Aware Today, Alive Tomorrow

The Past, Present and Future of Weather for the Everyday Driver

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Research Applications Laboratory

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50 Years
2010
Science Serving Society

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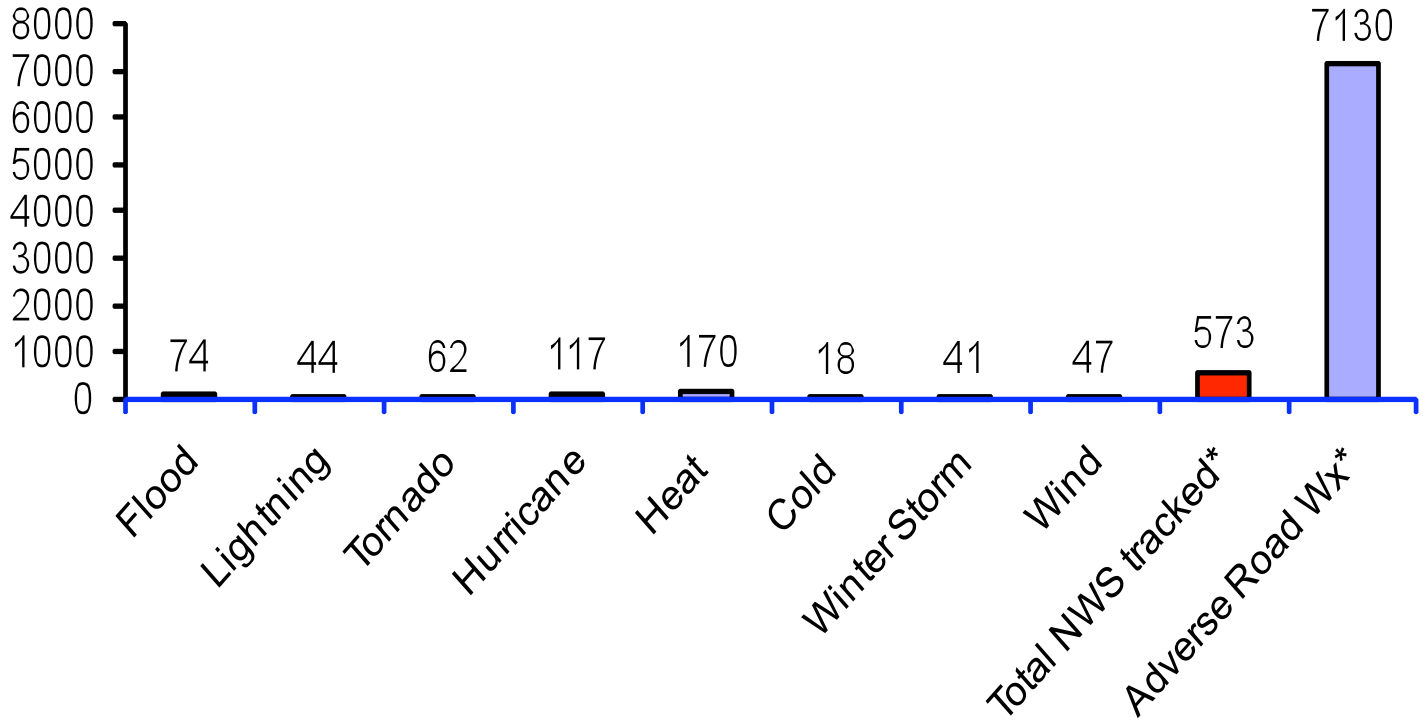
Why invest our tax dollars in R&D for surface transportation weather?



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Why invest our tax dollars in R&D for surface transportation weather?

- **Mobility**: Cost of congestion is $9.45 billion/yr for the 85 major urban areas (weather causes ~25% of non-recurrent delay on freeways)
- **Productivity:** Weather-related delay adds $3.4 billion to freight costs annually
- **Environment:** Chemicals and emissions affect watersheds, air quality and infrastructure

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What has been done about it?

