The U.S. Federal Highway Administration Winter Road Maintenance Decision Support System (MDSS)

Recent Enhancements & Refinements

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International Road Weather Conference

Historical Overview

Federal Highway Administration (FHWA) Road Weather Management Program objective:

- Develop an understanding of how weather and road conditions impact the nation's roadways
- Determine how best to mitigate road weather impacts

FHWA initiated a project to:

- Construct a MDSS functional prototype (MDSS FP) that can **provide objective guidance** to winter road maintenance decision makers concerning the appropriate treatment strategies to use to control roadway snow and ice during adverse winter weather events
- Provide a system that will **serve as a catalyst for additional research and development** by the private sector
- **Raise overall awareness** of the impact of weather on the roadway system by involving: AMS, ITSA, TRB, AASHTO, State DOTs, private sector, universities, national labs, etc.
- **Investigate new weather technologies and methods** that may have applicability for road weather use

MDSS Strategic Capabilities

Weather Information

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

Pavement Information

- Road temperature
- Bridge temperature
- Bridge frost potential
- Blowing snow potential
- Road contamination & chemical concentration

Treatment Guidance

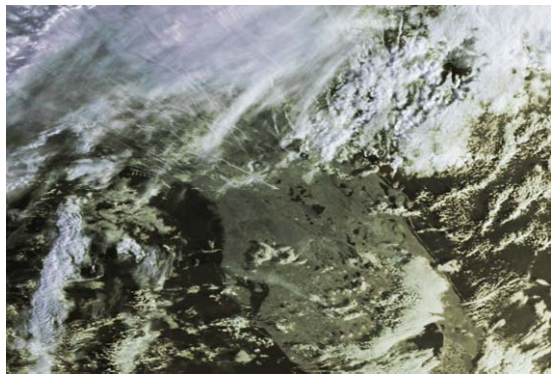
- Treatment type (plow, chemical, pre-treat)
- Treatment amount
- Treatment location

MDSS Tactical Capabilities

Observed (e.g., RWIS)

- Air temperature
- Relative humidity
- Wind speed
- Road temperature
- Bridge temperature
- Subsurface temp.

Remotely Sensed



- Radar reflectivity
- Satellite imagery

Other

- Automated Vehicle Location (AVL)
- Tactical alerts
  - Frozen precipitation
  - Pavement temp. < 0°C

MDSS Structure

Data Ingest Module

- Numerical model data
- Road Weather Information System (RWIS) data
- Miscellaneous observations (e.g., airport)

Road Wx Forecast and Data Fusion Module

- Consensus forecast generation

Road Condition and Treatment Module

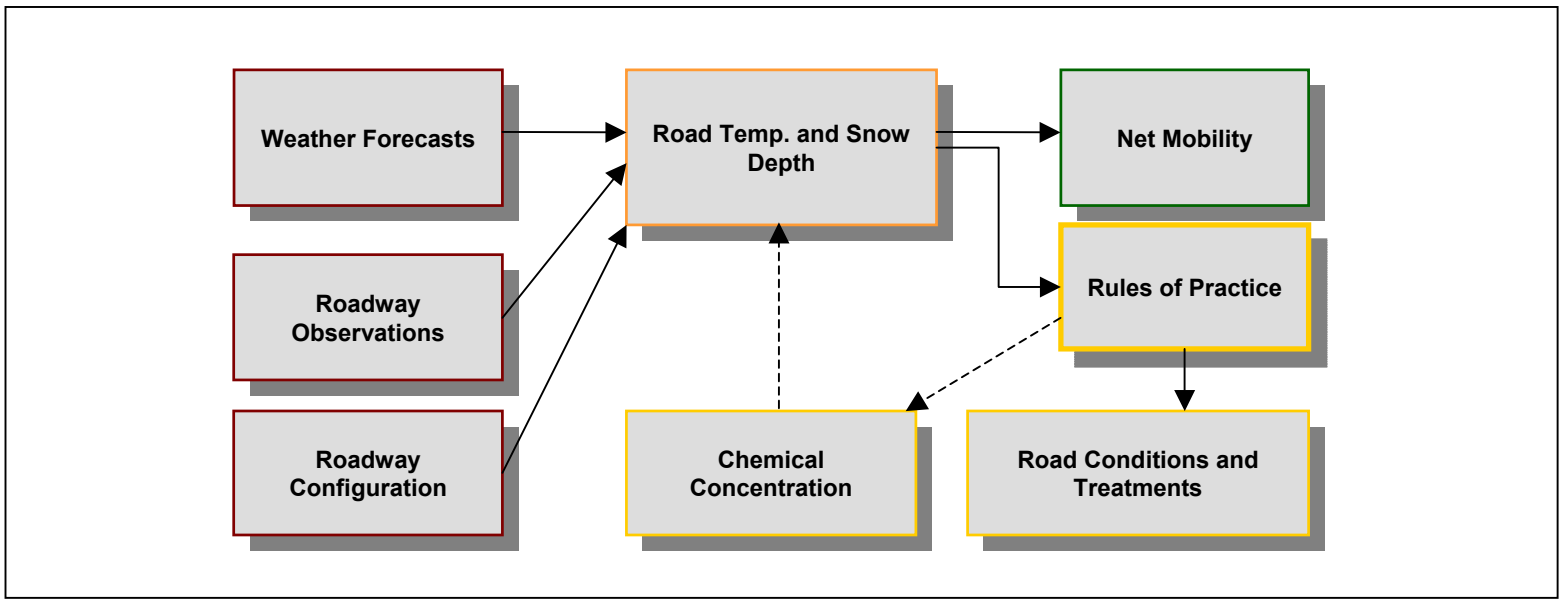
- Road temperature and condition forecasts
- Rules of practice for anti-icing and deicing operations
- Treatment recommendations

