

Winter Road Maintenance Decision Support System (MDSS) Prototype Development



MDSS Component Overview

Presented by

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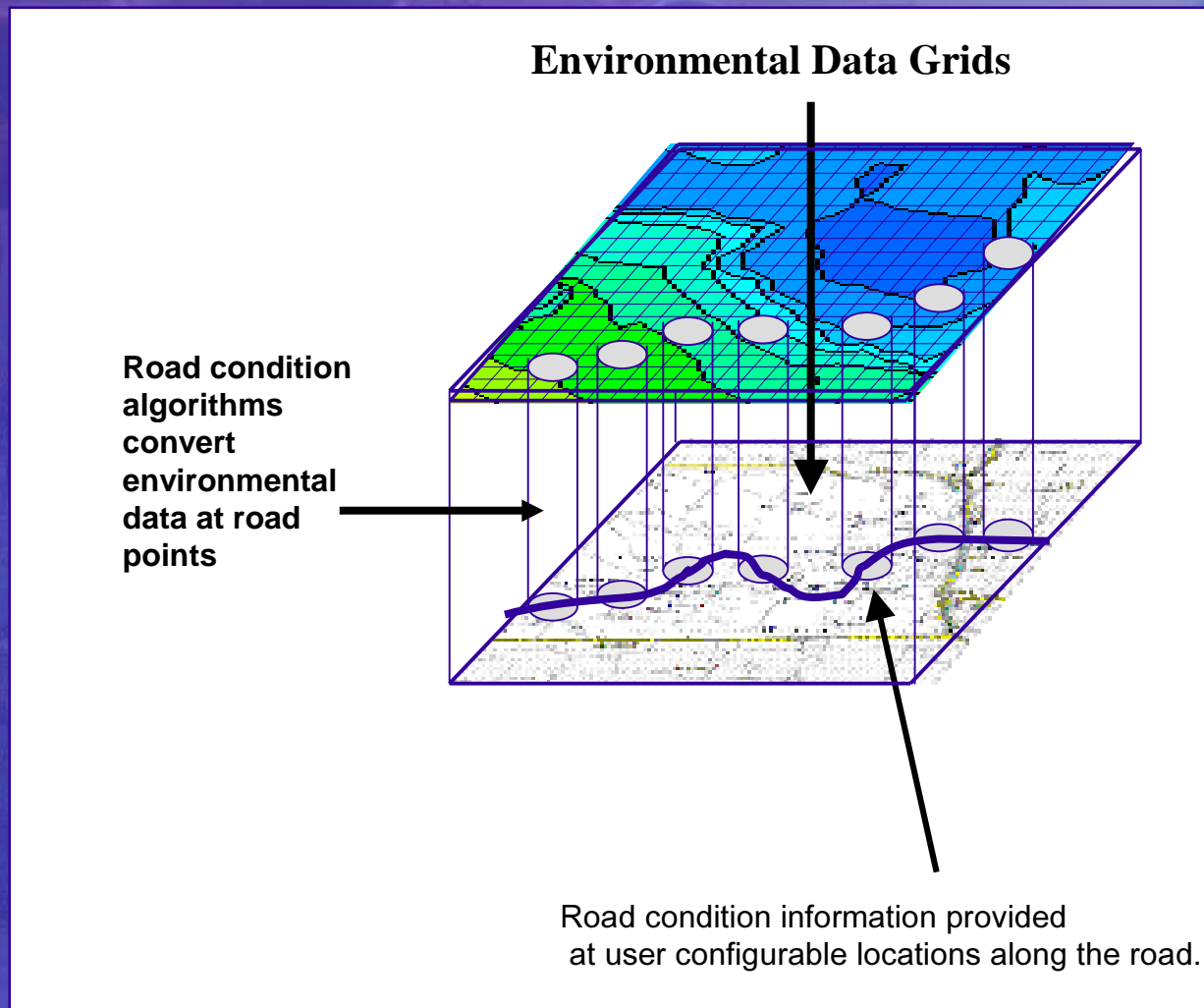
National Center for Atmospheric Research



