OFCM Session 6 – Urban Test Beds Vehicles as Mobile Platforms

Andrew Stern
Consulting Meteorologist
FHWA Road Weather Management Team
Noblis, Inc., Falls Church, VA

July 9, 2008 – Fairfax, VA

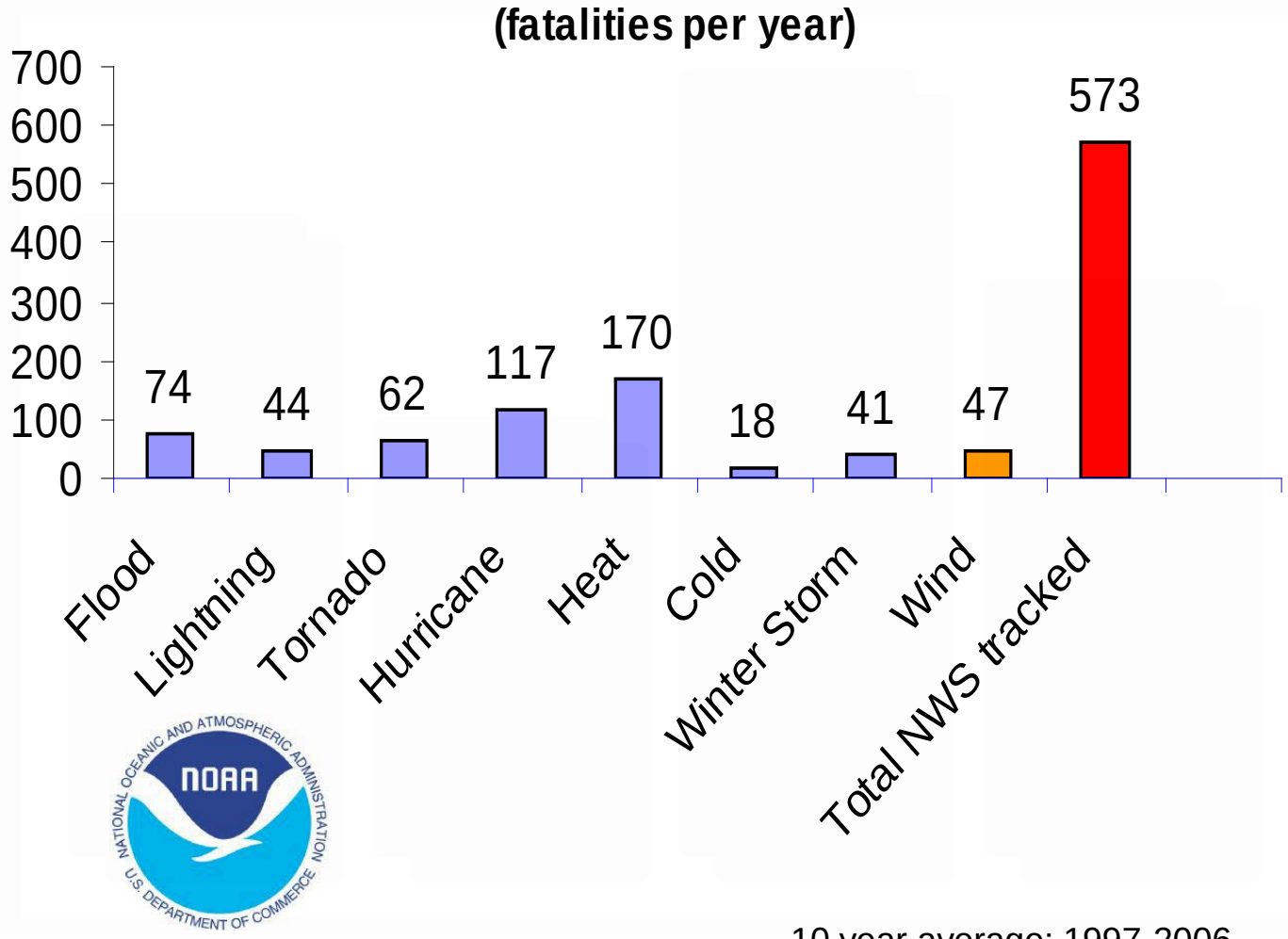
12th Annual GMU Conference on

Atmospheric Transport & Dispersion Modeling

Contact: astern@noblis.org; 703-610-1754