Java-based Display

- Delivery of information and data from upstream modules to end users via an interactive Graphical User Interface

MDSS Refinements and Improvements

Road Condition and Treatment Module (RCTM)

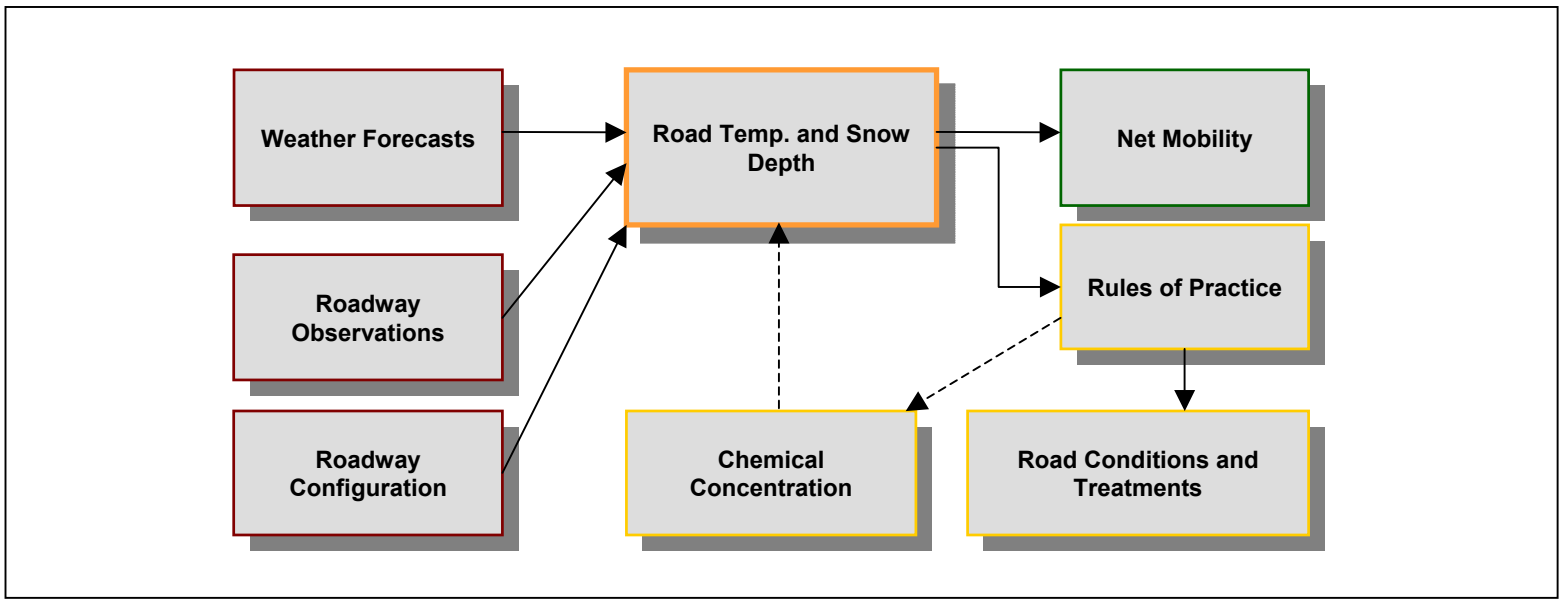


Rules of Practice (RoP)

- Improved flexibility in setting treatment parameters (e.g., agency-specific, route-specific)
- Direct use of eutectic curves and dilution information
- Added chemical types
- Improved treatment strategies (*continuous and triggered*)

MDSS Refinements and Improvements

Road Condition and Treatment Module (RCTM)



