Québec 2010
AIPCR · PIARC

XIII INTERNATIONAL WINTER ROAD CONGRESS

QUÉBEC, FEBRUARY 8 TO 11, 2010

SUSTAINABLE WINTER SERVICE FOR ROAD USERS

IMPROVING ROAD WEATHER PRODUCTS WITH VEHICLE PROBE DATA

Michael Chapman

National Center for Atmospheric Research

Scientist

mchapman@ucar.edu

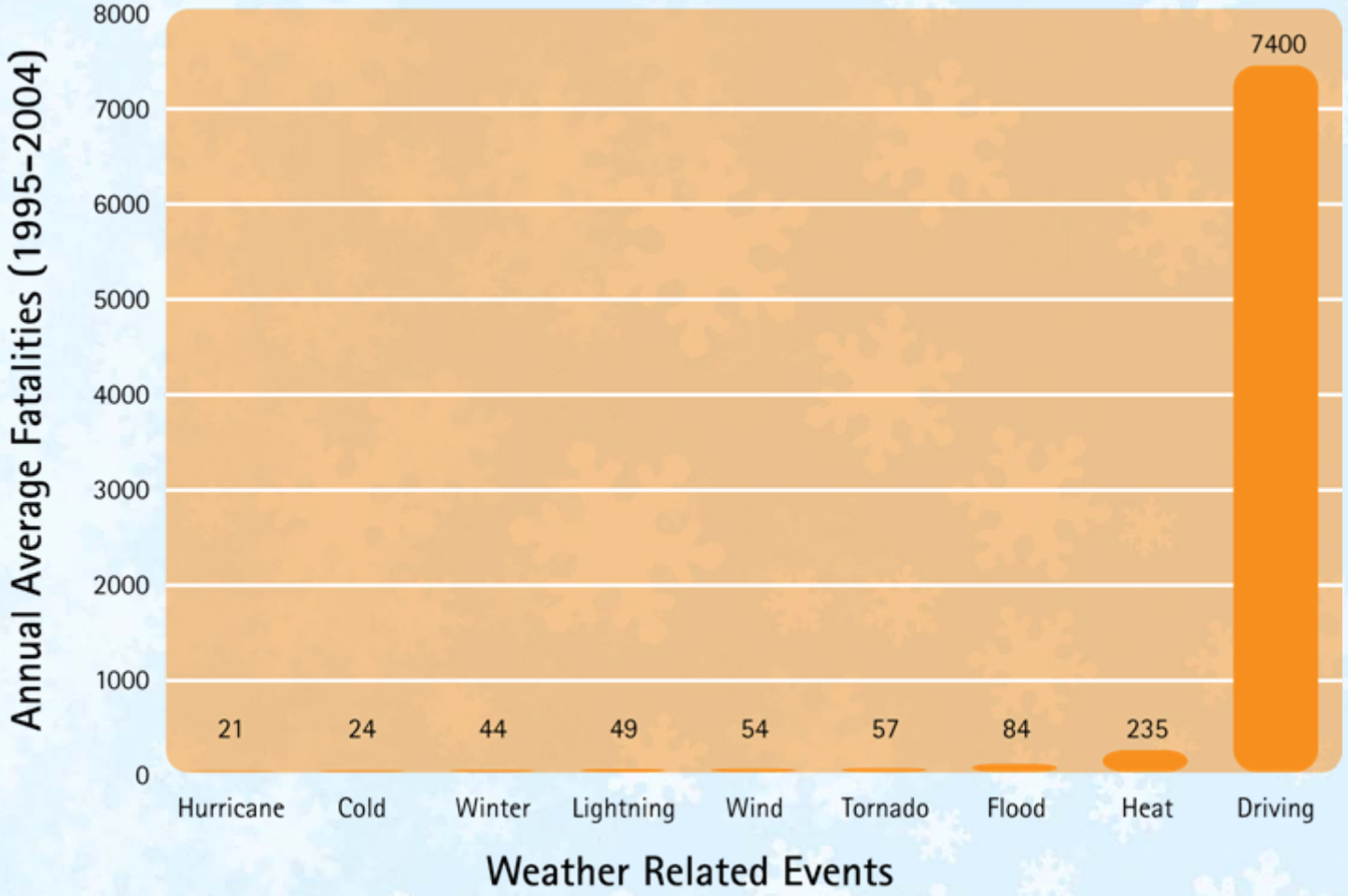
WORLD ROAD ASSOCIATION MONDIALE DE LA ROUTE
AIPCR · PIARC