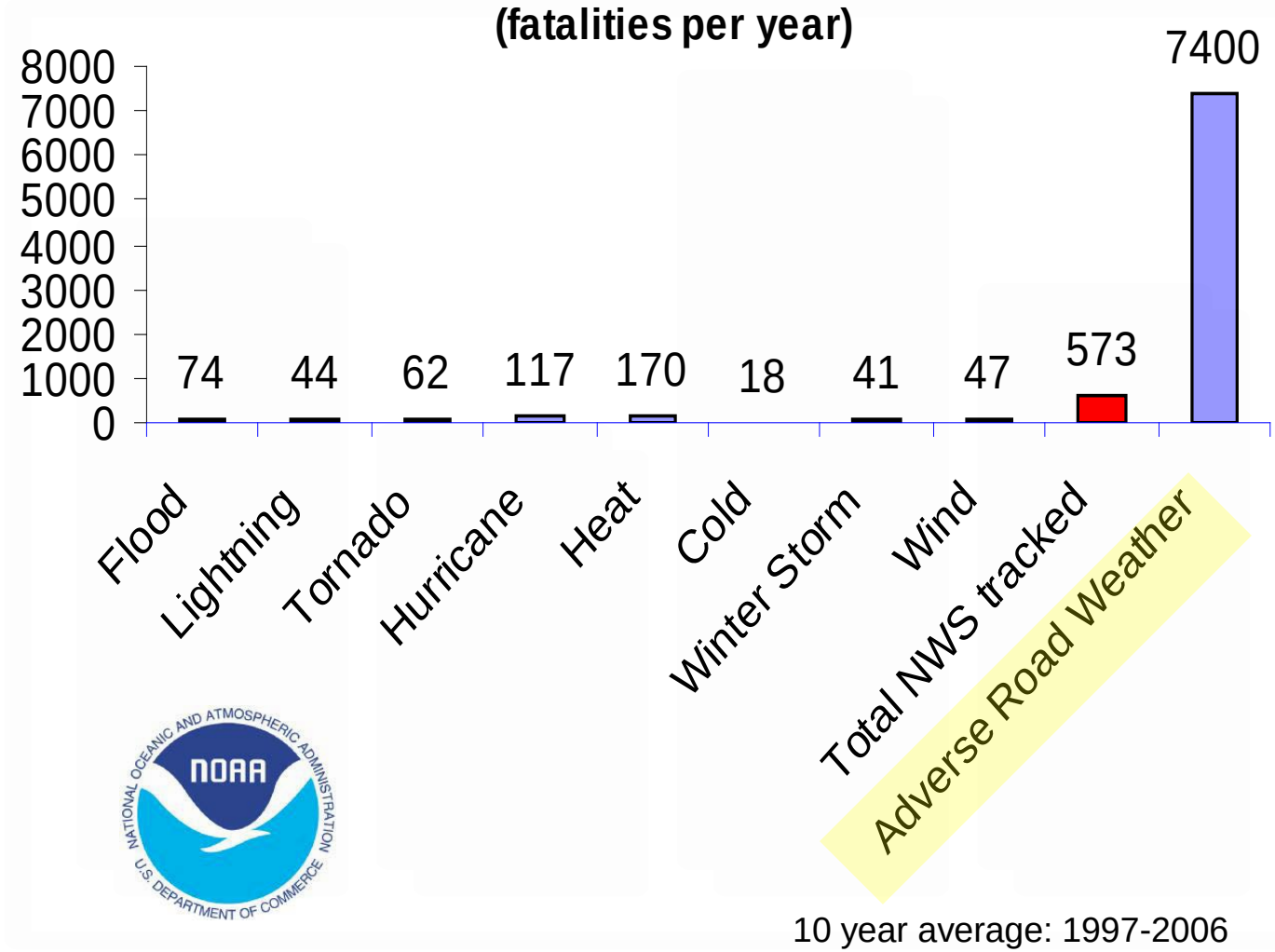
noblis

Annual Weather Related Fatalities



10 year average: 1997-2006

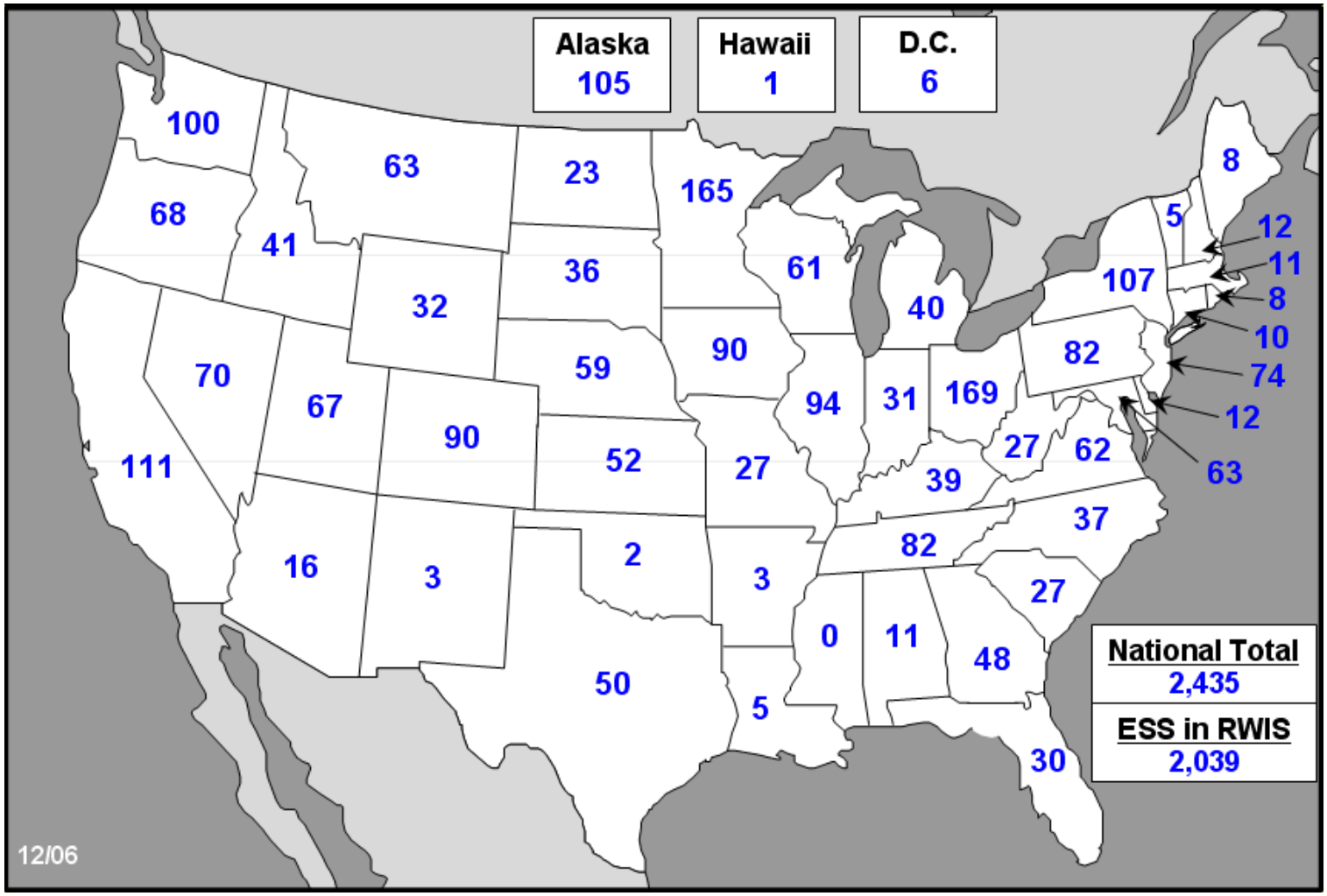
Annual Weather Related Fatalities



10 year average: 1997-2006

ESS Owned by State DOTs

An Environmental Sensor Station (ESS) is any site with sensors measuring atmospheric conditions, pavement conditions, and/or water level conditions.