Road Temperature and Snow Depth Module

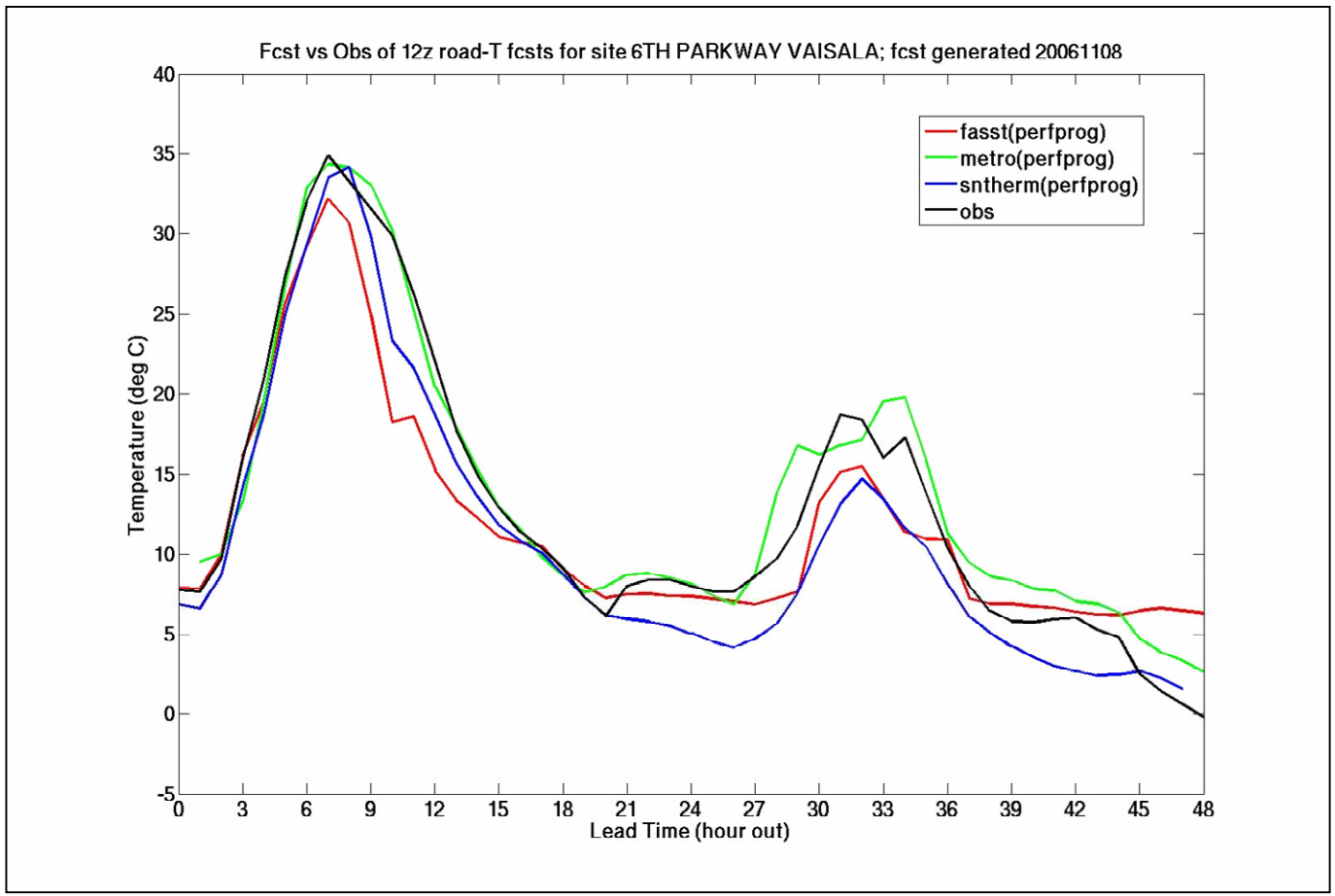
- Transitioned to using METRo (Model of the Environment and Temperature of Roads)*

- **Performance**
- Stability
- Efficiency
- Ease of Use
- Support

*Environment Canada

MDSS Refinements and Improvements

METRo (Model of the Environment and Temperature of Roads)*



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MDSS Refinements and Improvements

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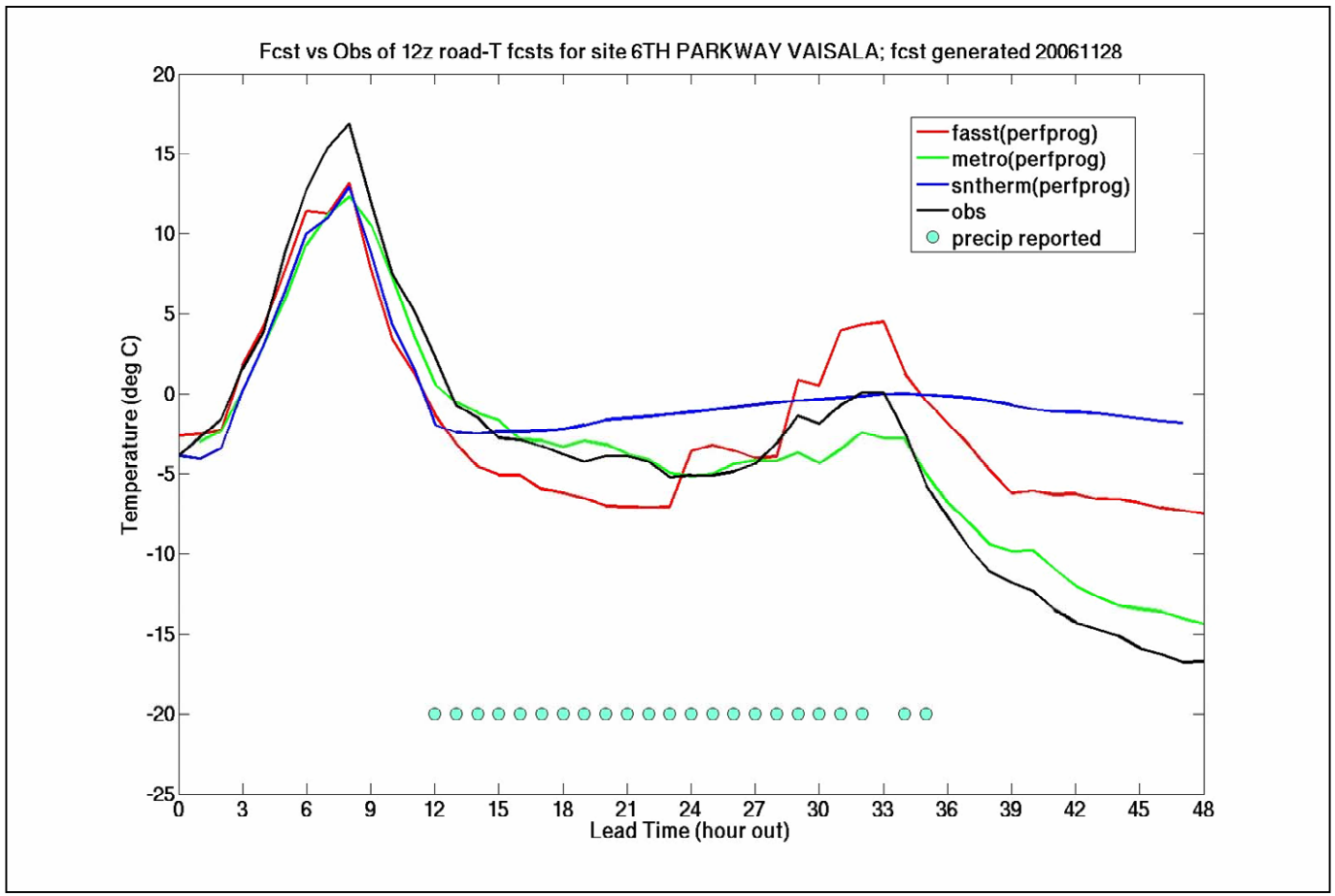