Québec

NCAR

MOTIVATION

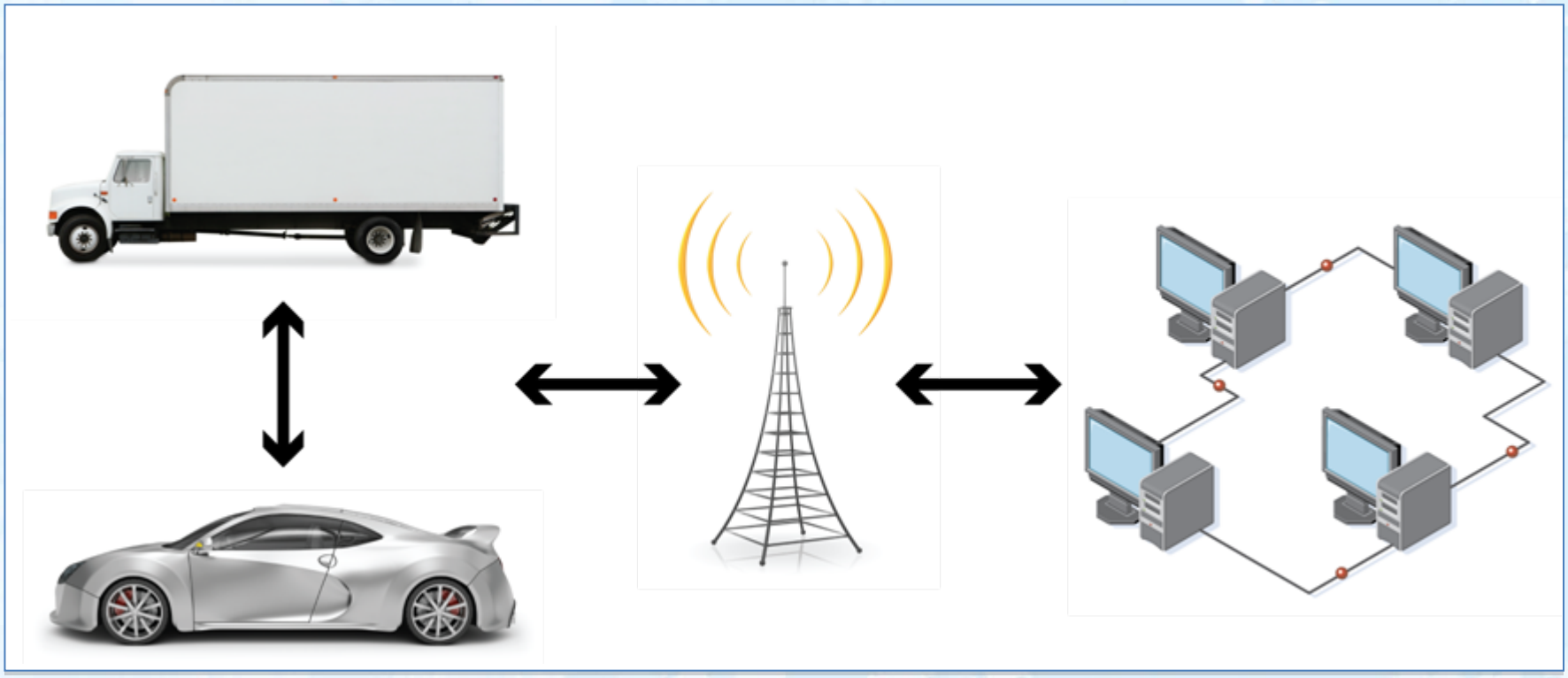
Safety



MOTIVATION

- **554 million vehicle-hours of delay per year result from snow, ice, and fog**
- **Delays to trucking companies range from $2.2-$3.5 billion annually**
- **Greenhouse gas emissions**

