Maintenance Decision Support System (MDSS)
Federal Prototype Activities

Kevin R. Petty
William P. Mahoney

National Center for Atmospheric Research (NCAR)

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Road Temperature Model Evaluation

Issue – SNTHERM, a 1-D energy balance model used in the prediction of road temperature and road condition, is no longer supported

Goal – to find a replacement model for SNTHERM

Models:

1. FASST - Fast All-season Soil Strength
2. METRo - Model of the Environment and Temperature of Roads

Criteria:

Performance
Code Stability
Efficiency
Support
Ease of use
Road Temperature Model Evaluation

Clear Case:
8 November 2006

Perfect Prognosis Approach
Road Temperature Model Evaluation

Clear Case: 8 November 2006
Forecast Driven
Rain Case: 11 November 2005
Perfect Prognosis Approach
Road Temperature Model Evaluation

Snow Case: 28 November 2006
Perfect Prognosis Approach
Road Temperature Model Evaluation

METRo - Model of the Environment and Temperature of Roads

Pros:  
- Good performance  
- Easy to acquire and set up, even for novice users  
- Good support from developers (Environment Canada)  
- Expanding community of end users

Cons:  
- Processing time (uses industry standard Extensible Markup Language [XML] for data processing) – roughly 2.0 seconds  
  48 hour point forecast

Online Wiki for more information:

http://documentation.wikia.com/wiki/METRo
Enhanced MDSS Display Capabilities

- Ability to display and animate gridded products
  - National Radar Mosaic
  - Visible Sat Image
  - IR Sat Image
  - WV Sat Image

- Data are loaded in netCDF, an emerging standard meteorological format
Enhanced MDSS Display Capabilities

- Real-time Automated Vehicle Location (AVL) data.
  - Location
  - Speed
  - Direction
  - Treatment
  - Observed Weather
  - Observed Road Cond.
Enhanced MDSS Display Capabilities

- Dynamic base maps
  - Roads
  - Political Boundaries
  - Topographic Detail
  - Pan
  - Zoom
Enhanced MDSS Display Capabilities

• New short-term tactical alerts (3-hr)
  ○ Frozen precipitation
  ○ Road Segment predicted to drop below freezing with precip occurring and/or road wet
Enhanced MDSS Display Capabilities

• Display more localizable than previous versions
• Configuration files are separate from application source code (i.e., recompilation not required to move display from one state to another)
• Nearly all layer configuration specified in one XML file
• Geographic data requested using Web Map Service (WMS) protocol
• Road segments and alert zones specified in Shapefile format.
System Replay/Archive

- Data archive selector allows event replay capability
  - 5 day storage of radar and satellite data
  - 1 year archive of MDSS forecasts
MDSS 2006-07 Colorado Demonstration

National Weather Service Data
- NAM
- GFS model
- MAYMOS
- METARS
- SYNOP

Supplemental Data
- Rapid Update Cycle (RUC) Model
- RWIS Data
  - E-470
  - Colorado DOT
  - City of Denver

Road Weather Forecast System
- Data Ingest
  - Forecast Module A
  - Forecast Module B
  - Forecast Module C
  - Forecast Module D
  - Forecast Module N
  - Forecast Integrator
  - Post Processor
  - Forecast Product

Road Condition and Treatment Module
- Road Temperature Prediction Model
- Chemical Concentration Algorithms
- Rules of Practice for Anti- and Deicing

Road Weather Predictions and Plow Route Specific Treatment Recommendations
MDSS 2006-07 Colorado Demonstration

- Supported the City and County of Denver and the 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.)
MDSS 2006-07 Colorado Demonstration

• Between 1 October 2006 and 1 May 2007 – 16 separate snow events
• Two major winter storms within 2 weeks
  ○ 2 – 3 feet in Denver Metro (20 December)
  ○ ~1 foot in Denver Metro (28 December)
• Some events exhibited variable conditions over relatively short distances
• MDSS – in general, good forecast performance – handles heavier snowfall events better than light events.
MDSS 2007-08 Colorado Demonstration

• Run old and new displays in parallel
• Add new forecast sites for City of Denver – based on new sensors
• Bug fixes and/or nominal system changes, as necessary