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MDSS Refinements and Improvements

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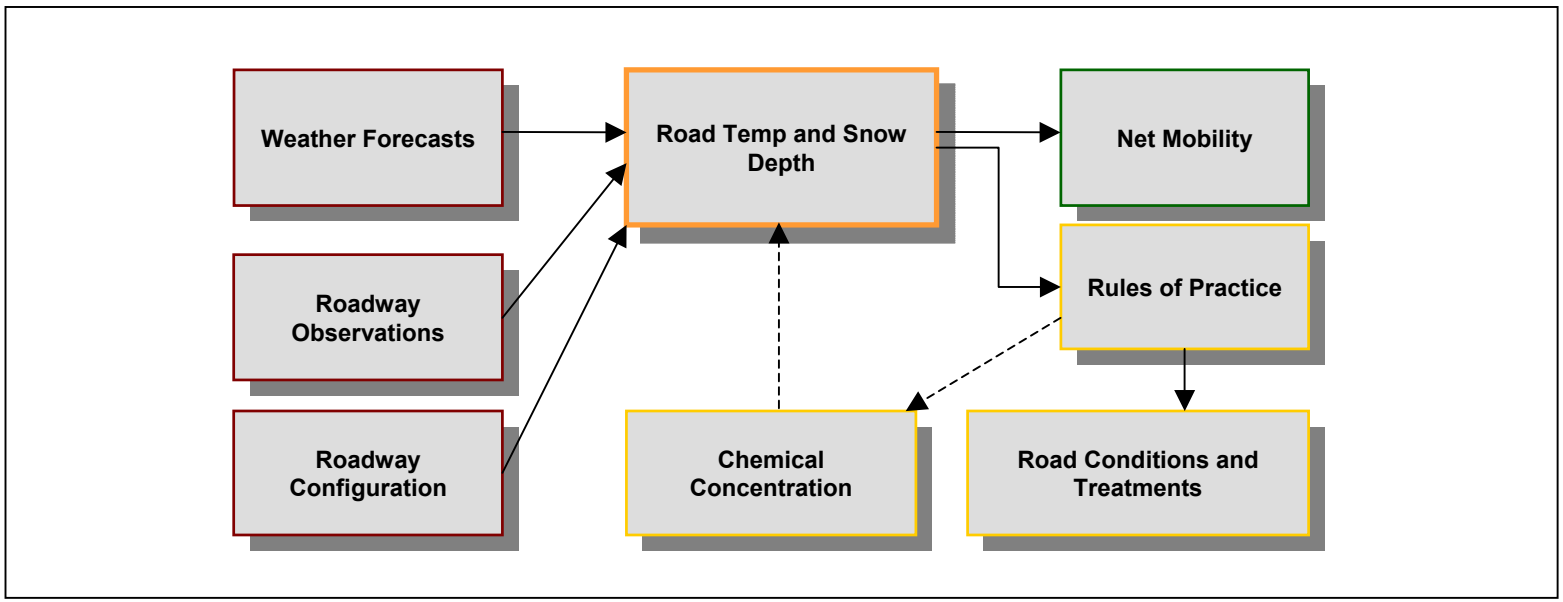