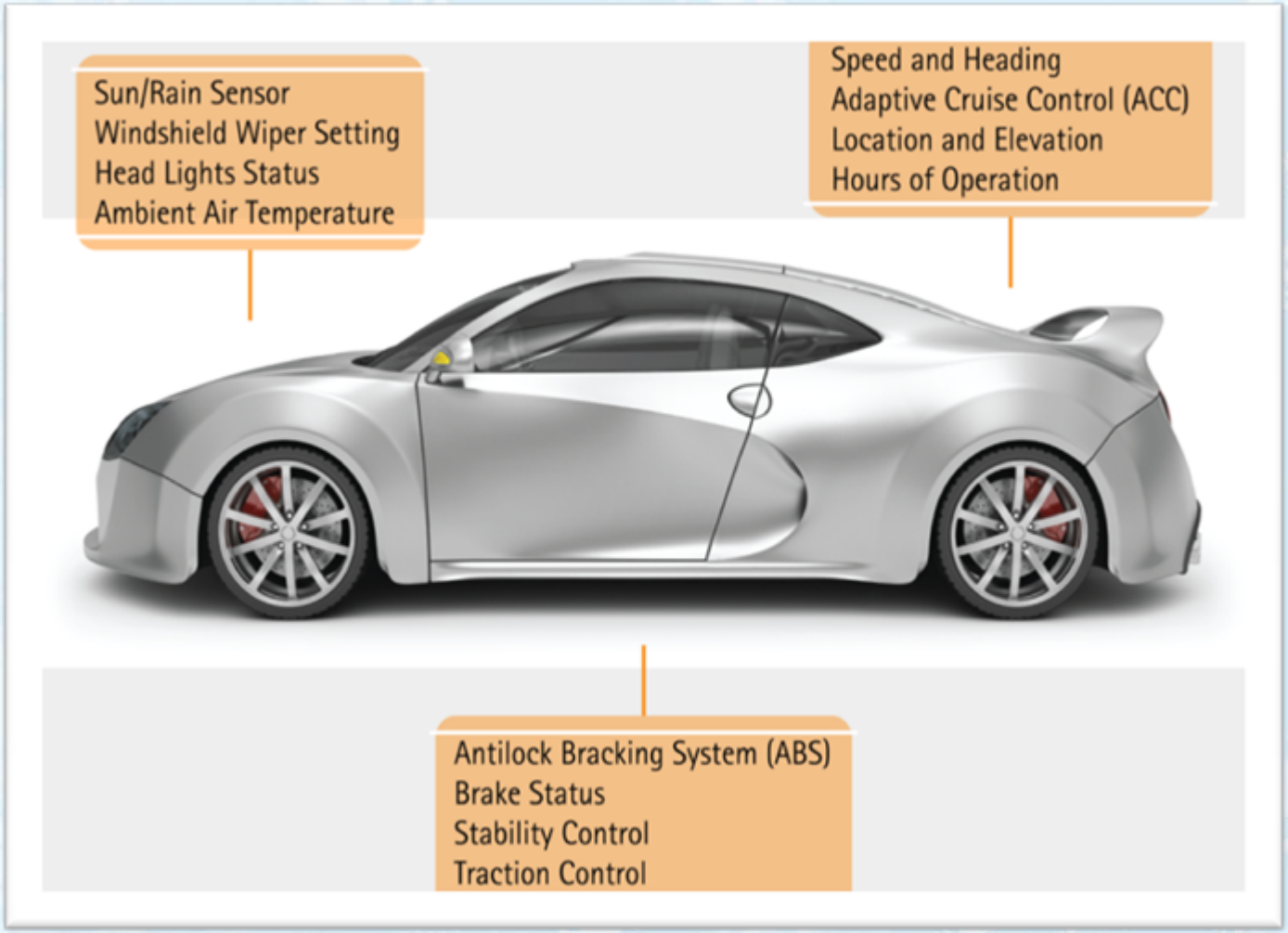
THE INTELLIDRIVE(SM) INITIATIVE



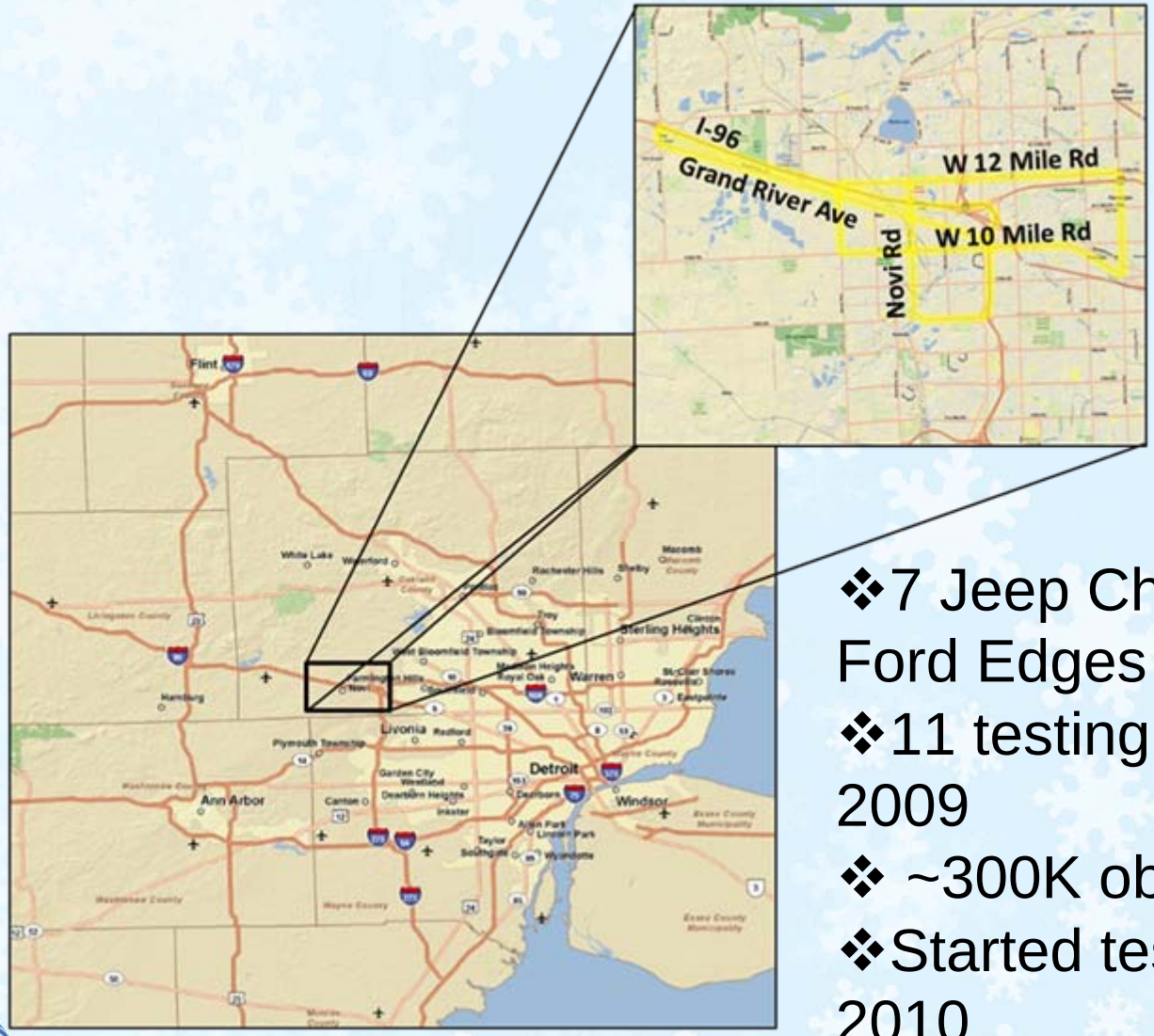
IntelliDrive℠
Safer. Smarter. Greener.

http://www.intellidriveusa.org

THE INTELLIDRIVE(SM) INITIATIVE



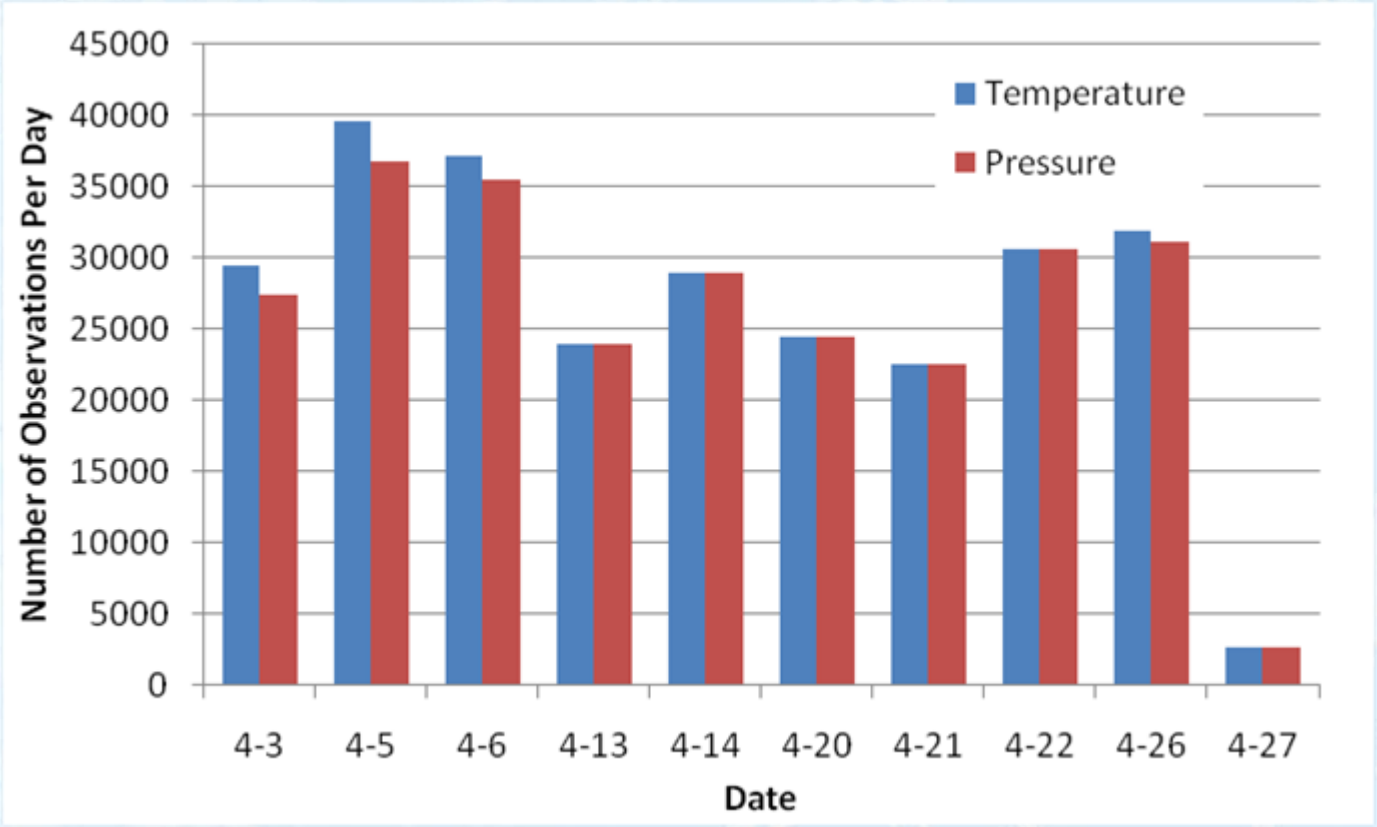
DETROIT INTELLIDRIVE(SM) TESTBED



- 7 Jeep Cherokees and 3 Ford Edges
- 11 testing days April 2009
- ~300K observations
- Started testing again Jan 2010