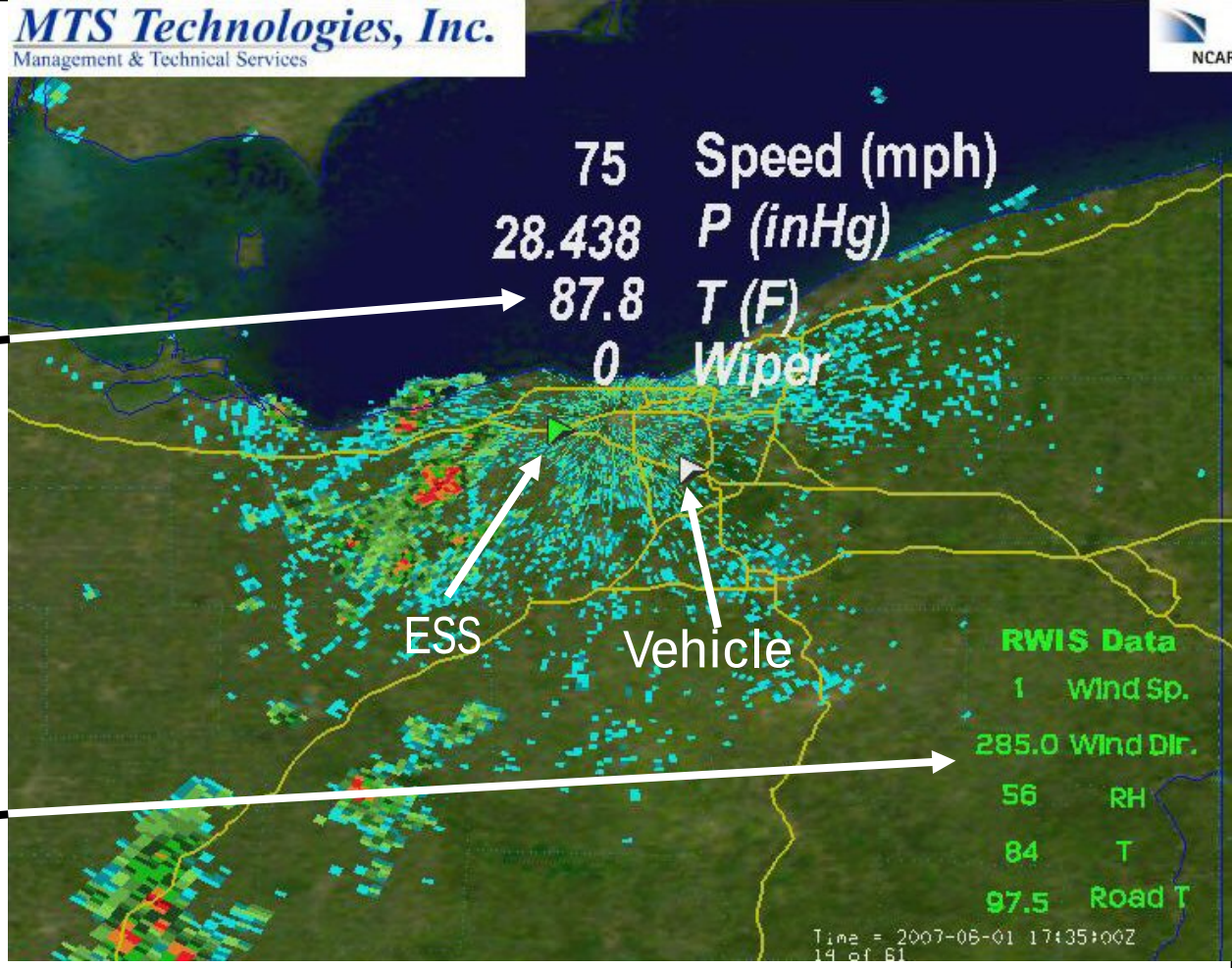


Vehicle-based data:

- Speed (mph)
- Pressure (in Hg)
- Air Temperature (F)
- Wiper State
  - 0=Off
  - 1-5=Intermittent
  - 13=On Low
  - 14=On High

ESS Data

- Wind Speed/Dir
- Air Temp/RH
- Road Temp



Pre-VII Proof of Concept Research June 1 2007

Setup:

- Vehicle heading west along I-80/Ohio Tnpk (white triangle)
- Subset of vehicle sensor data are captured
- Data are correlated with radar each volume
- Road weather station data are also captured (green triangle)

Wiper State: Off

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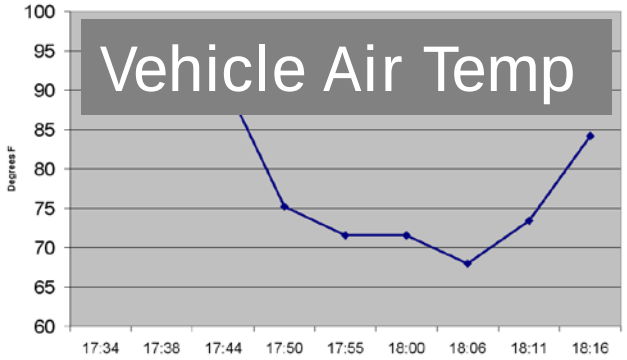
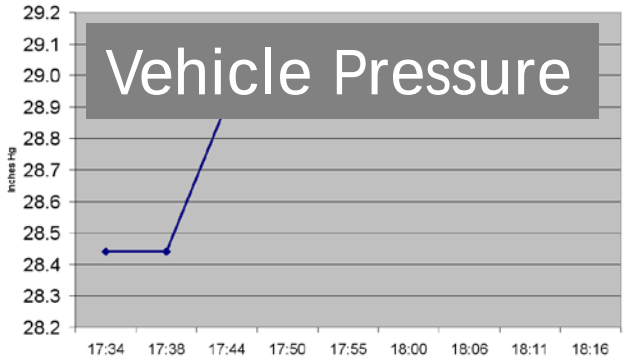
Management & Technical Services