Road Temperature and Snow Depth Module

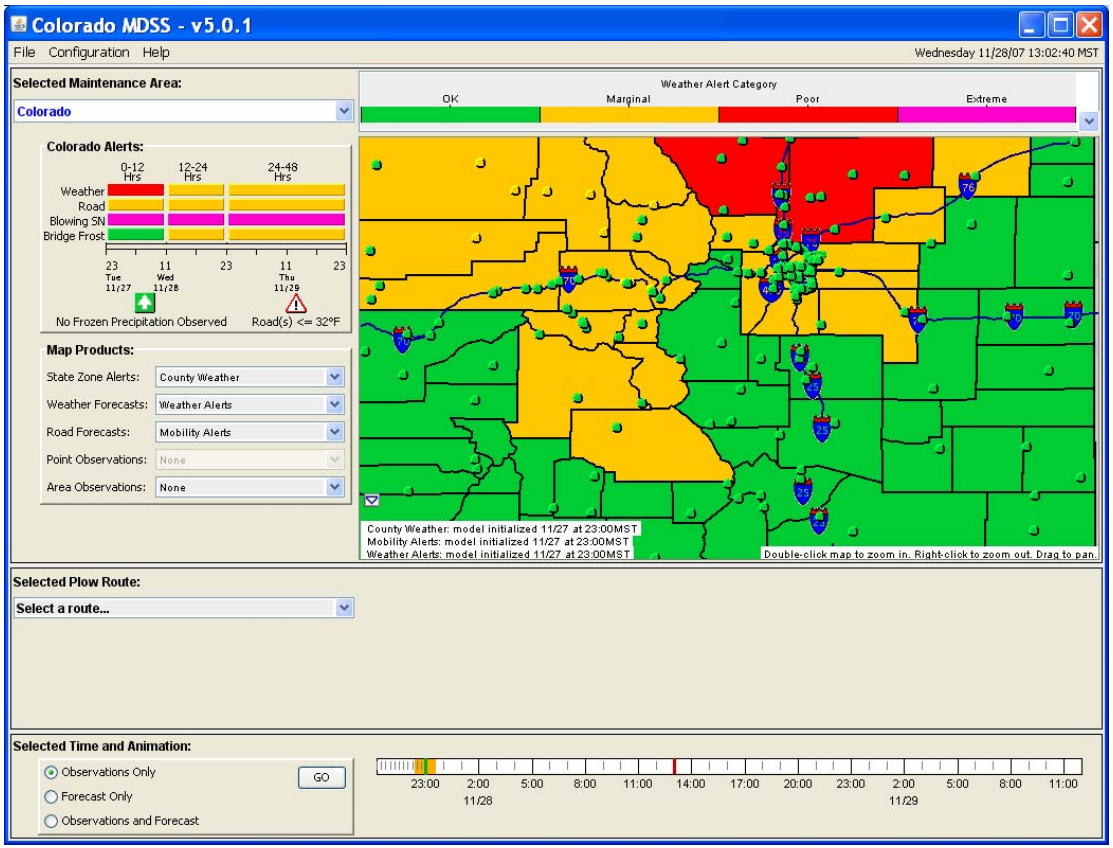
- Transitioned to using METRo (Model of the Environment and Temperature of Roads)*

- Performance
- **Stability**
- **Efficiency**
- **Ease of Use**
- **Support**

MDSS Display Features

Java-based Display

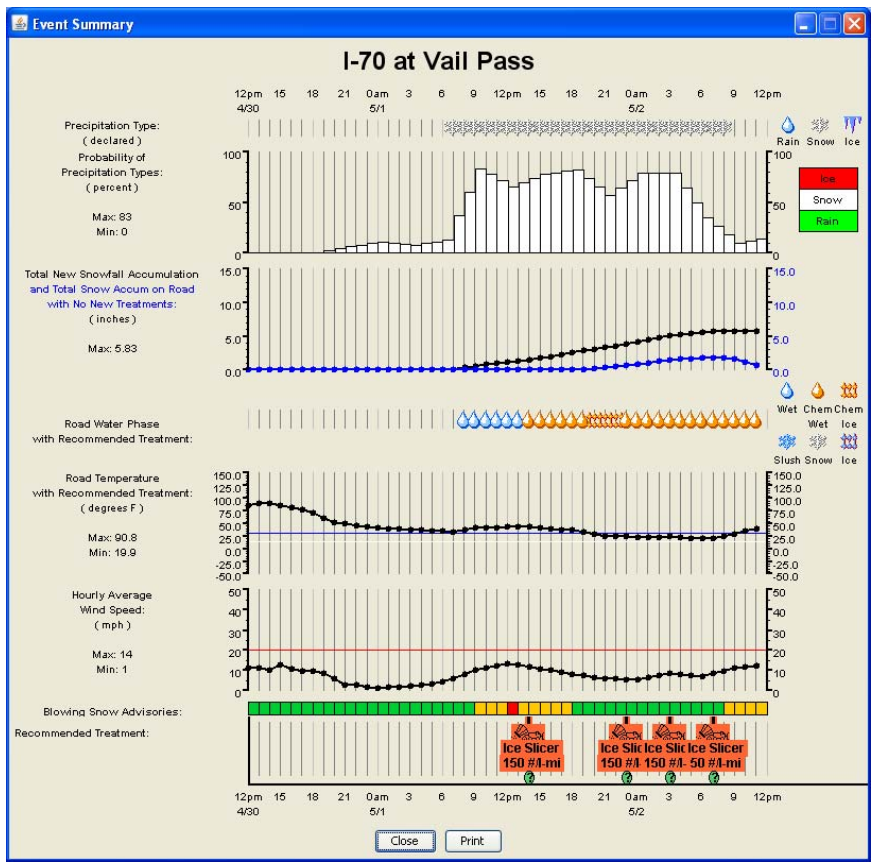
- Determine whether adverse weather or road conditions are predicted to occur in the future (current forecast period is 48 hours, updated every 3 hours)



