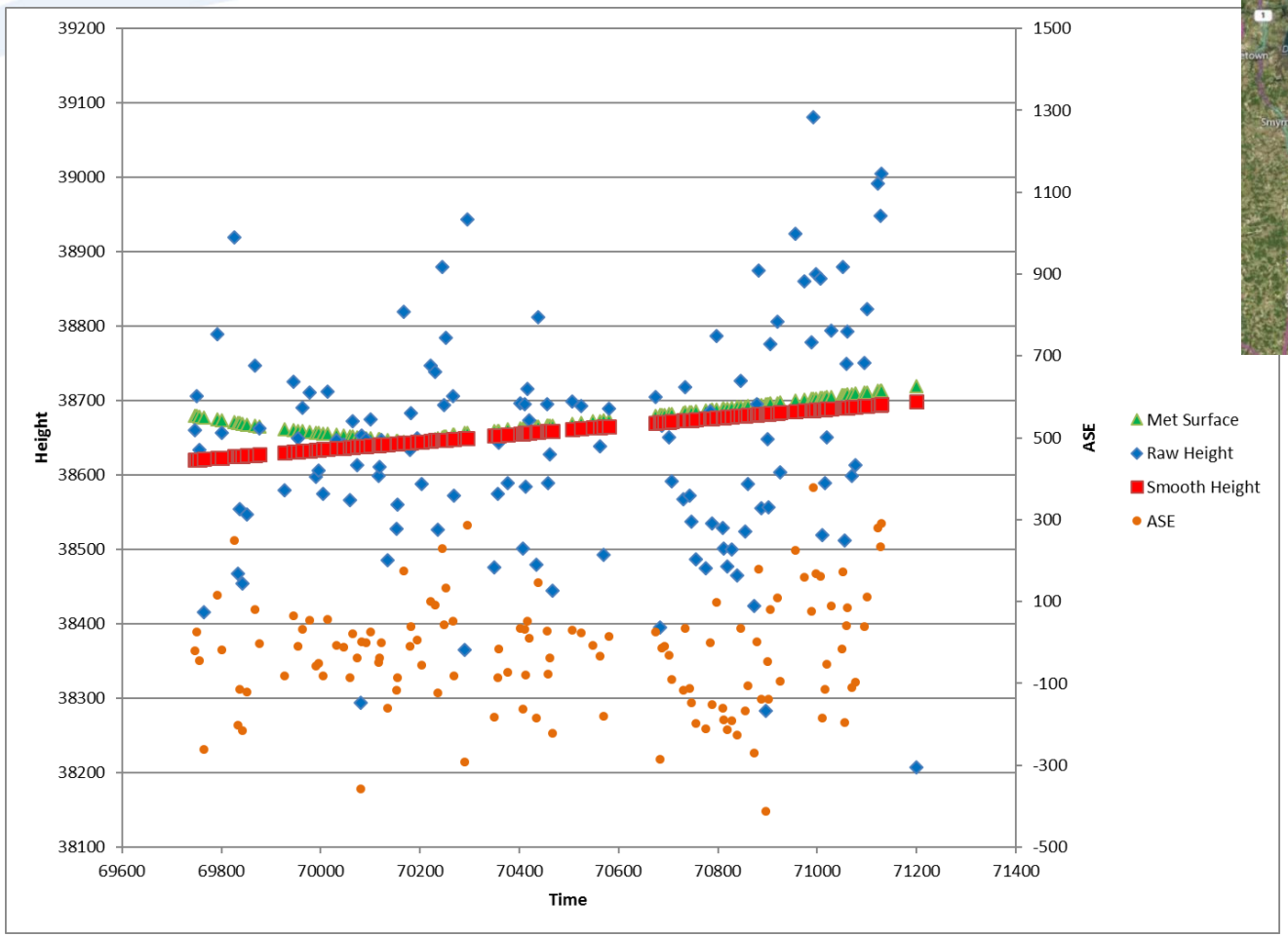
Atlantic City AGHME Flight





Aircraft flew twice through the center

2,500 Second duration