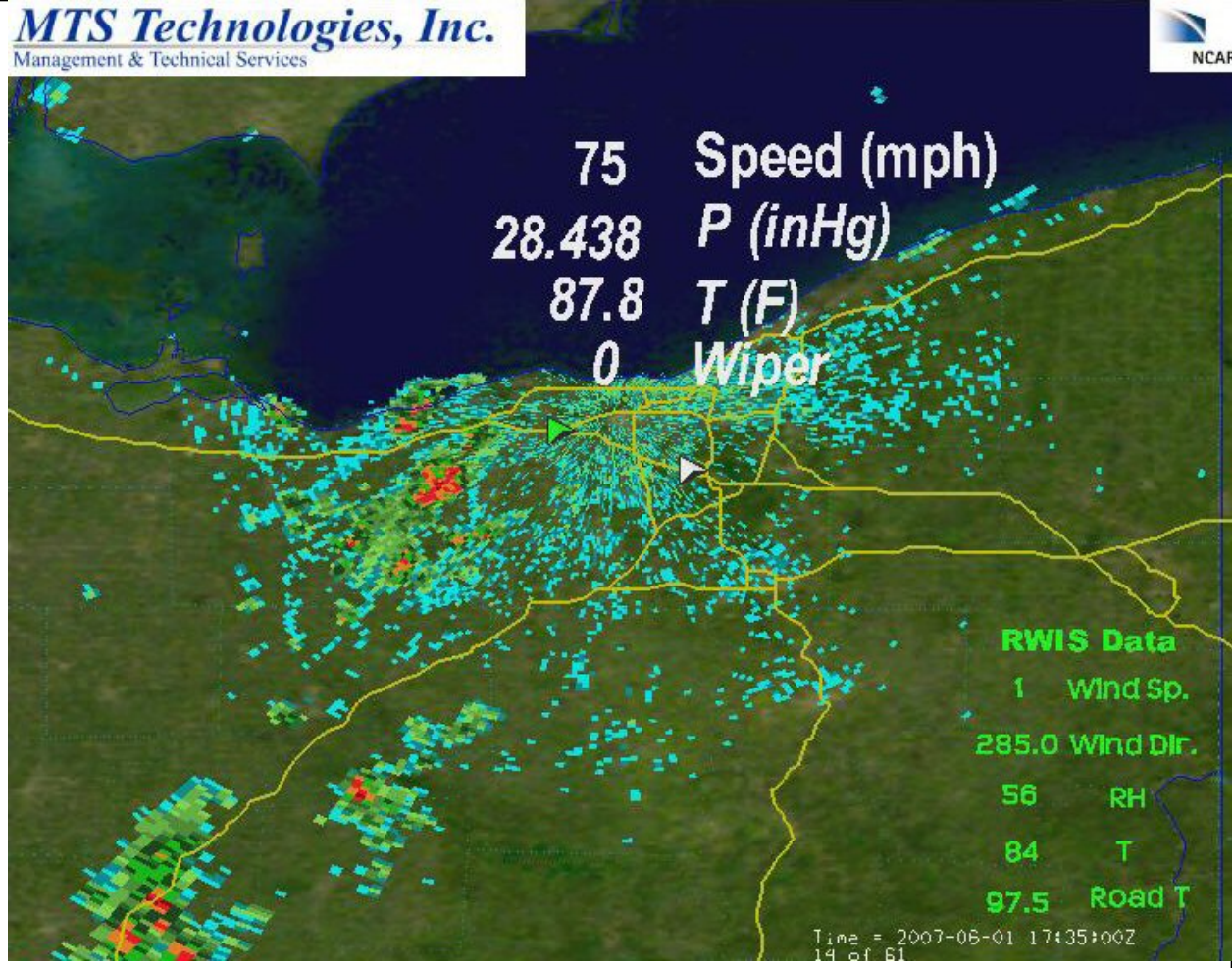
NCAR

Vehicle Air Temperature

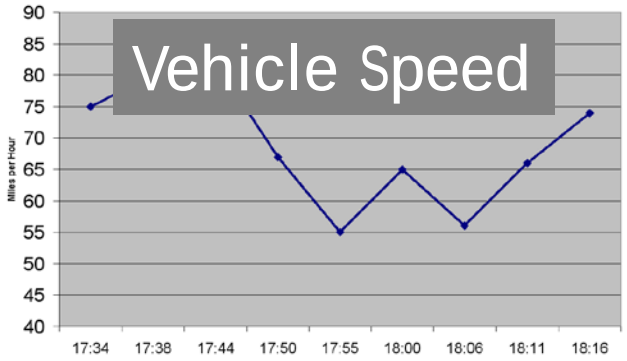


Vehicle Pressure

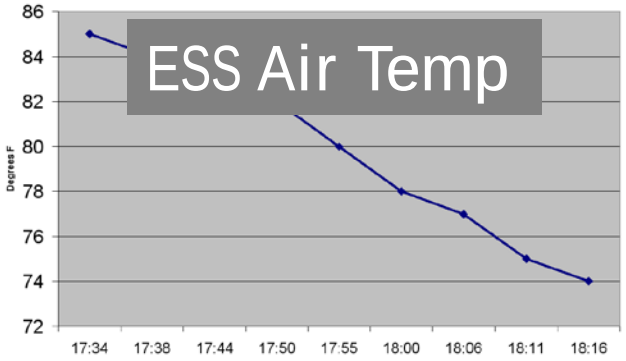




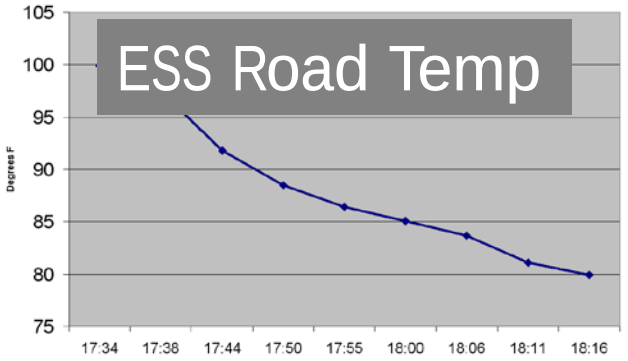
Vehicle Speed



ESS Air Temperature