MDSS Display Features

Java-based Display

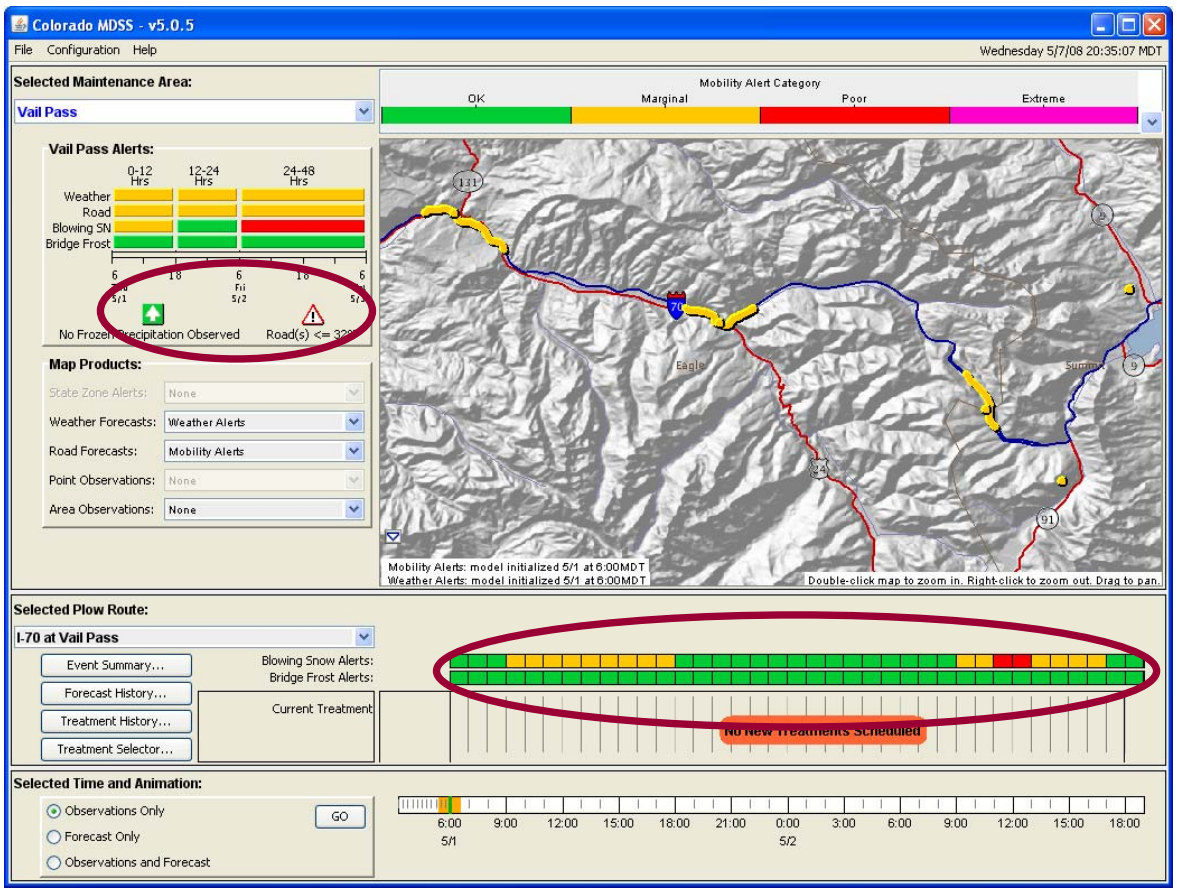
- Examine forecasted and observed road weather information at user-defined forecast sites/routes/zones



MDSS Display Features

Java-based Display

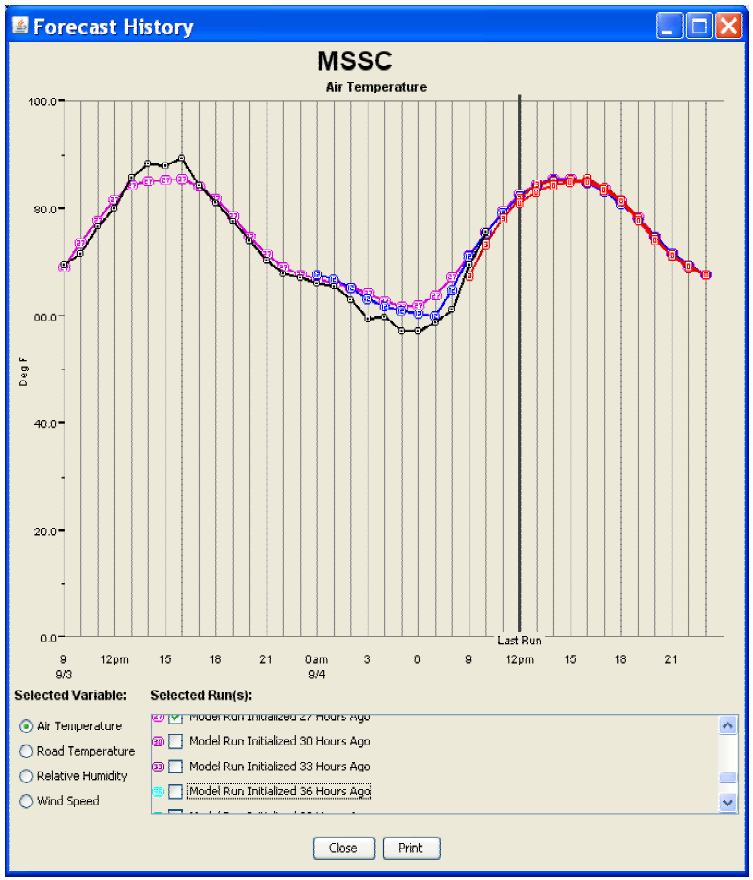
- Be alerted to potential real-time and near-term road weather hazards