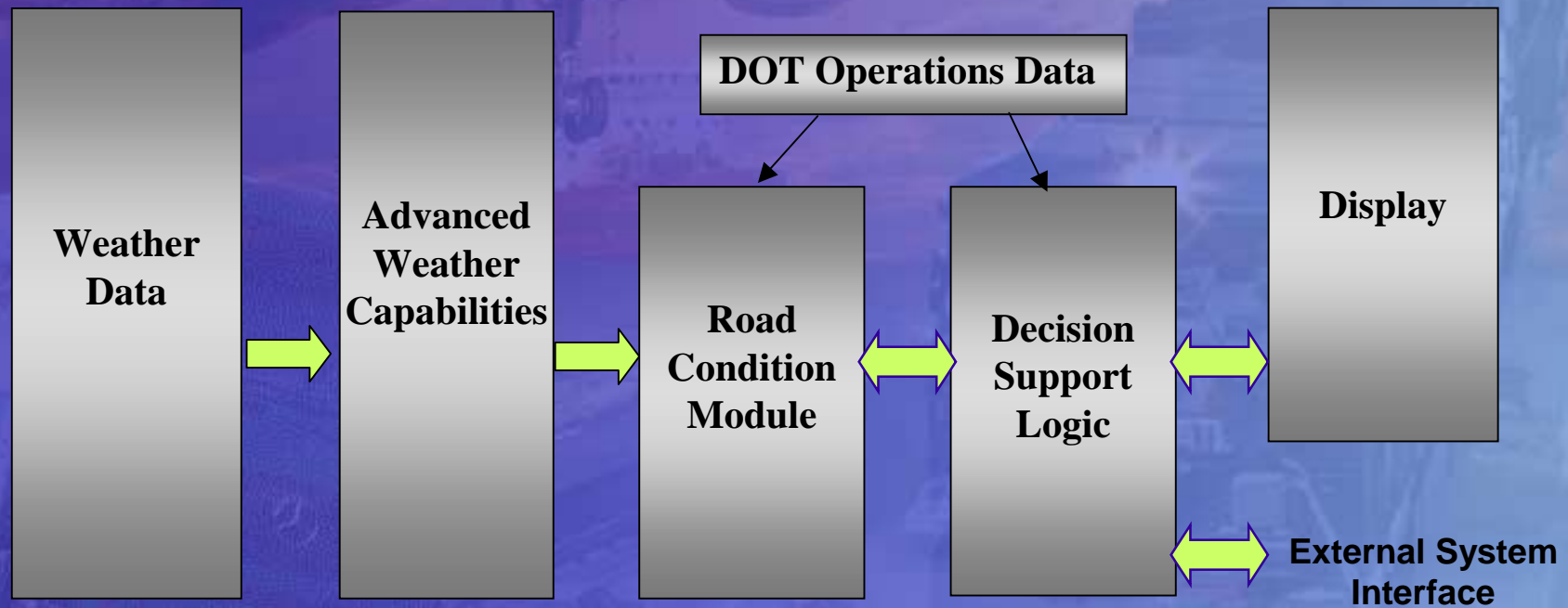


MDSS Prototype Components

Translation of Environmental Data to Road Condition Information



MDSS Prototype Components



MDSS Prototype Focus Areas

Weather Component Focus :

- Event start and stop times
- Surface temperature (2 m)
- Precipitation type
- Precipitation rate
- Precipitation accumulation
- Conditional probabilities
- Surface wind speed
- Surface wind direction
- Surface visibility



MDSS Prototype Focus Areas

Road Component Focus:

- Pavement temperature and trends
- Pavement chemical concentration
- Pavement friction coefficient (road mobility)
- Pavement contamination
- Snow drifting



MDSS Prototype Focus Areas

Decision Support System Component Focus:

- Monitor weather & road conditions
- Monitor probability & intensity of weather threat
- Treatment options & timing
- Crew scheduling & managing crew shifts
- Dispatch crews to treat roadway
- Post event clean up