- ✧ Early 2000s a disconnect between weather and winter road maintenance community uncovered
- ✧ Plan put in place to mesh weather, road weather, and winter road maintenance actions
- ✧ Maintenance Decision Support System (MDSS) engineered as open-source platform that fostered an MDSS market
- ✧ Robust system that can be applied to many other surface transportation weather-related problems

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What is MDSS? **Strategic decision making tool (12 – 72hours)**

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What is MDSS?

Strategic decision making tool (12 – 72hours)

Weather Forecast Information:

- Air temperature
- Relative humidity
- Wind speed/direction
- Precipitation type, rate, accumulation

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Road Surface Information:

- Road temperature
- Bridge temperature
- Bridge frost potential
- Blowing snow potential

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Treatment recommendations:

- Treatment type (plow, chemical, pre-treat)
- Treatment amount
- Treatment location

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What is MDSS? Tactical decision making tool (0 – 12hours)

Observations and Forecasts:

-Air Temp
-Pavement/Bridge temp

-Wind speed/direction

-Relative Humidity

-Precipitation

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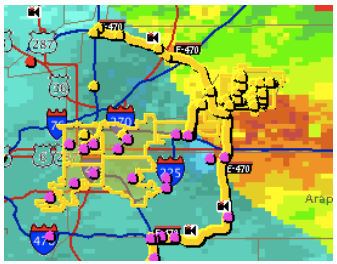

Remotely Sensed Observations:

-Radar

-Satellite

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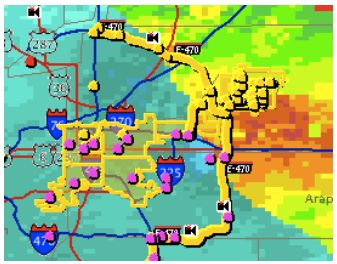

Remotely Sensed Observations:

-Radar

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Other Technology: Traffic and Vehicle Cams, vehicle-based observations

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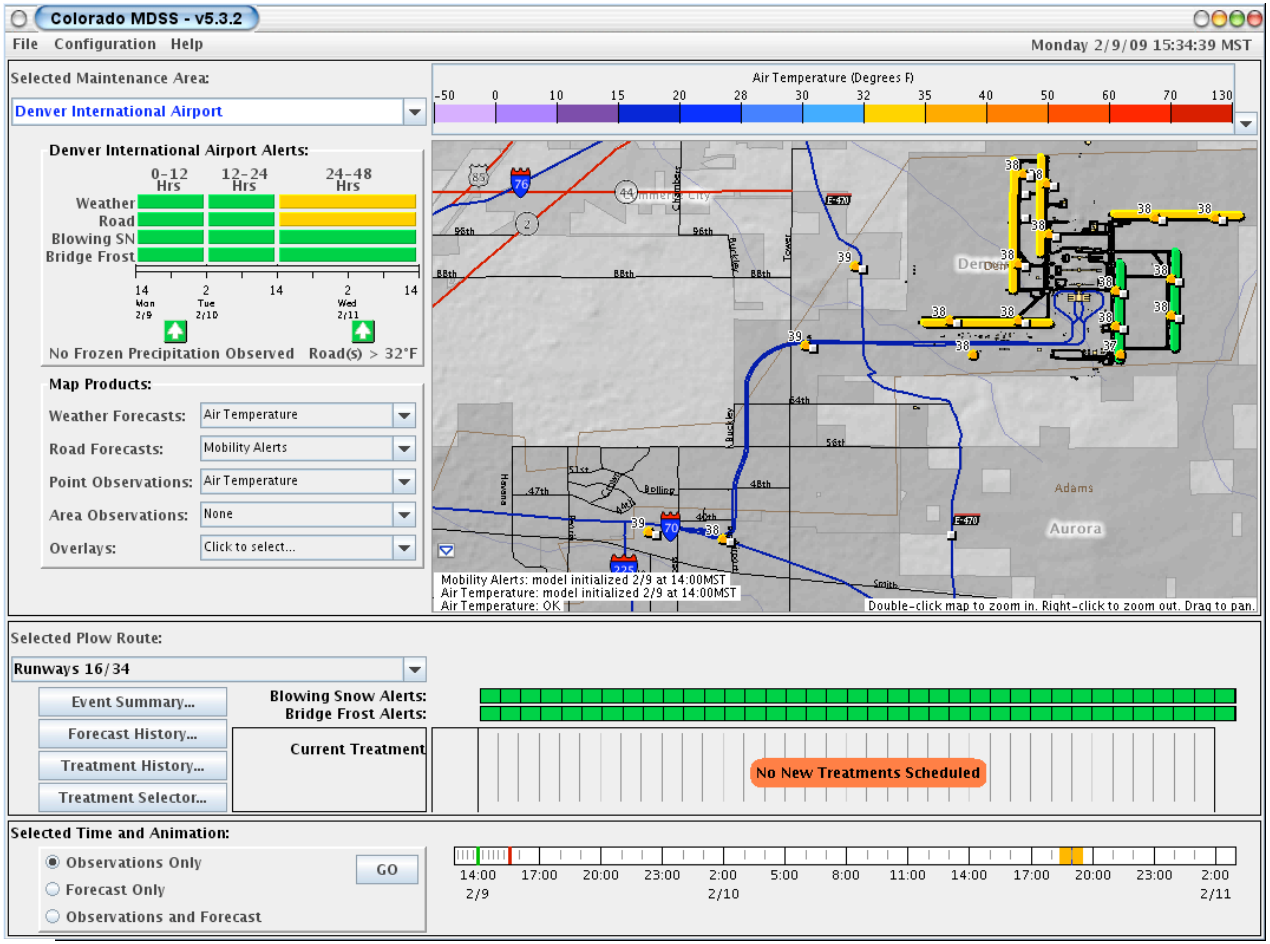