ESS Road Temperature



Wiper State: Off

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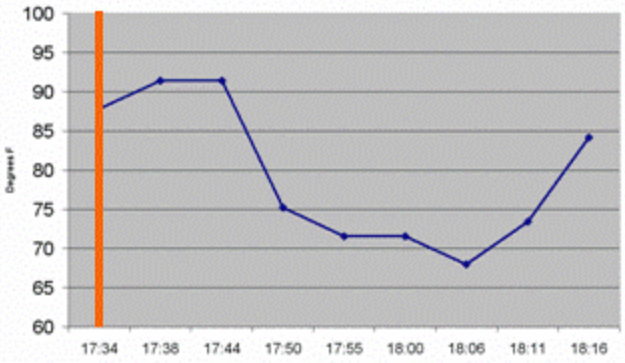
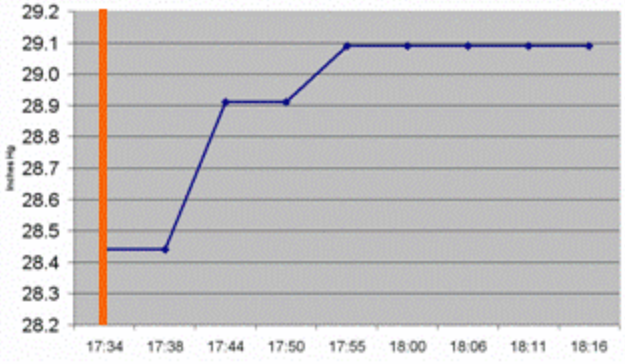
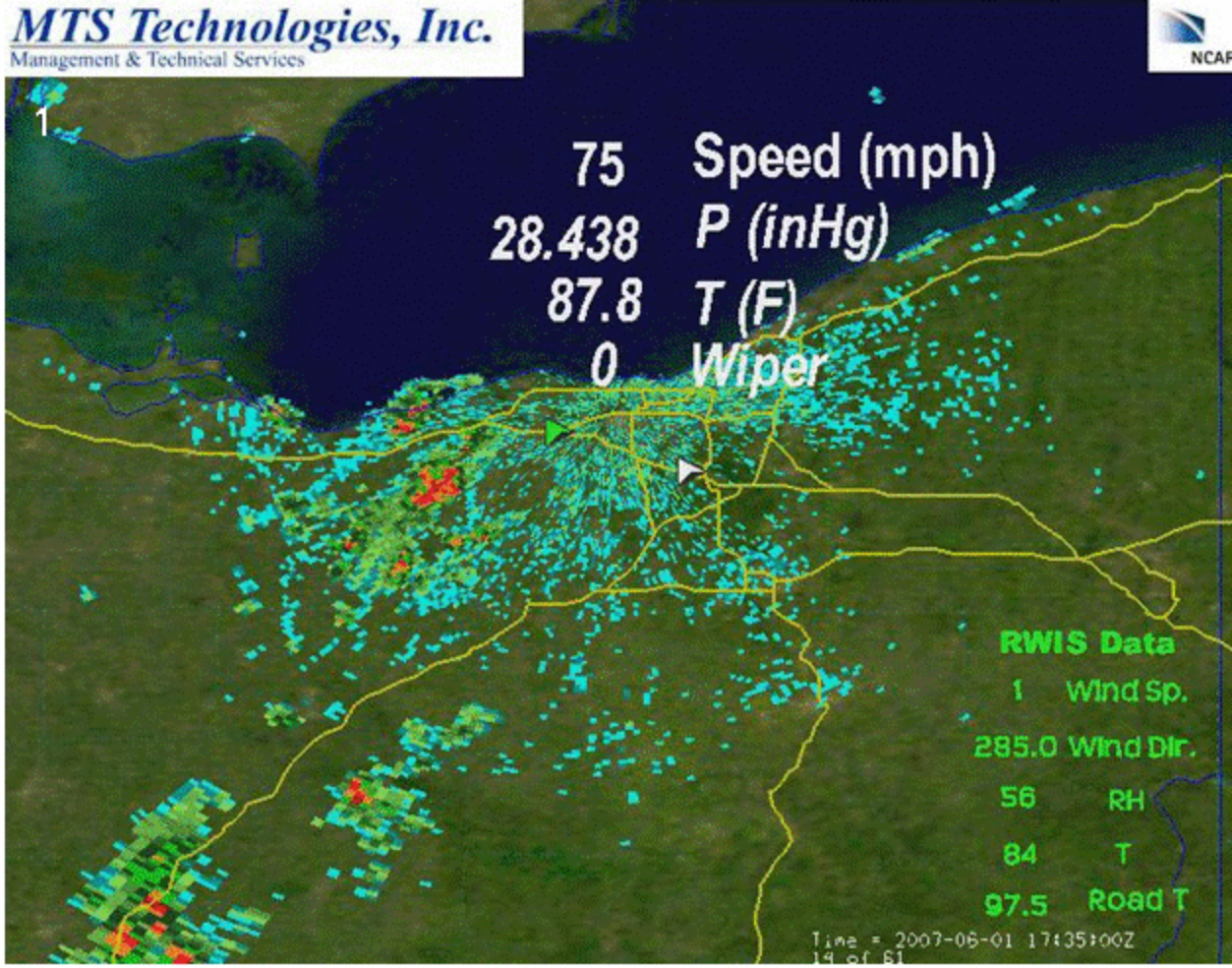
Vehicle Air Temperature