MDSS Prototype Modules

Nine primary modules
in FY2001

Ensemble Forecasting
FSL



Video Camera Image
Processing - LL



Maintenance Decision Support System - Core

Road Weather Forecast System - NCAR

Road Chemical Concentration - CRREL

Road Friction Coefficient - CRREL

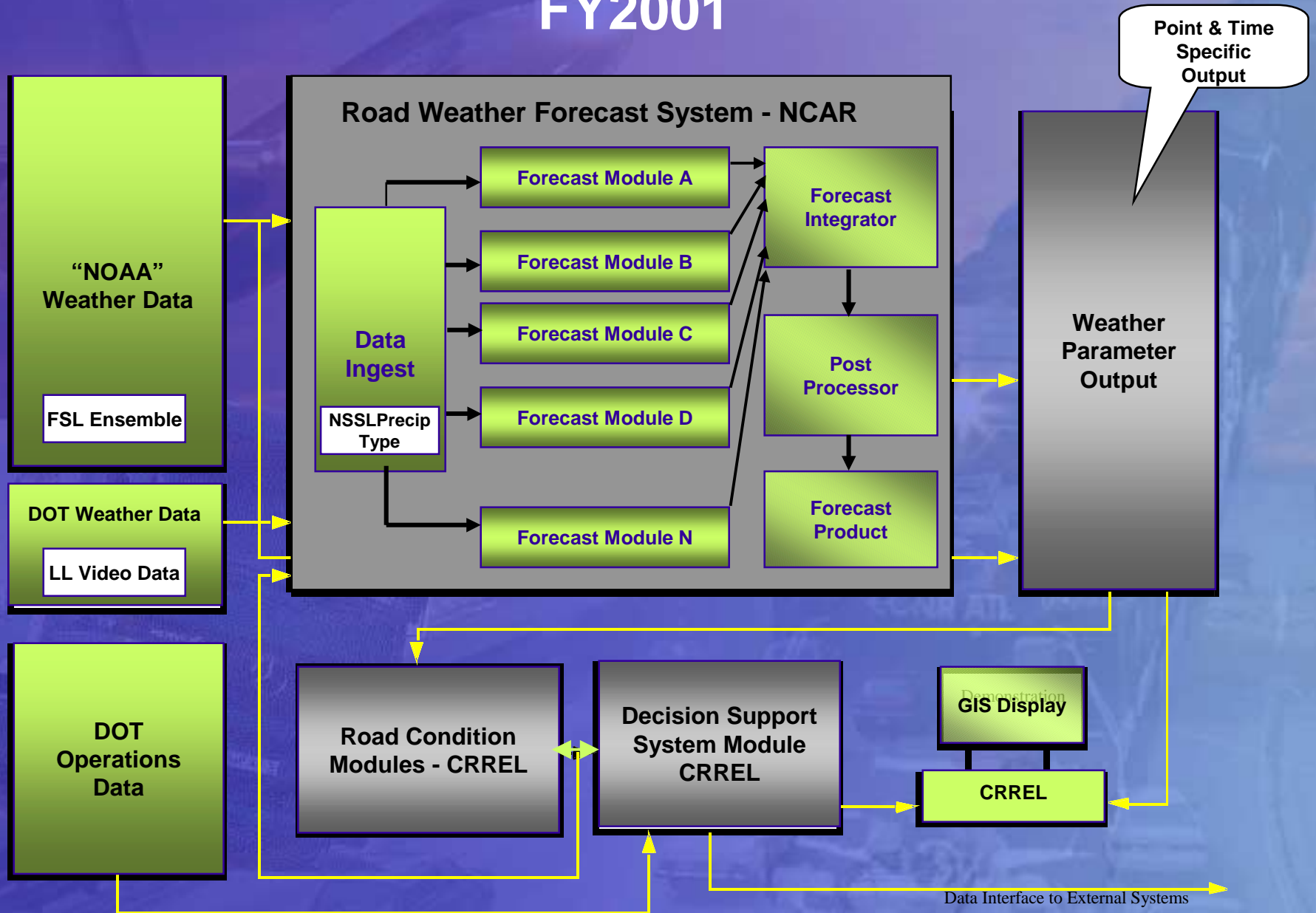
Road Surface Temperature - CRREL

Snow Drifting Algorithm - CRREL

Rules of Practice Module - CRREL

Precipitation Type - NSSL