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What is being done?

MDSS infrastructure being modified for:

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What is being done?

MDSS infrastructure being modified for:

Non winter maintenance

Striping

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Weed spraying

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What is being done?

MDSS infrastructure being modified for:

Non winter maintenance

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Weed spraying

Construction and repair

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What is being done?

MDSS infrastructure being modified for:

Non winter maintenance

Striping

Weed spraying

Construction and repair

Thunderstorms and Precipitation

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What is being done?

Other possibilities…

Emergency Medical Services

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Emergency Medical Services

Flooded roads

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What is being done?

Other possibilities…

Emergency Medical Services

Flooded roads

Visibility (dust, fog, and smoke)

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What is being done?

Other possibilities…

Emergency Medical Services

Flooded roads

Visibility (dust, fog, and smoke)

Route planning

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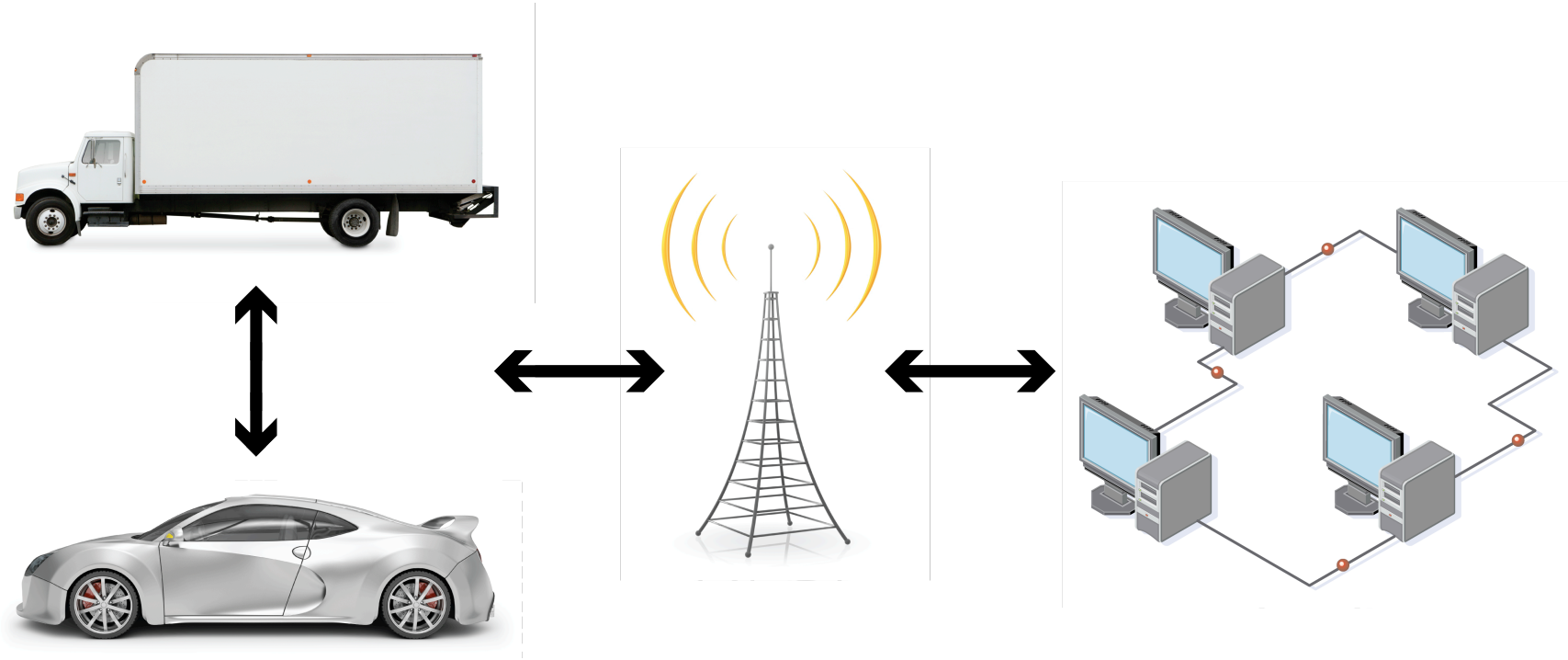
What does the future hold?



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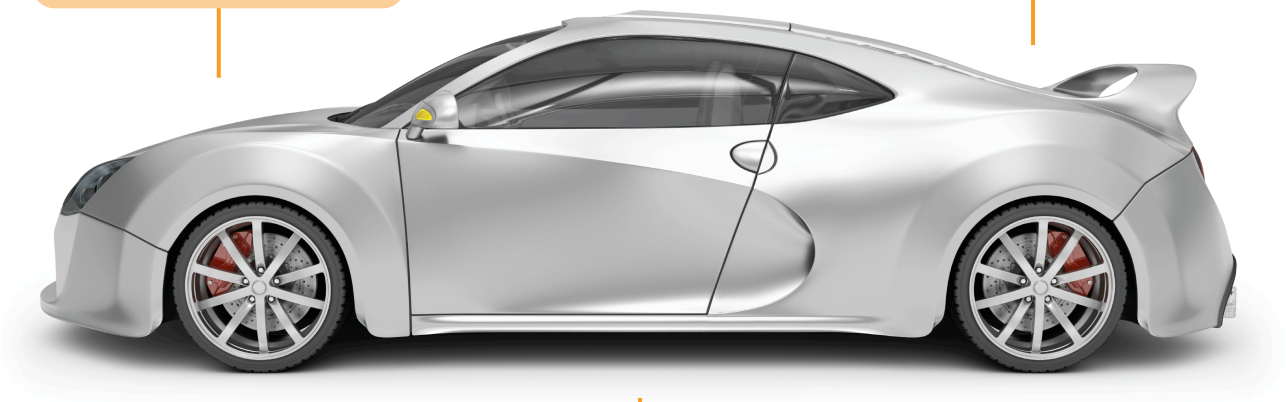
What does the future hold?