Good MET/Aircraft surface agreement confirms good ASE

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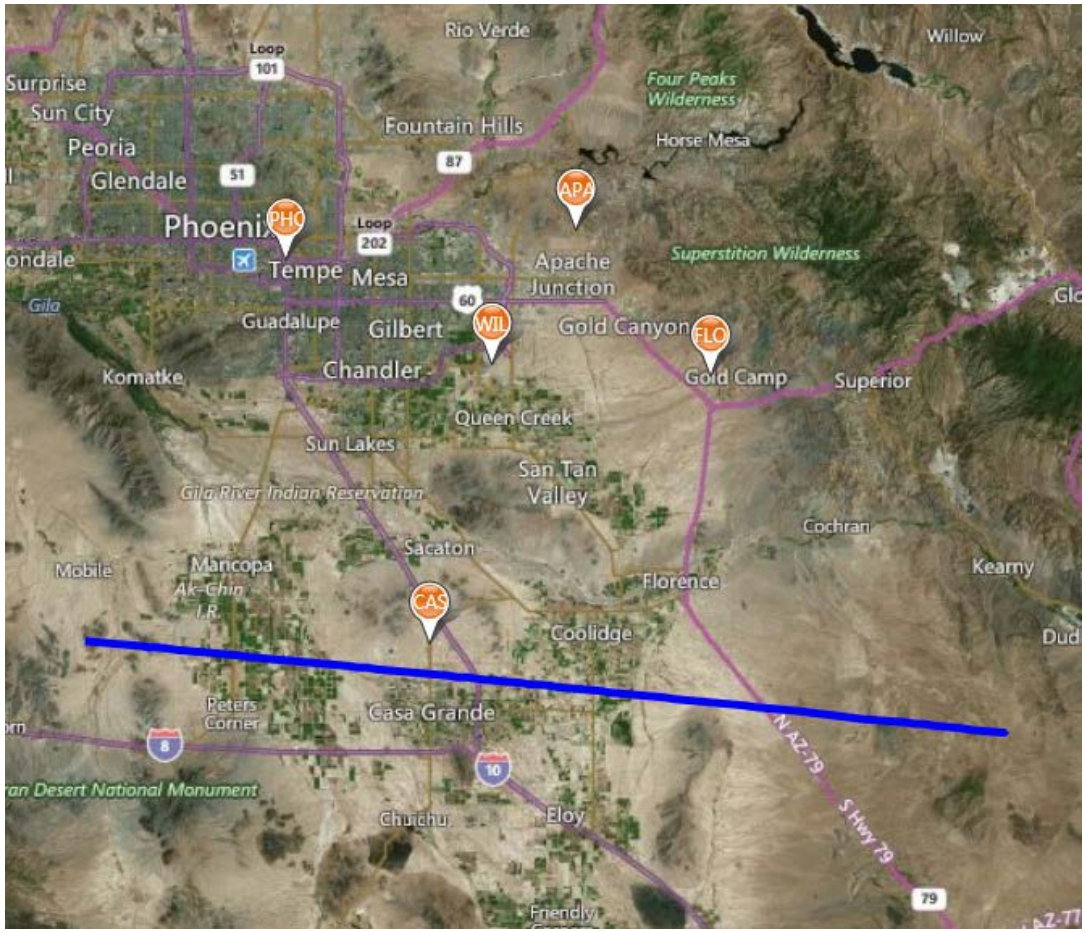
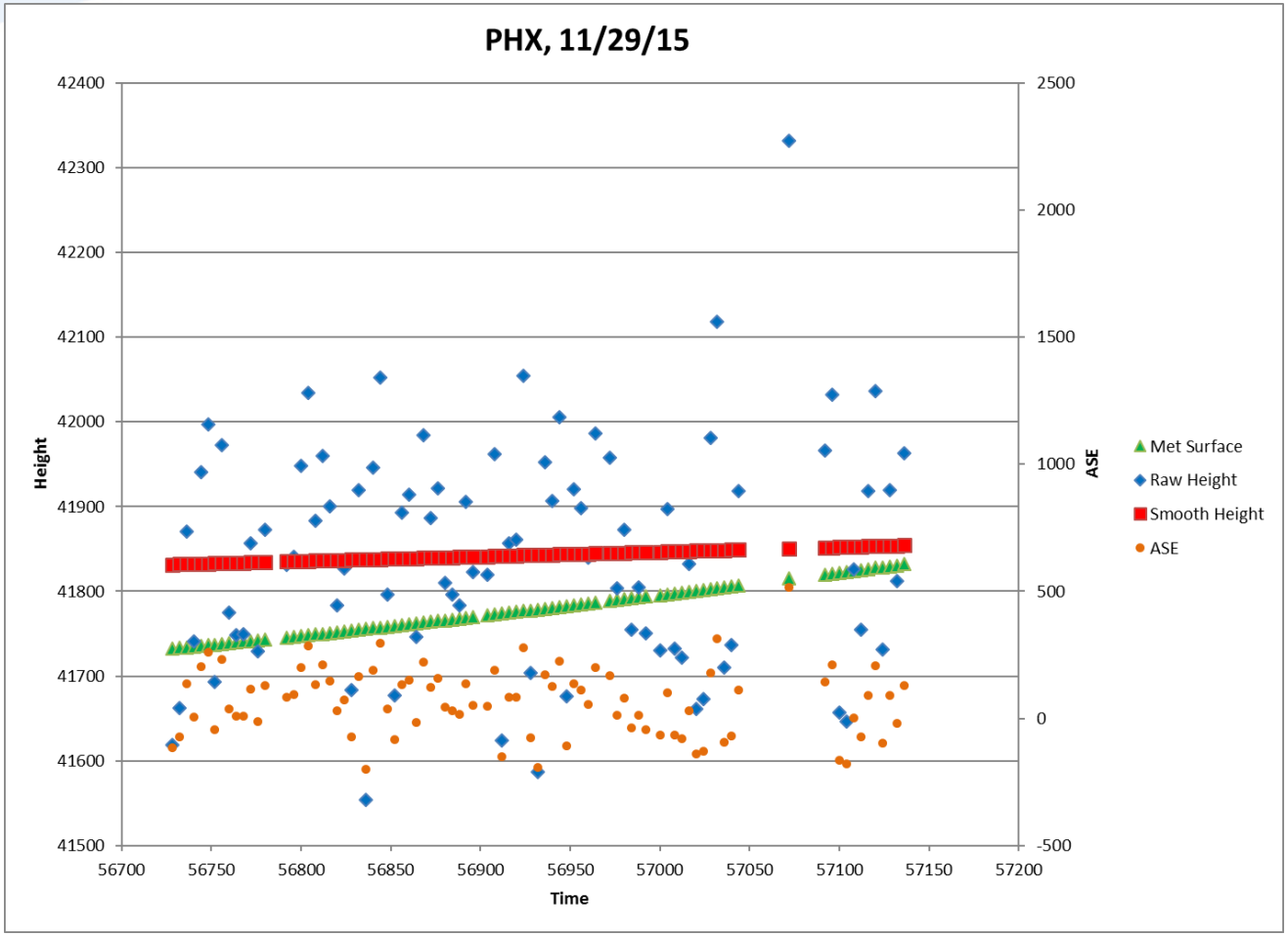
Pressure Surface Alignment Sample Case with ADS-B