MDSS Display Features

Java-based Display

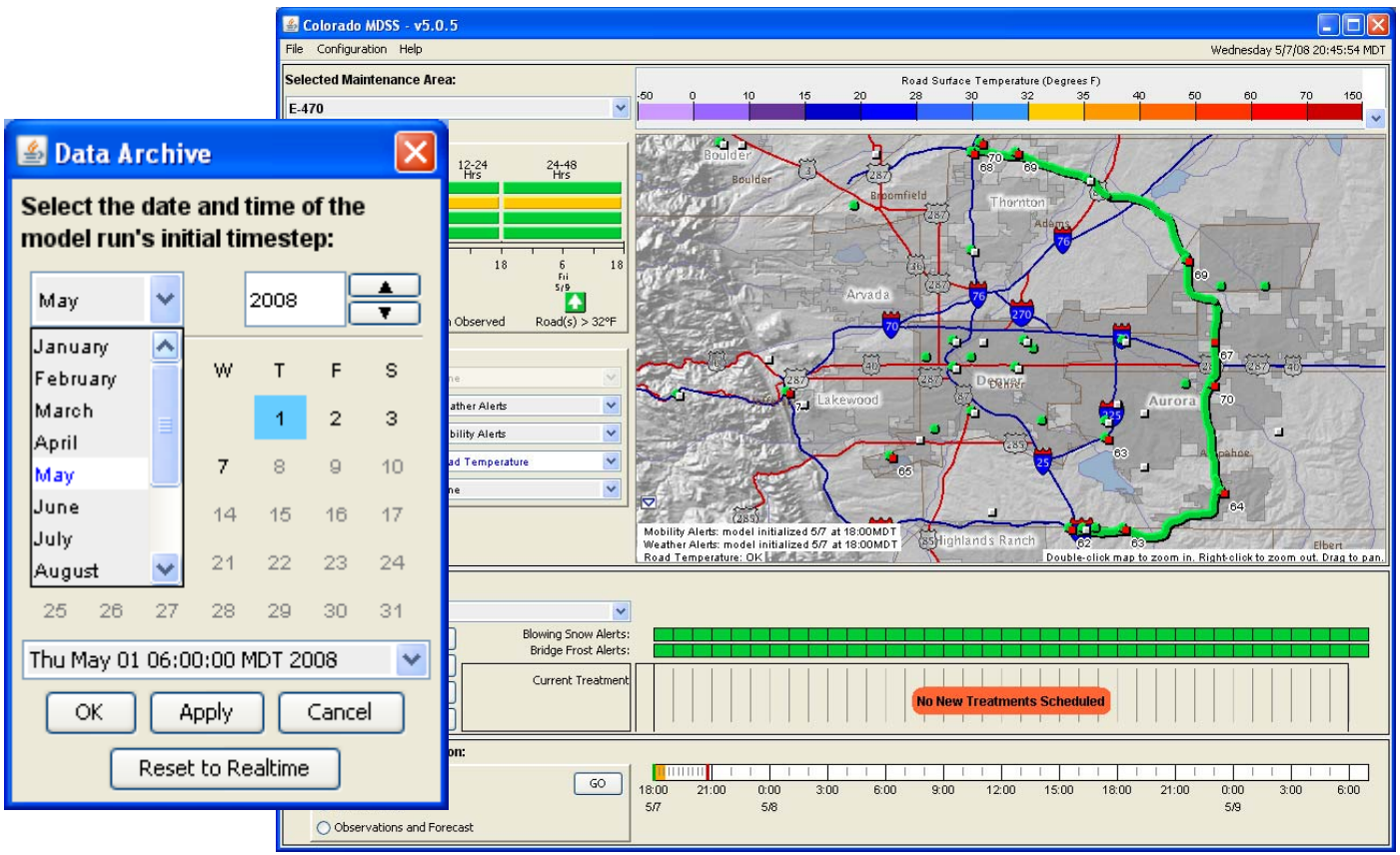
- Verify forecast performance (air and pavement temperature, relative humidity, and wind speed)