Sun/Rain Sensor
Windshield Wiper Setting
Head Lights Status
Ambient Air Temperature

Speed and Heading
Adaptive Cruise Control (ACC)
Location and Elevation
Hours of Operation



Antilock Bracking System (ABS)
Brake Status
Stability Control
Traction Control

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Weather-Related Traffic Hazard Diagnosis	
•Precipitation (e.g., rain, snow, etc.)	•Severe Thunderstorms
•Visibility	•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	

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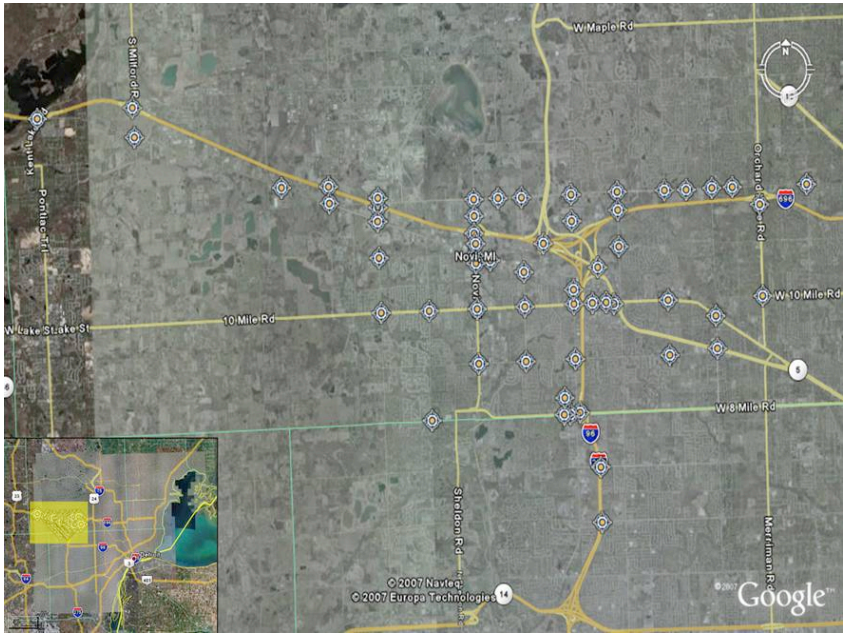
- April 2009 and Winter/Spring 2010
- 10 well-equipped vehicles (6 Jeeps, 3 Ford Edges, 1 Nissan Altima)
- Over 30 days of weather-targeted testing

Key PoC Data Elements	
Barometric Pressure	Brake Status
External Air Temperature	Brake Boost
Date (Year, Month, Day)	Accelerometer (lateral, long.)
Time (Hour, Minute, Sec.)	Yaw Rate
Location (lat/lon)	Headlight Status
Elevation	Traction Control
Vehicle Heading	Stability Control
Vehicle Velocity	Wiper Status
Hours of Operation	ABS Status



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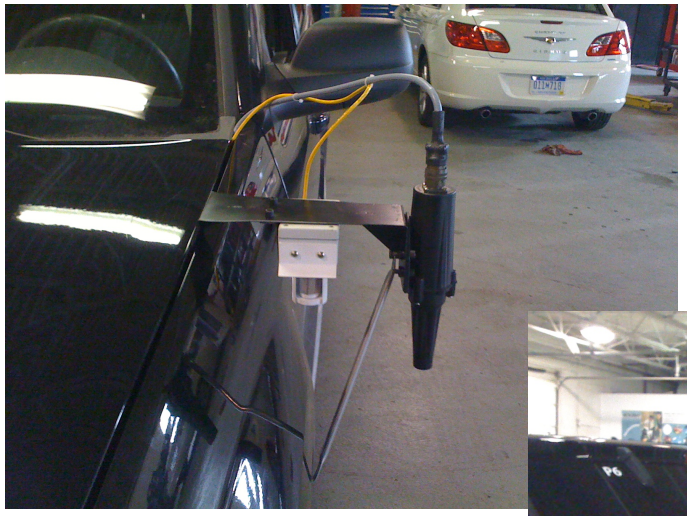