DTE09

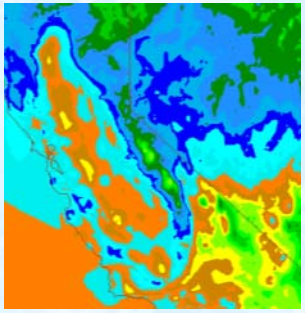
- ~270,000 temperature and ~260,000 pressure observations collected



QUALITY CONTROL

Sensor Range Test (SRT)

Neighboring Vehicle Test (NVT)

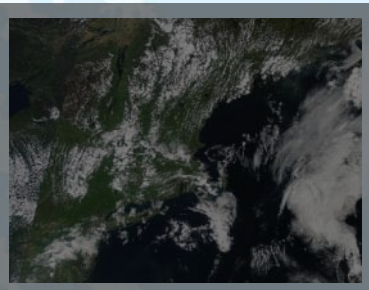


Model Analysis Test (MAT)

Climatological Range Test (CRT)

Neighboring Surface Station Test (NST)

Source: Florida DOT



Remote Observation Test (ROT)

QUALITY CONTROL

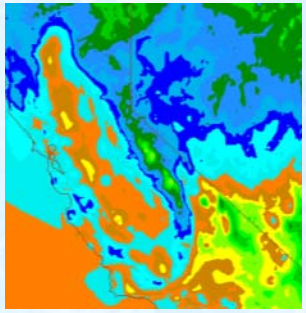
Sensor Range Test (SRT)

Climatological Range Test (CRT)

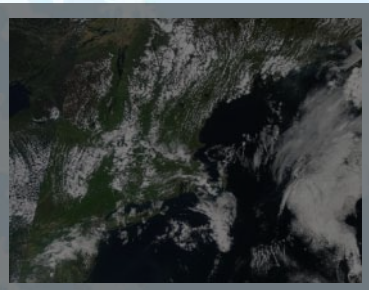
Neighboring Vehicle Test (NVT)

Source: Florida DOT

Neighboring Surface Station Test (NST)

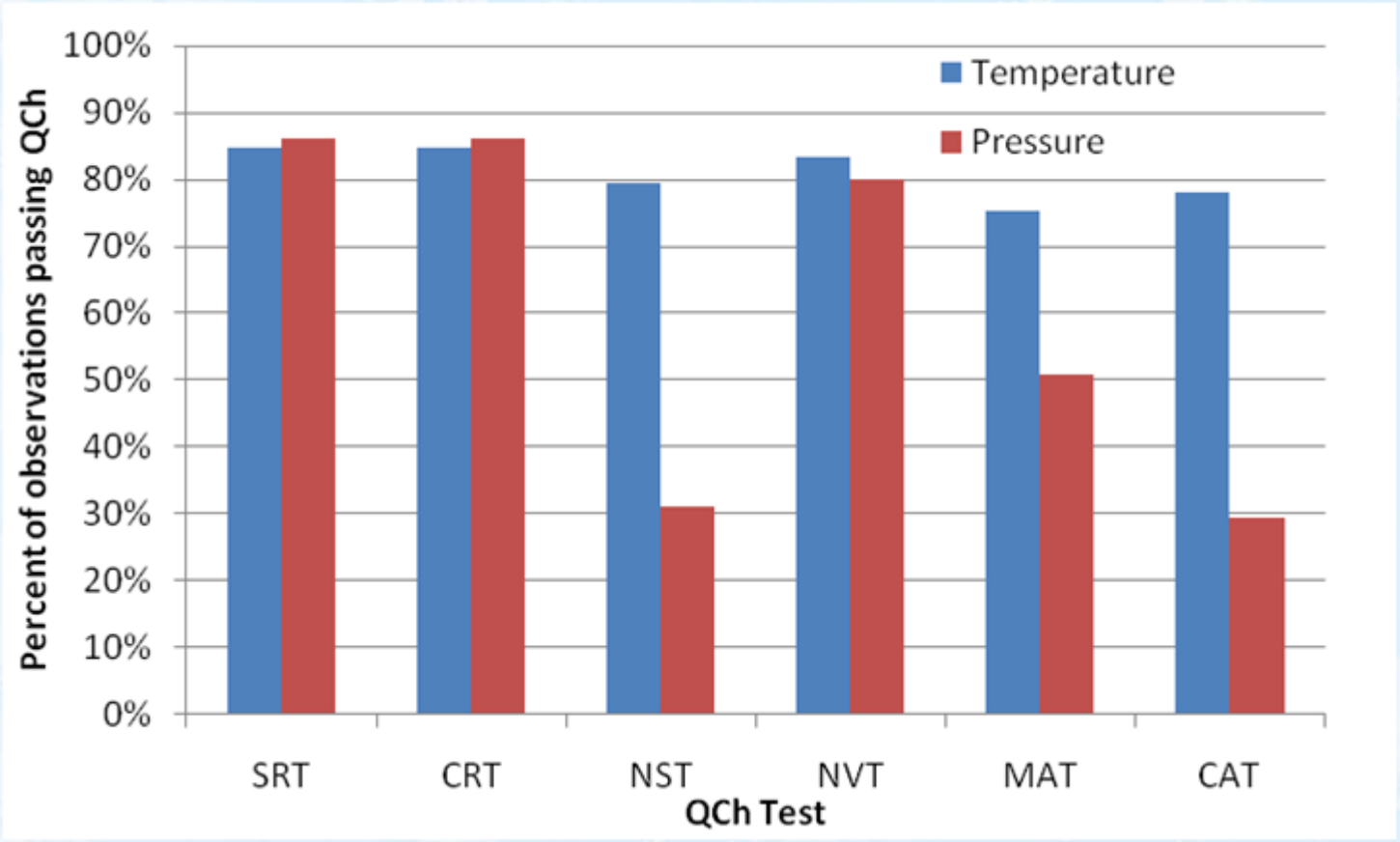


Model Analysis Test (MAT)



