Federal Maintenance Decision Support System (MDSS) Prototype Update

Kevin R. Petty, Ph.D.
National Center for Atmospheric Research
Boulder, Colorado, USA

MDSS Meeting
6 August 2008
Reno, Nevada
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
Maintenance Decision Support System

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
Maintenace Decision Support System

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)
- Camera (fixed and mobile)
- Tactical alerts
  - Frozen precipitation
  - Pavement temp. < 0°C
Maintenance Decision Support System

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 Demonstration 2007-2008

City and County of Denver and E-470 Public Highway Authority

- MDSS road weather forecasts and treatment recommendations
  - Limited supplemental forecasts/updates (within 24 hrs of significant event)

  - MDSS performance
  - Synoptic (large scale) situation
  - Key parameters (snowfall amounts, 32°F road temps, etc.)

- Between 1 October 2007 and 1 May 2008 – Over 20 separate snow events
- Mainly small (.5-1 inch) to moderate events (6 to 8 inch)
- Some events exhibited variable conditions over relatively short distances
- MDSS – in general, continue to see good forecast performance and realistic treatment recommendations (need verification)
City and County of Denver and E-470 Public Highway Authority
Maintenance Decision Support System

MDSS Refinements and Improvements

Misc. Changes and Fixes

• Corrected treatment suppression problem
• Corrected road condition assessment issue
• Modified the installation process
• Modified distribution process
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
METRo (Model of the Environment and Temperature of Roads)*

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

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

*Environment Canada
Road Temperature and Snow Depth Module

• METRo (Model of the Environment and Temperature of Roads) processing speed

• Developed a new ASCII input/output version
• Working to modify other parts of code (python interpreter)
Maintenance Decision Support System

MDSS Refinements and Improvements

Java-based Display

• Integrating support for various fixed and mobile cameras
Maintenance Decision Support System

MDSS Refinements and Improvements

Java-based Display

• Minor modifications to enable easy access to features
Maintenance Decision Support System

MDSS Refinements and Improvements

Java-based Display

- Enhancements to real-time and near-term road weather hazards
Java-based Display

• Examine archived events, including weather and road condition forecasts, observations, treatment recommendations, and selected treatment actions
• Incorporating support for animating AVL data and playback
• Latest public release of the MDSS FP occurred fall 2007
• Updated April 2008

Kevin Petty (MDSS Project Manager)
NCAR/RAL
3450 Mitchell Lane
Boulder CO 80301
Ph: 303-497-2705
Fax: 303-497-8386
kpetty@ucar.edu

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