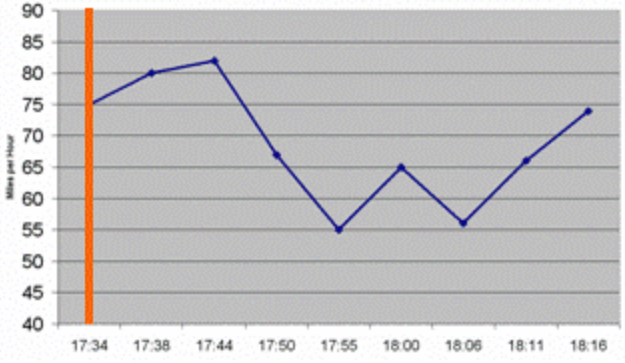


Vehicle Pressure

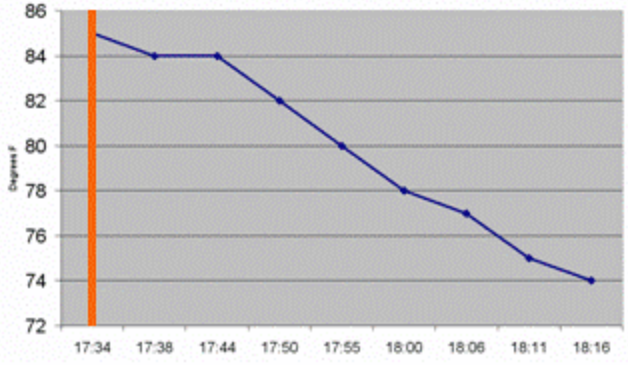




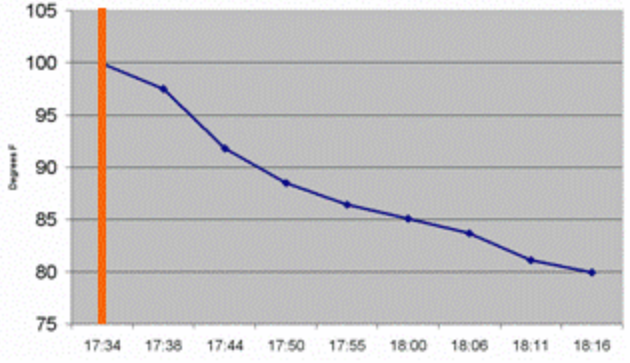
Vehicle Speed



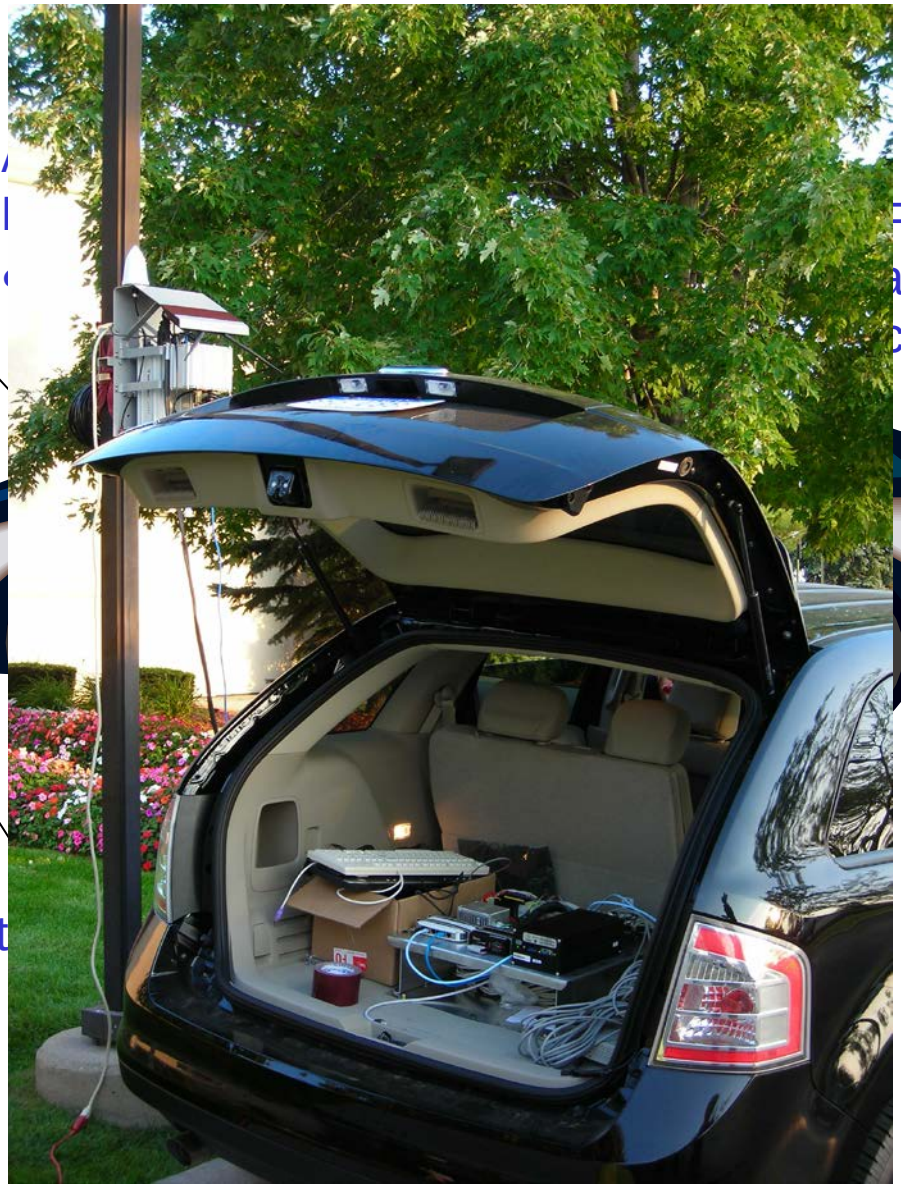
ESS Air Temperature



ESS Road Temperature



Vehicle-based Probe Data Elements