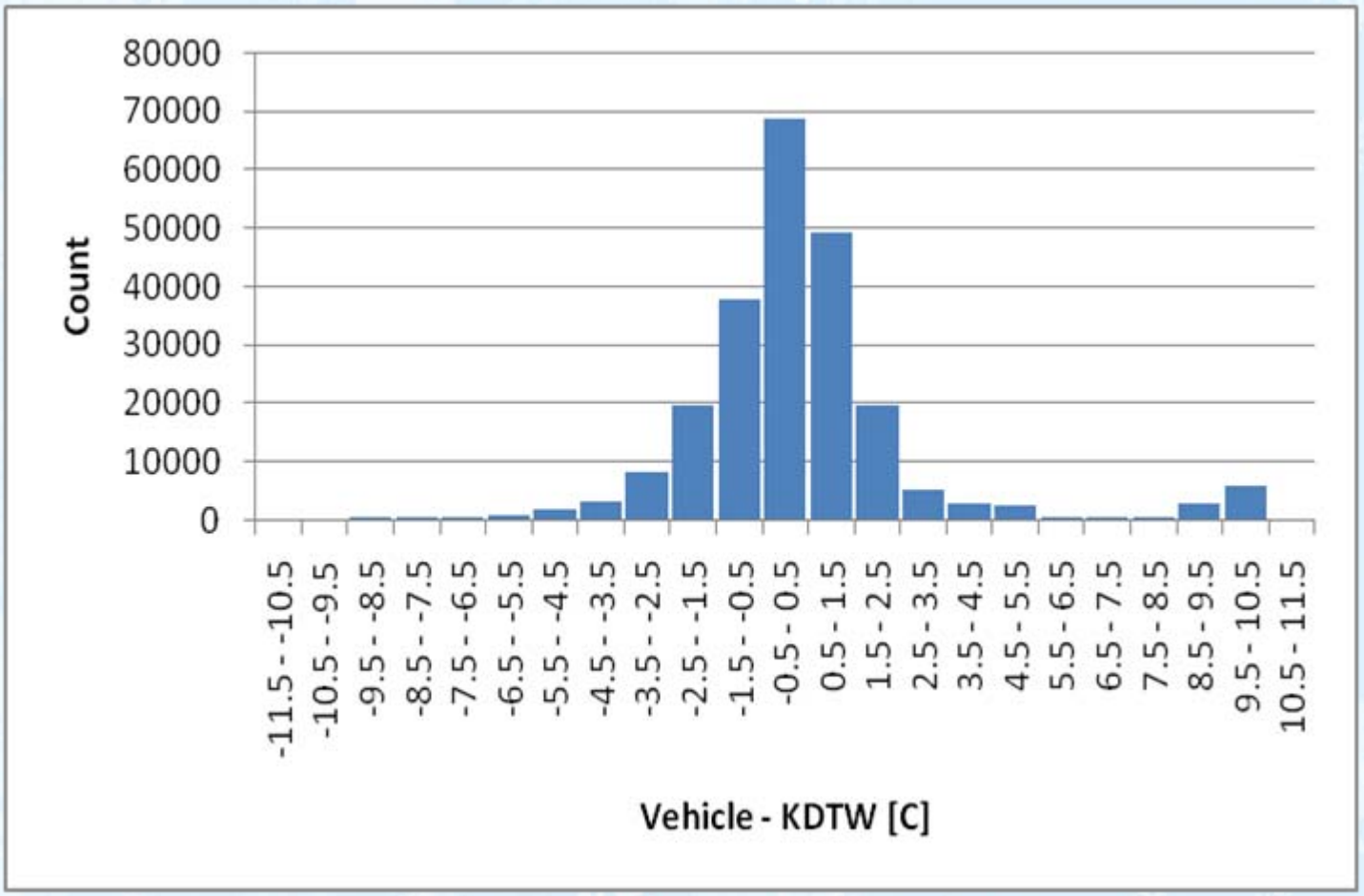
Remote Observation Test (ROT)

% OF DTE09 OBSERVATIONS PASSING QC



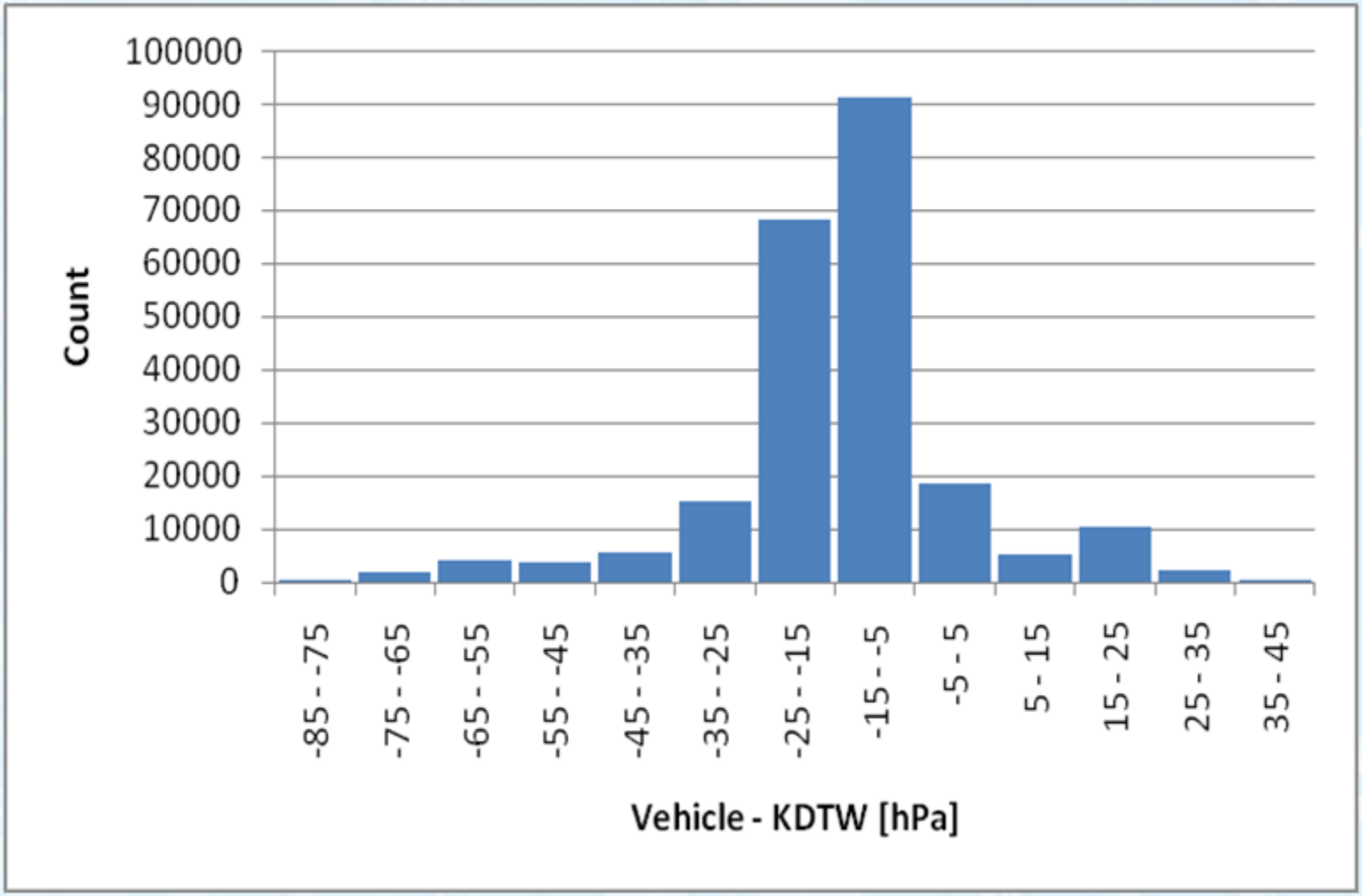
Problem…. Station (KDTW) for NST is @25 miles from testbed