QTT Inc Surface Patrol

- Air Temp
- Dew Point
- Surface Temp

Vaisala DSC111

- Road Condition
- Road Friction

Vaisala WXT520

- Temp
- RH
- Pressure
- Wind

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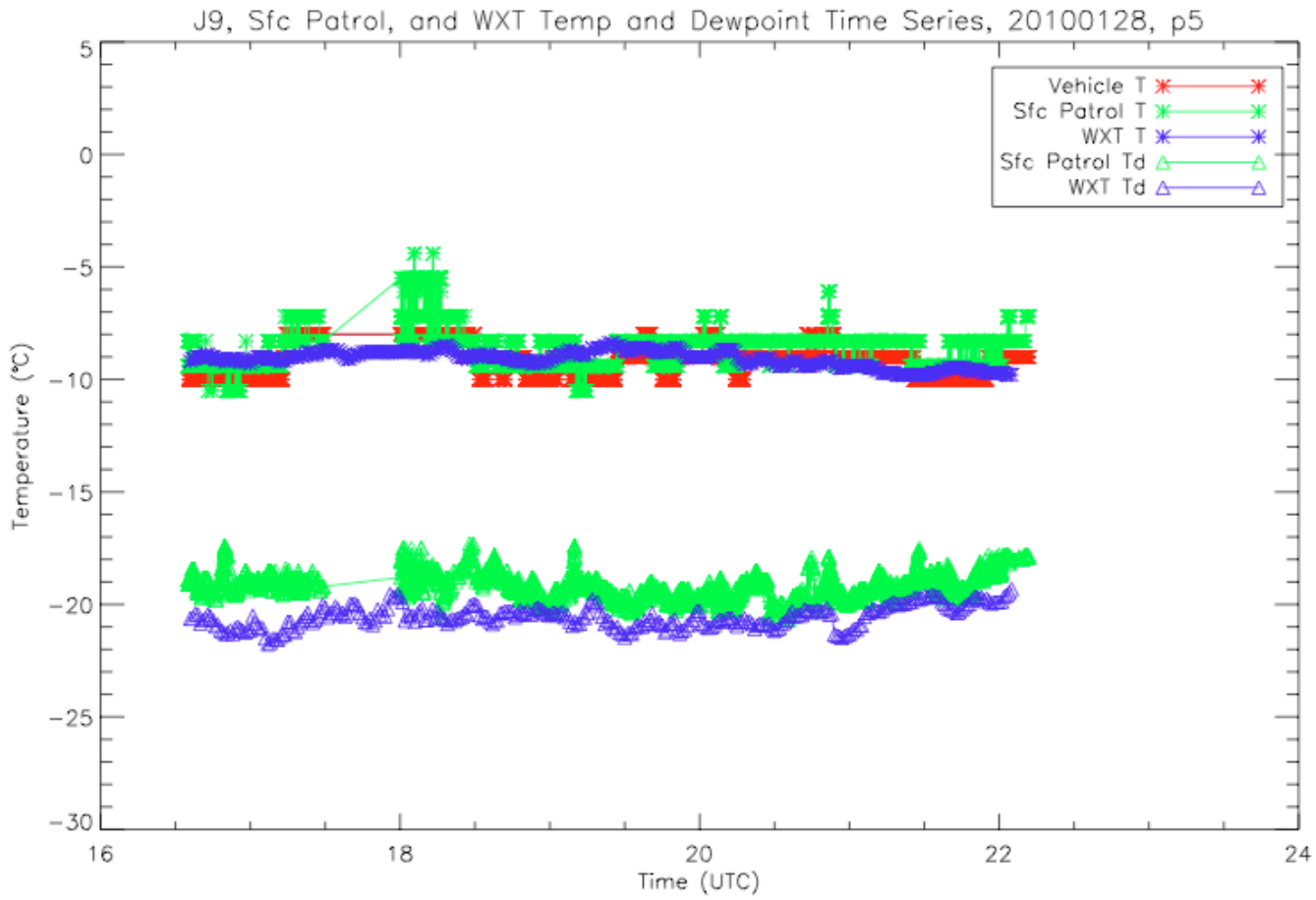

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Measuring and diagnosing slick roads