MDSS Display Elements

Java-based Display

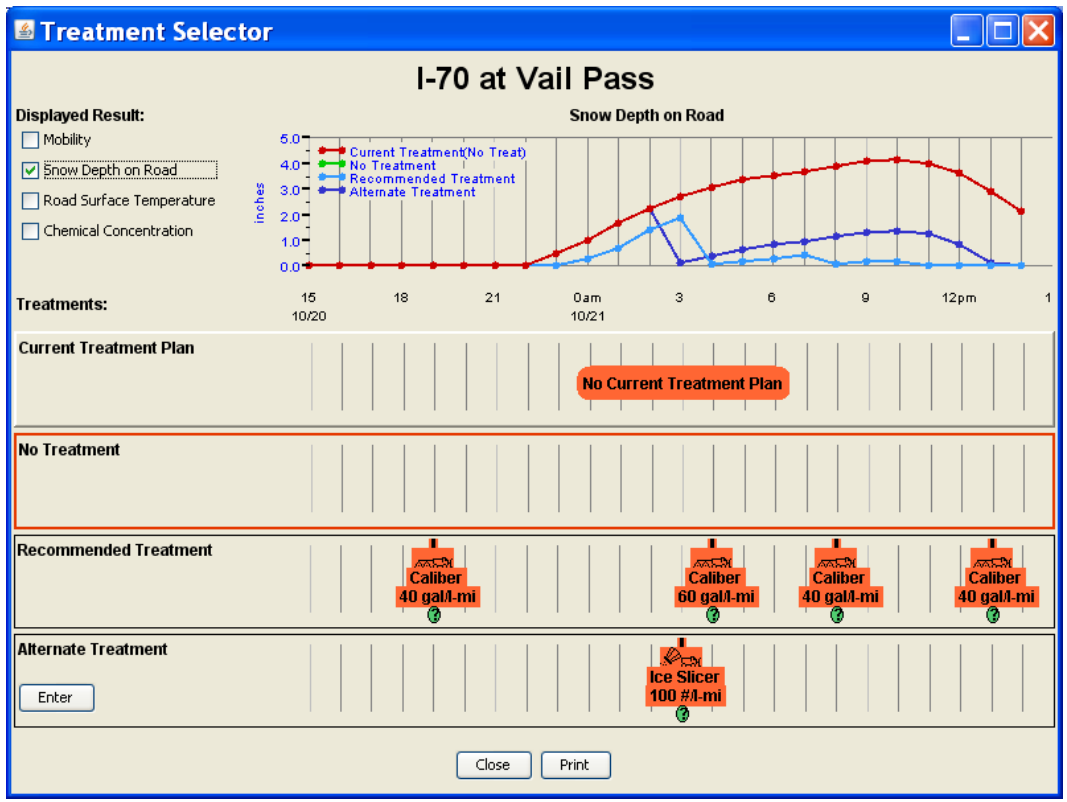
- Examine archived events, including weather and road condition forecasts, observations, treatment recommendations, and selected treatment actions



MDSS Display Elements

Java-based Display

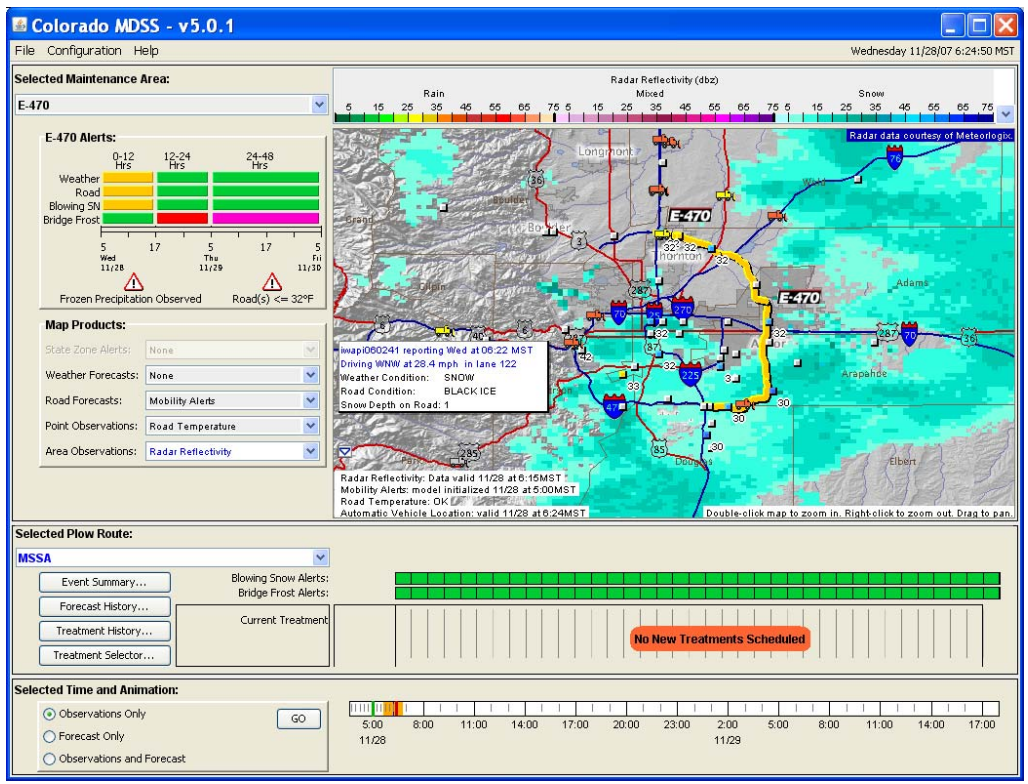
- View system-generated winter maintenance treatment plans for each route or zone
- Assess the predicted impact of system-recommended treatment plans
- Perform *what if* scenarios to assess the impact of user-defined treatment plans



Recent MDSS Display Extensions

Java-based Display

- Display and animate gridded products, such as radar and satellite data
- Dynamic basemaps (support arbitrary zoom and pan)
- Archive forecast display
- Display Automated Vehicle Location (AVL) data



MDSS Information and Requests

- Latest public release of the MDSS FP occurred fall 2007
- Updated April 2008

http://www.ral.ucar.edu/projects/rdwx_mdss/

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