Phoenix
ASE 70
SD 42



AGHME Aircraft Height and MET Alignment



Well-sampled flight

308 Second Duration

Moderate MET/Aircraft surface agreement

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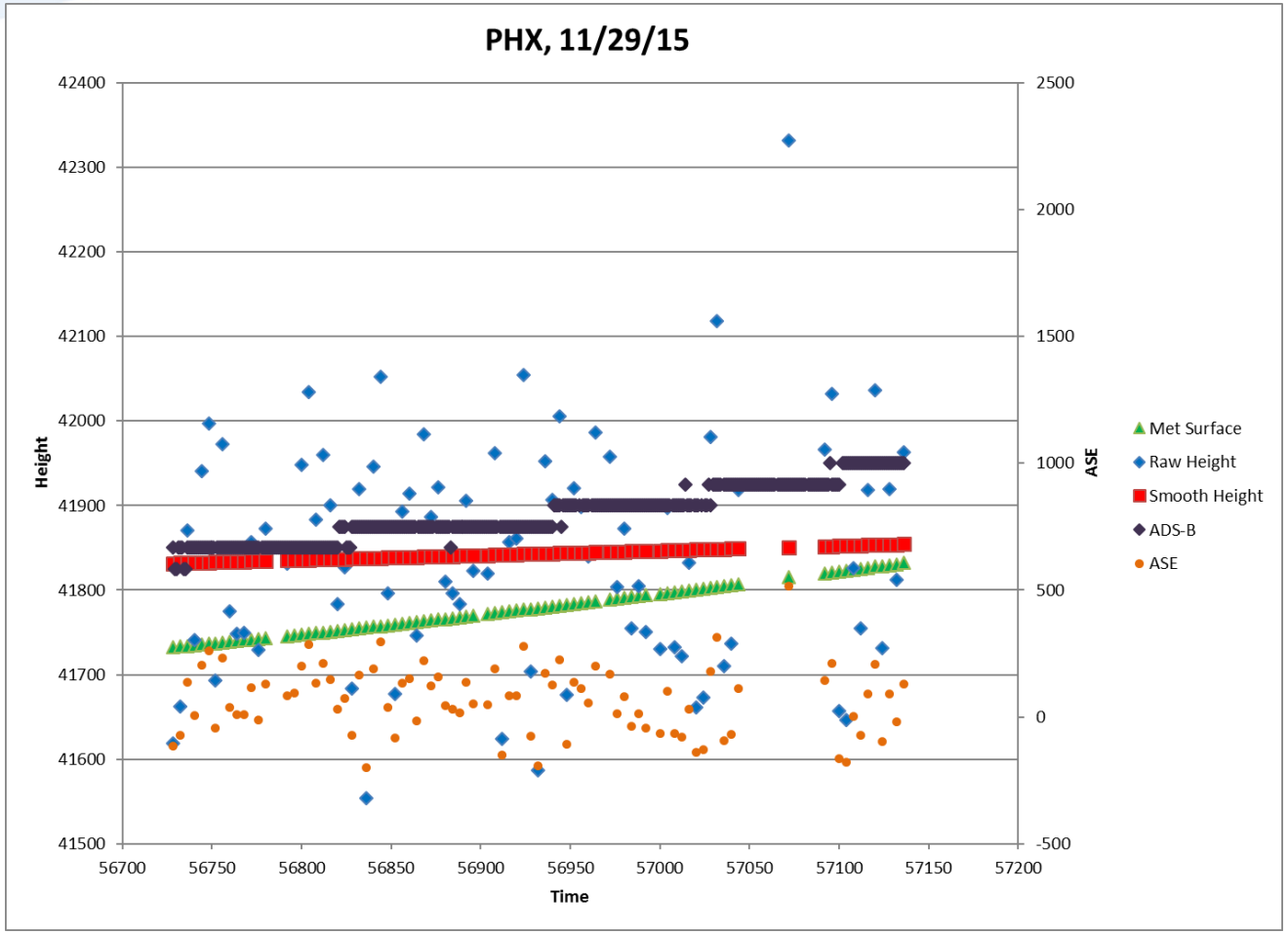
ADS-B Aircraft Height and MET Alignment



Continuous ADS-B data aligned with AGHME data

Improved MET/Aircraft surface dynamic agreement

Estimate of ASE	
AGHME	ADS-B
70	114
42	10

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Conclusion

- Ensure high confidence in accurate ASE results
- Report only verified monitoring results to operators to decrease monitoring burden