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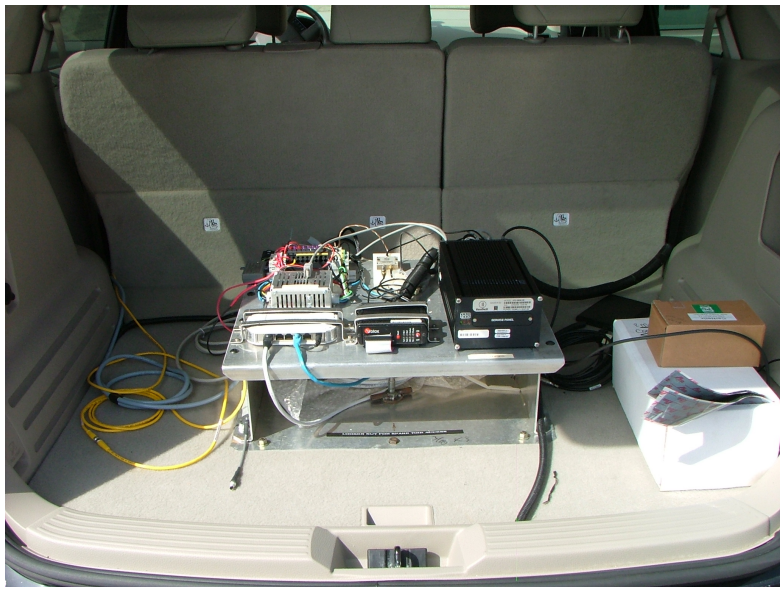
The future of connected vehicles…



Initial computer and communications (2008)

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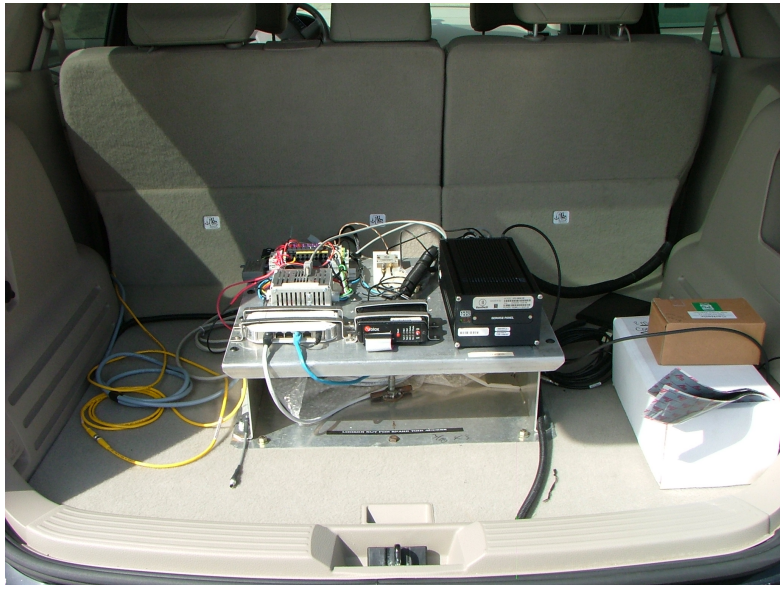