DTE09 - RESULTS



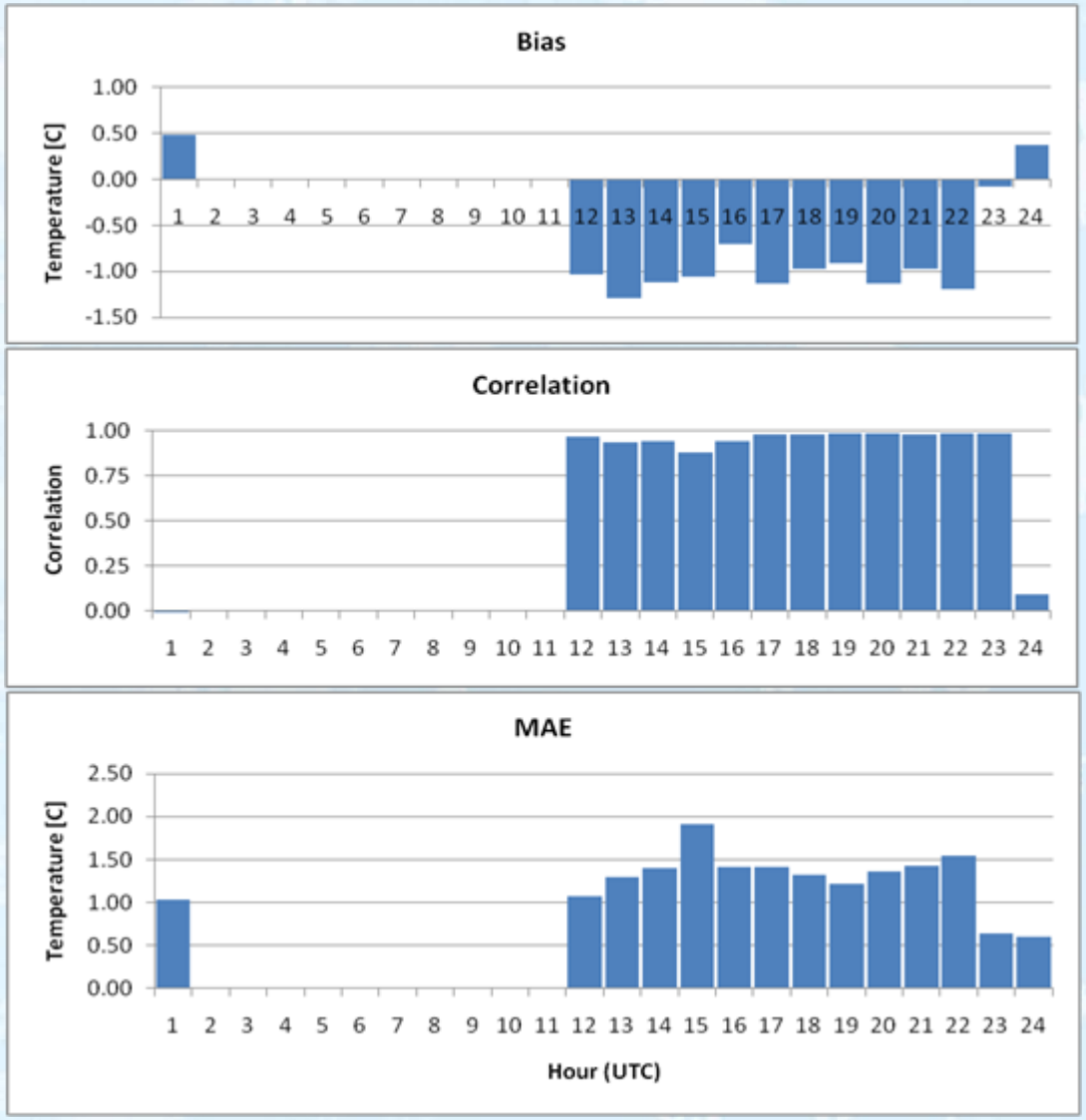
Temperature

DTE09 - RESULTS



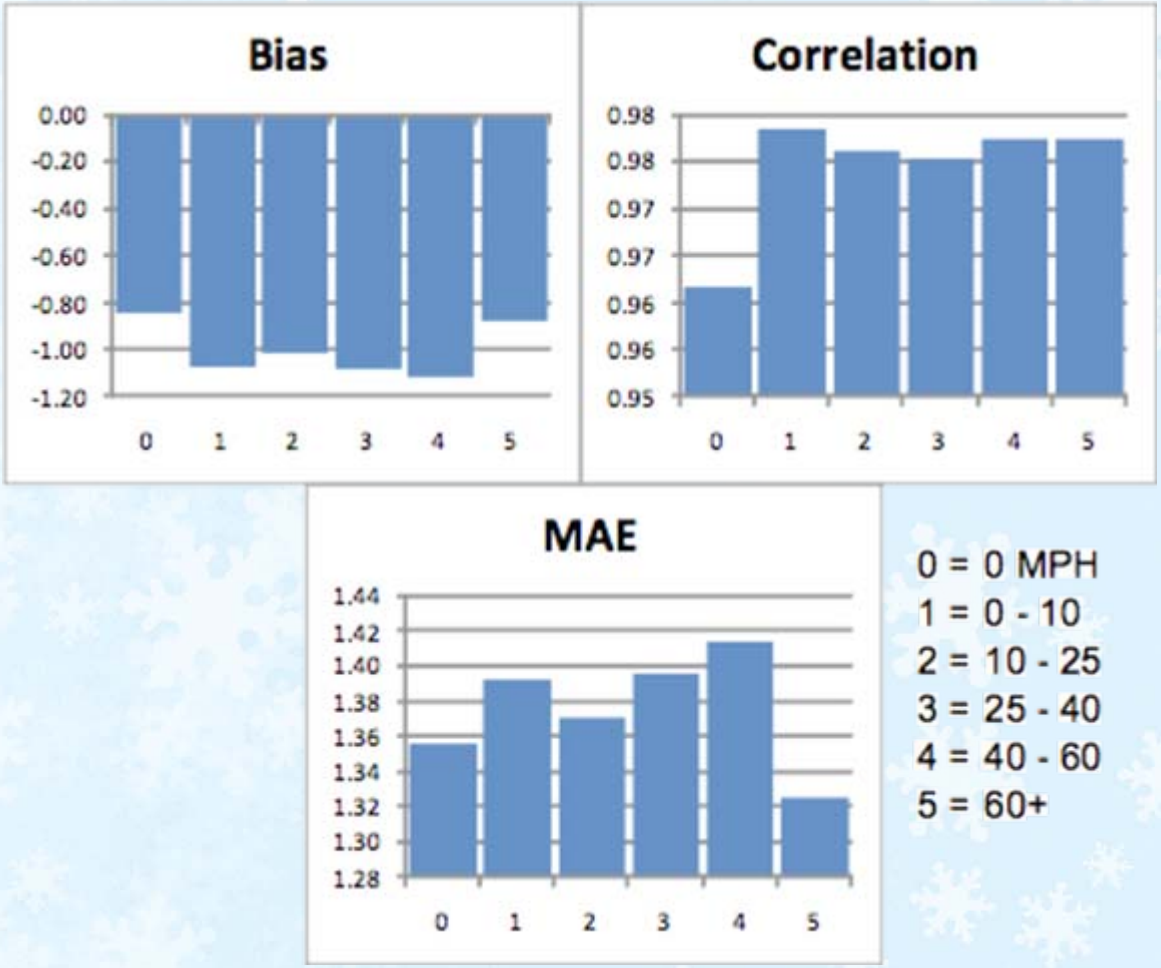
Pressure

DTE09 - RESULTS



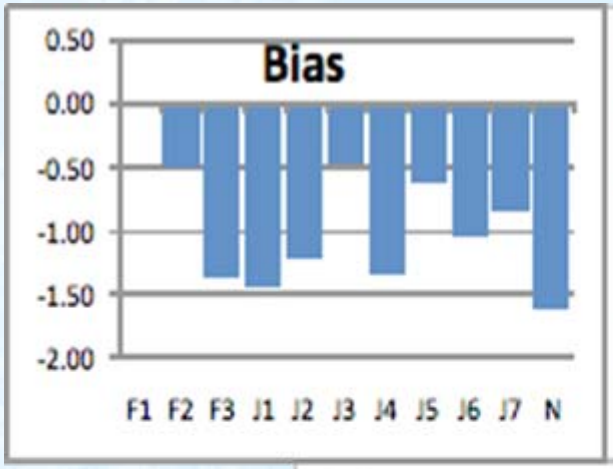
Temperature

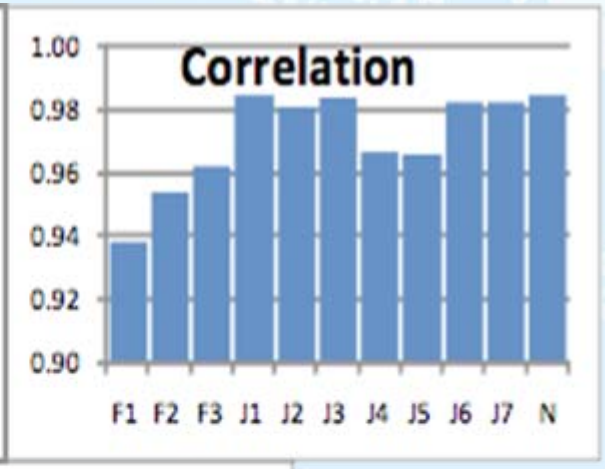
DTE09 - RESULTS

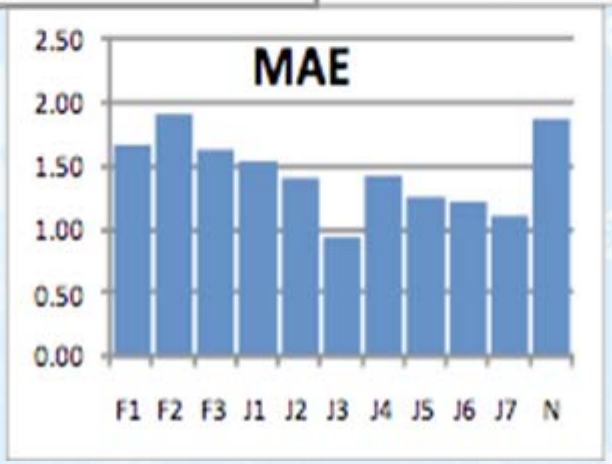


Temperature

DTE09 - RESULTS







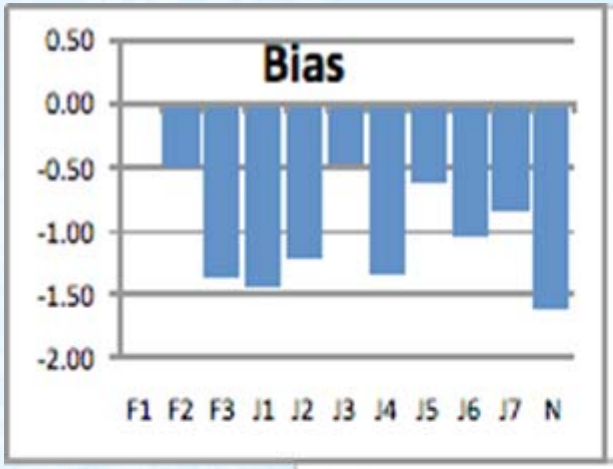
F(1-3) - Ford Edges

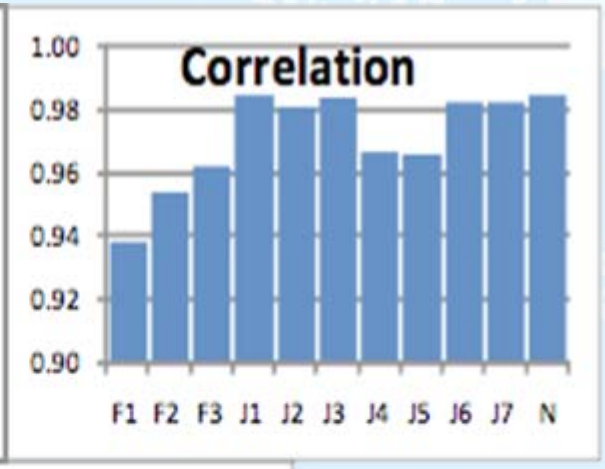
J(1-7) - Jeep Cherokees

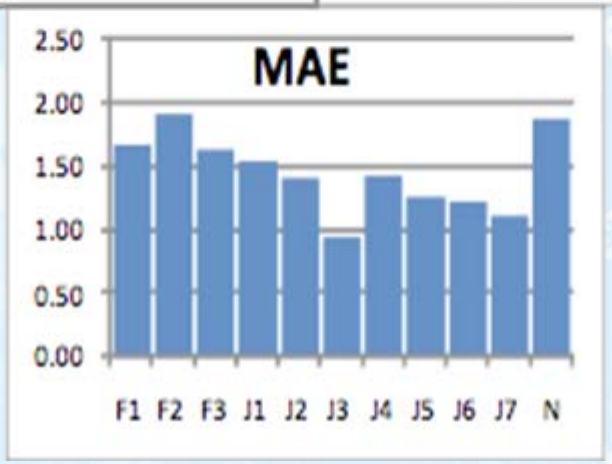
N - Nissan Altima

Temperature

DTE09 - RESULTS







F(1-3) - Ford Edges

J(1-7) - Jeep Cherokees

N - Nissan Altima

Temperature

We also stratified the results by precipitation temperature ranges and vehicle colors…

Québec 2010