Barometric Pressure

Brake Status & Boost

Headlight Status

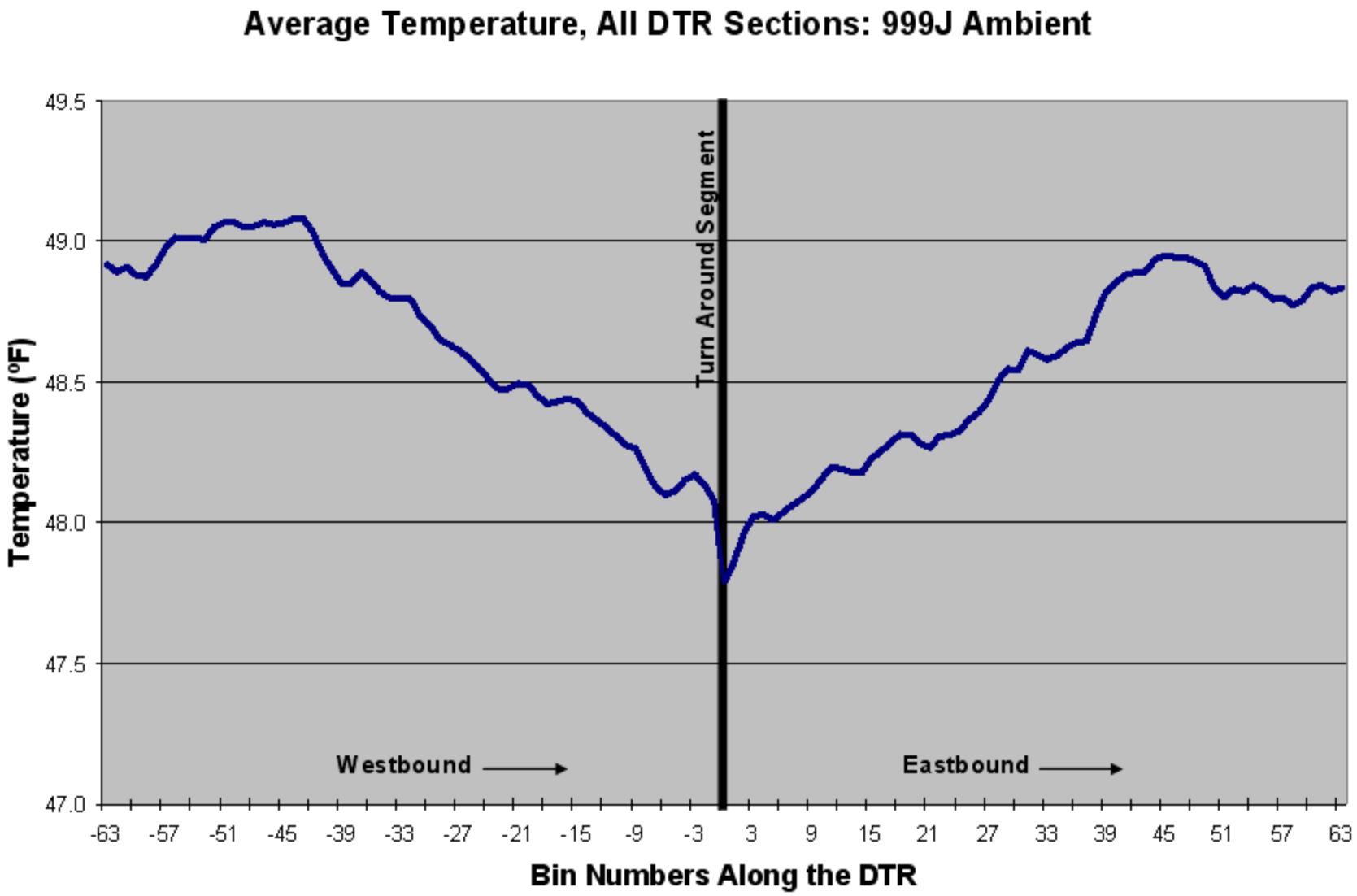
External Air Temperature

Fog Stat

Position, Heading, ation & cle Speed

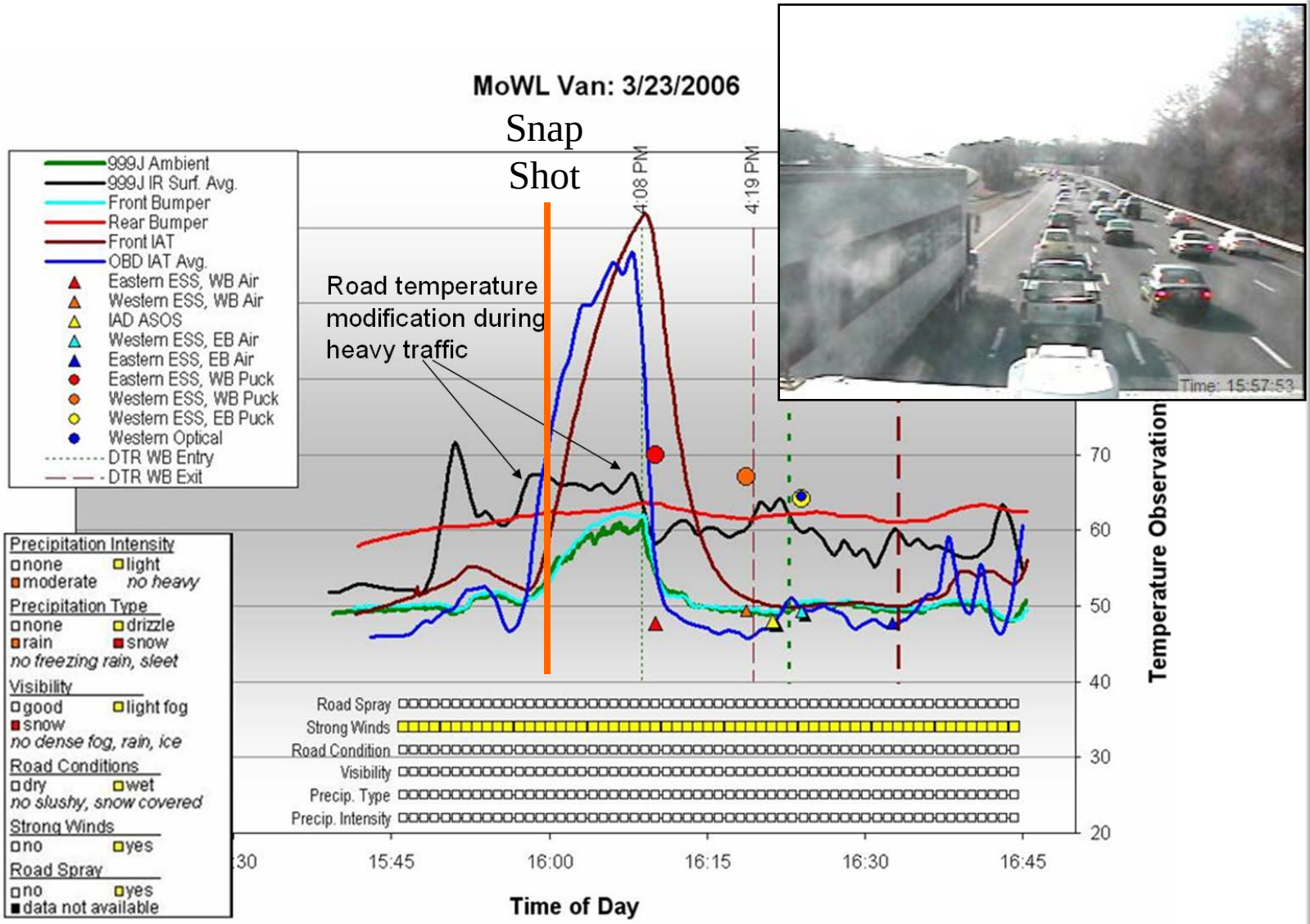
Anti-lock Braking System

DTR Thermal Profile (Air Temp)