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2010

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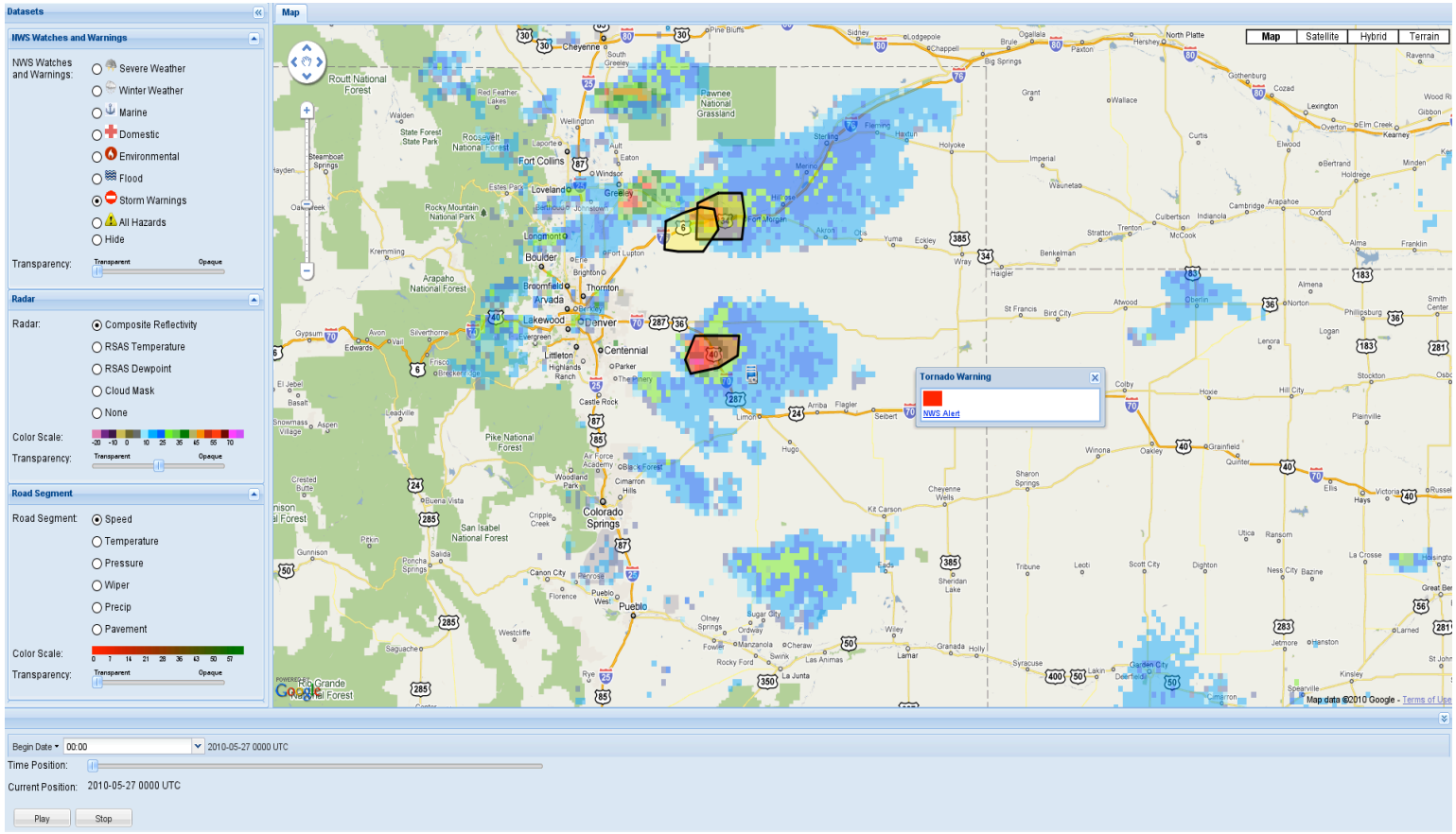
The future of road weather research…



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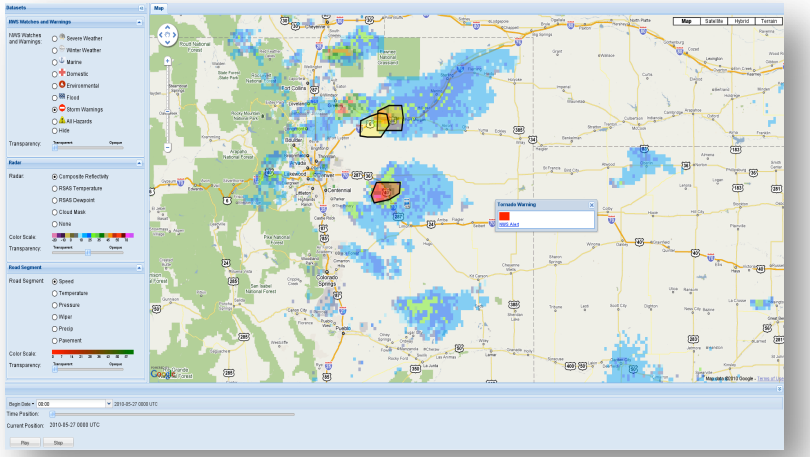

With past, present, and future research….
All-weather road hazard products will be developed and transferred directly to the driver that will save time, money and lives.

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Thanks for celebrating with us!

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