AIPCR · PIARC

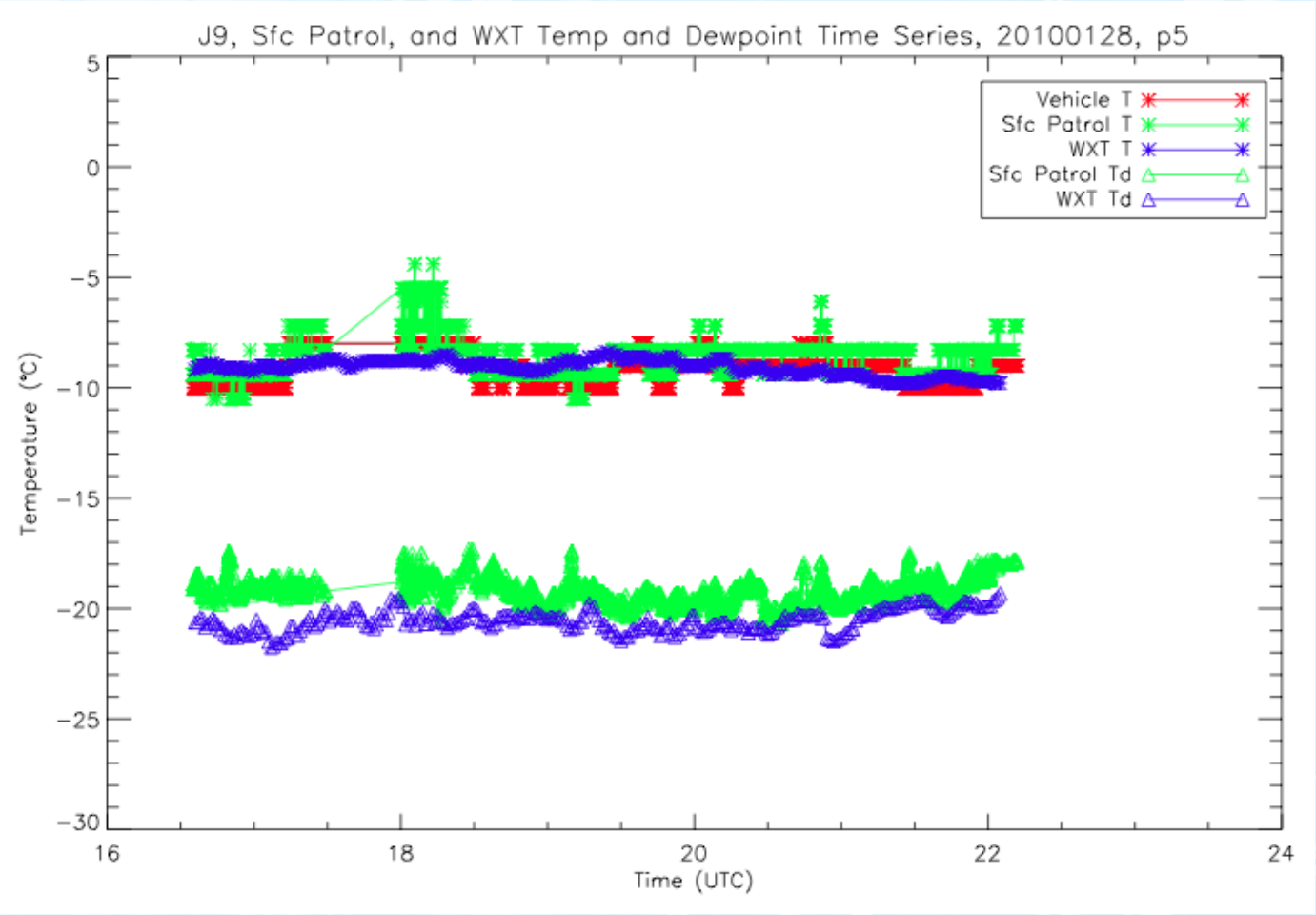
DTE10 - ENHANCEMENTS

QTT Inc Surface Patrol
- Air Temp
- Dew Point
- Surface Temp

Vaisala DSC111
- Road Condition
- Road Friction

Vaisala WXT520
- Temp
- RH
- Pressure
- Wind

DTE10 - RESULT



POSSIBLE APPLICATIONS

Weather-Related Traffic Hazard Diagnosis	
•Precipitation (e.g., rain, snow, etc.)	•Severe Thunderstorms
•Dense Fog	•Hail
•Smoke	•Flooding
•Pavement Conditions (e.g., wet, snow-packed, etc.)	•Blowing Snow/Ground blizzards
Numerical Model Initialization	
•Surface Pressure	•Wind (speed and direction)
•Air Temperature	•Visibility
•Relative Humidity	•Precipitation (occurrence, rate and type)
Miscellaneous Products and Applications	
•Input for Decision Support Systems	•Identification of Radar Anomalous Propagation
•Pavement Temperature Analysis	•Identification of Virga
•Diagnosing Boundary Layer Water Vapor	•Air Quality Monitoring
•Improved Weather Characterization in Complex Terrain	

THE FUTURE

Near Term

- Experiments targeting congestion, dense fog and snow in Detroit – Winter 2010
- Build on existing road-specific algorithms in VDT
- Leverage other vehicle observations (e.g. CDOT snowplows, Fleet data, DUAP experiment, etc.)
- Collaborate with others partners

Long Term

- Build road weather specific products using direct observations from vehicles that will improve safety and mobility

THANKS FOR YOUR TIME…

Please come by USA exhibit for a look!

www.intellidriveusa.org

http://www.rap.ucar.edu/projects/intellidrive/