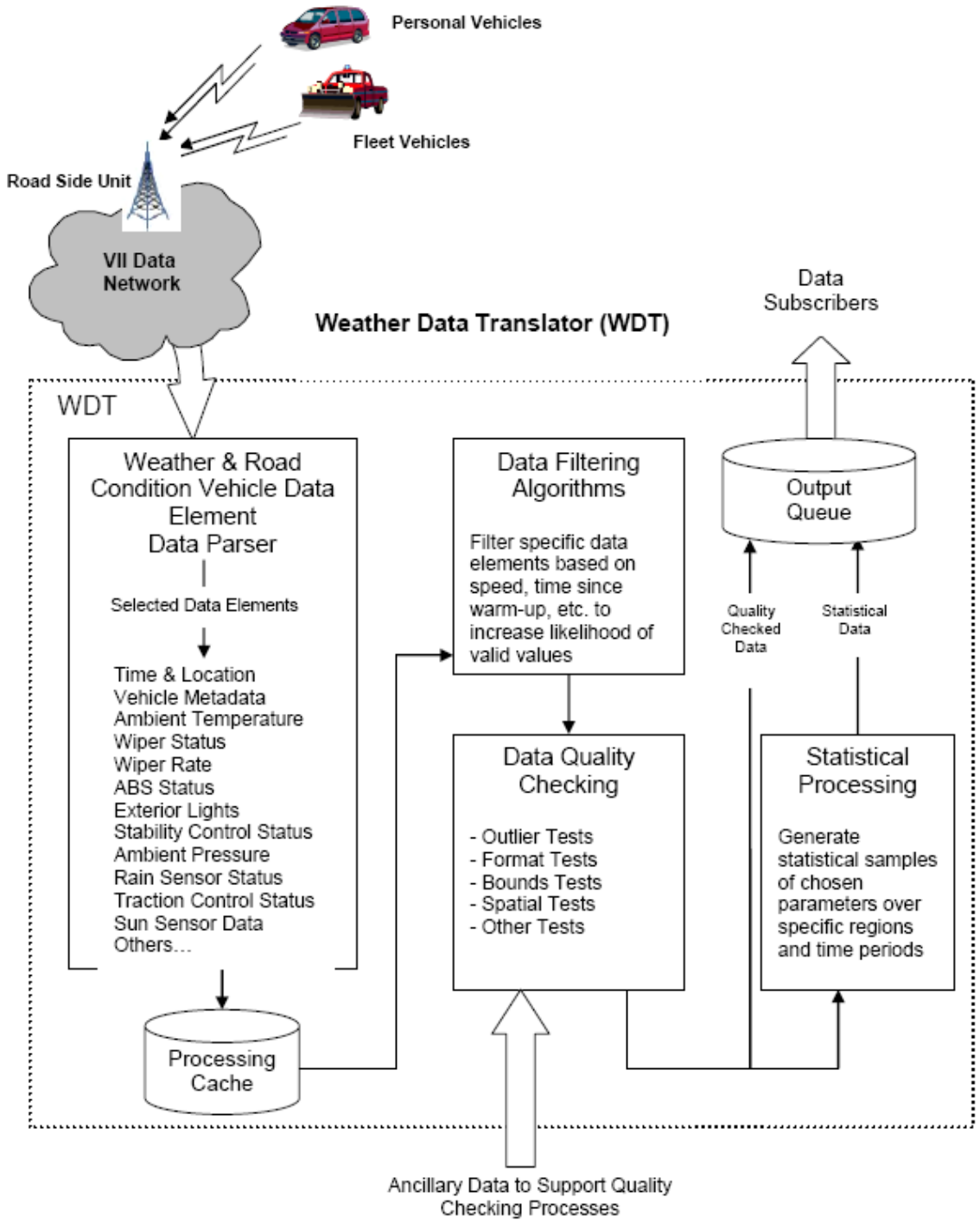


Tysons near Dulles Tysons

Congestion Modifying Road Temps



Weather Data Translator



Derived Observations

- Combines vehicle-based data with in situ or remote-sensed data to infer or derive a new field. Potential fields include:

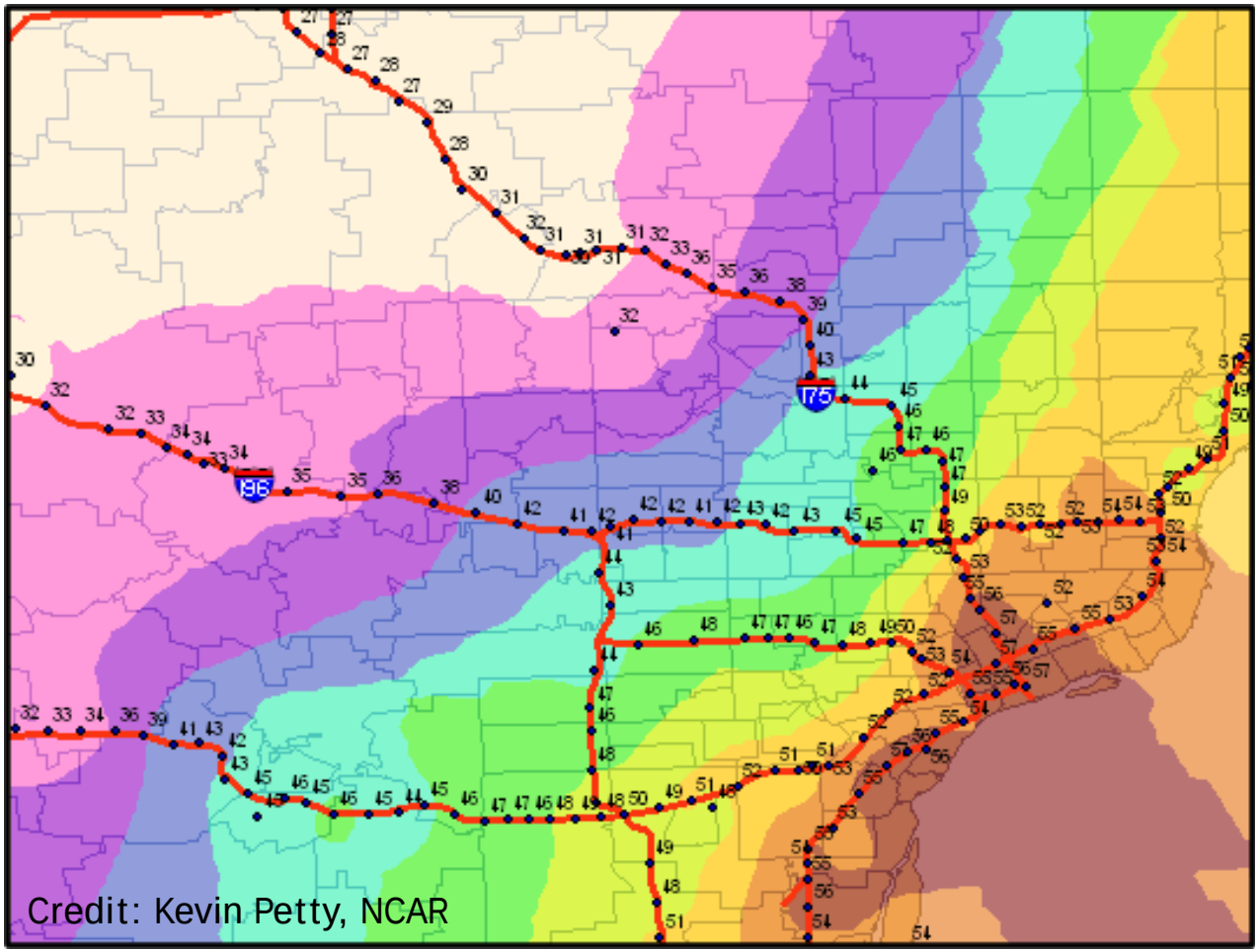
Derived Elements	Sources
• Air temperature	Obs Ta, ESS
• Precipitation occurrence (yes, no)	Wiper, Radar
• Precipitation intensity (none(NP), light(LGT), moderate(MDT), heavy(HVY))	Wiper, Radar
• Precipitation type (liquid, frozen)	Obs Ta, ESS
• Barometric pressure	Obs Pr, ESS
• Pavement condition (not slippery, slippery)	Obs VTC/VSC
• Frictional Index (0.0 – 1.0)	Derived
• Vehicle Speed	Obs Speed

Research Questions

- How many probe data samples are needed to obtain quality observations?
- How often should vehicle-based observations be generated?
- Should observations be synchronized to clock time or radar volume times?
- How long should a road segment be?
- Should these definitions be consistent in urban & rural regions, during commuting times & at night?

Our Vision

- Increasing quality surface observation data density from thousands to millions



Credit: Kevin Petty, NCAR

Contact Information

- FHWA Road Weather Policy
  - Paul Pisano, Team Leader, Road Weather
  - Paul.Pisano@dot.gov, 202-366-1301
- VII/Road Weather Program
  - Pat Kennedy, Transportation Specialist
  - Pat.Kennedy@dot.gov, 202-366-9498
- Technical Consultant
  - Andy Stern, Meteorologist, Noblis, Inc.
  - astern@noblis.org, 703-610-1754

U.S. Department of Transportation
Federal Highway Administration

Road Weather Management