Engineering Components for MDSS FY2001



National Center for Atmospheric Research Research Application Program

Road Weather Forecast System



NCAR/RAP

Road Weather Forecast System - NCAR

Multiple
Input
Data
Sources

Weather
Data
Ingest
Module

Wx Forecast Module A

Wx Forecast Module B

Wx Forecast Module C

Wx Forecast Module D

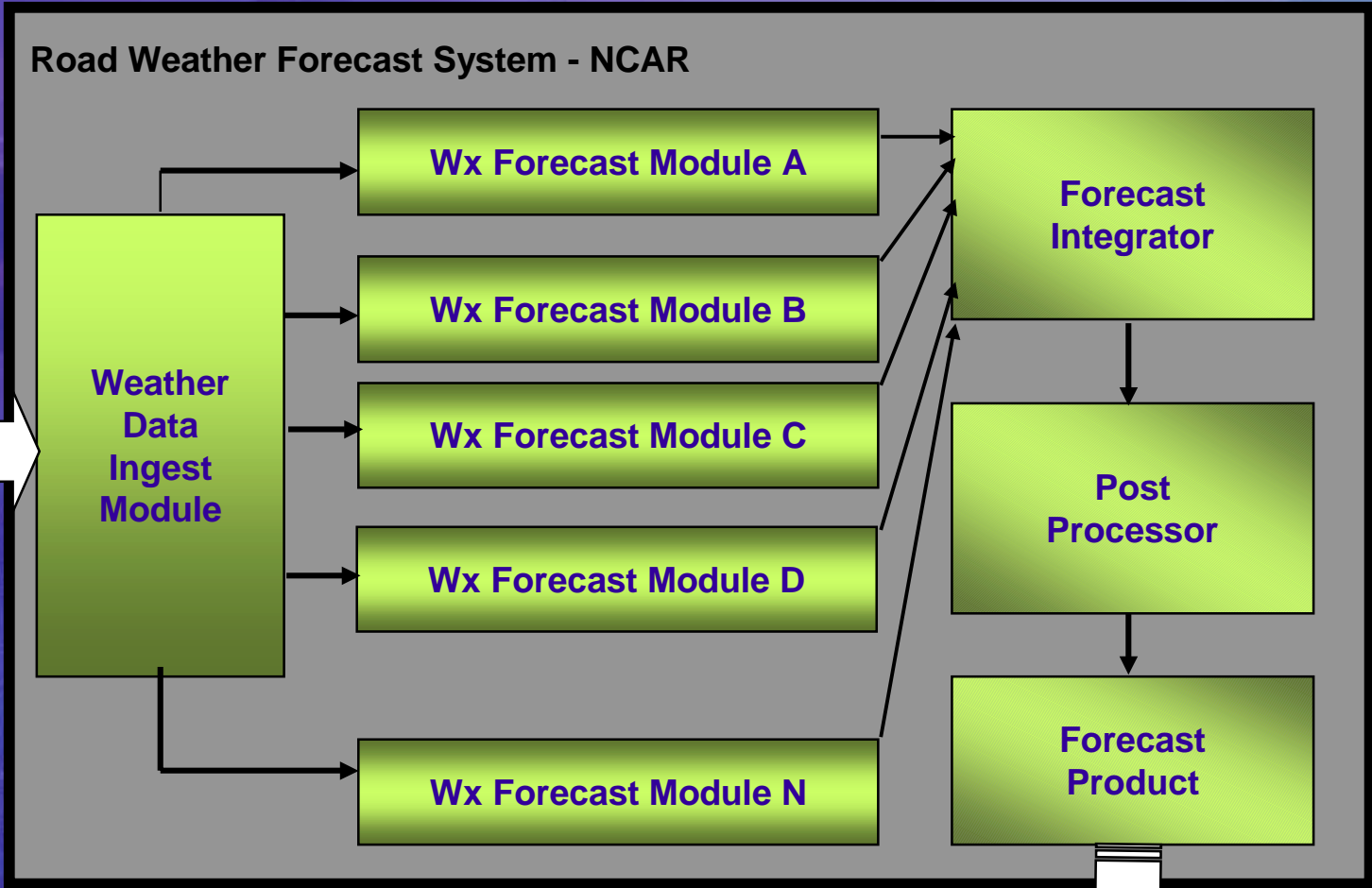
Wx Forecast Module N

Forecast
Integrator

Post
Processor

Forecast
Product

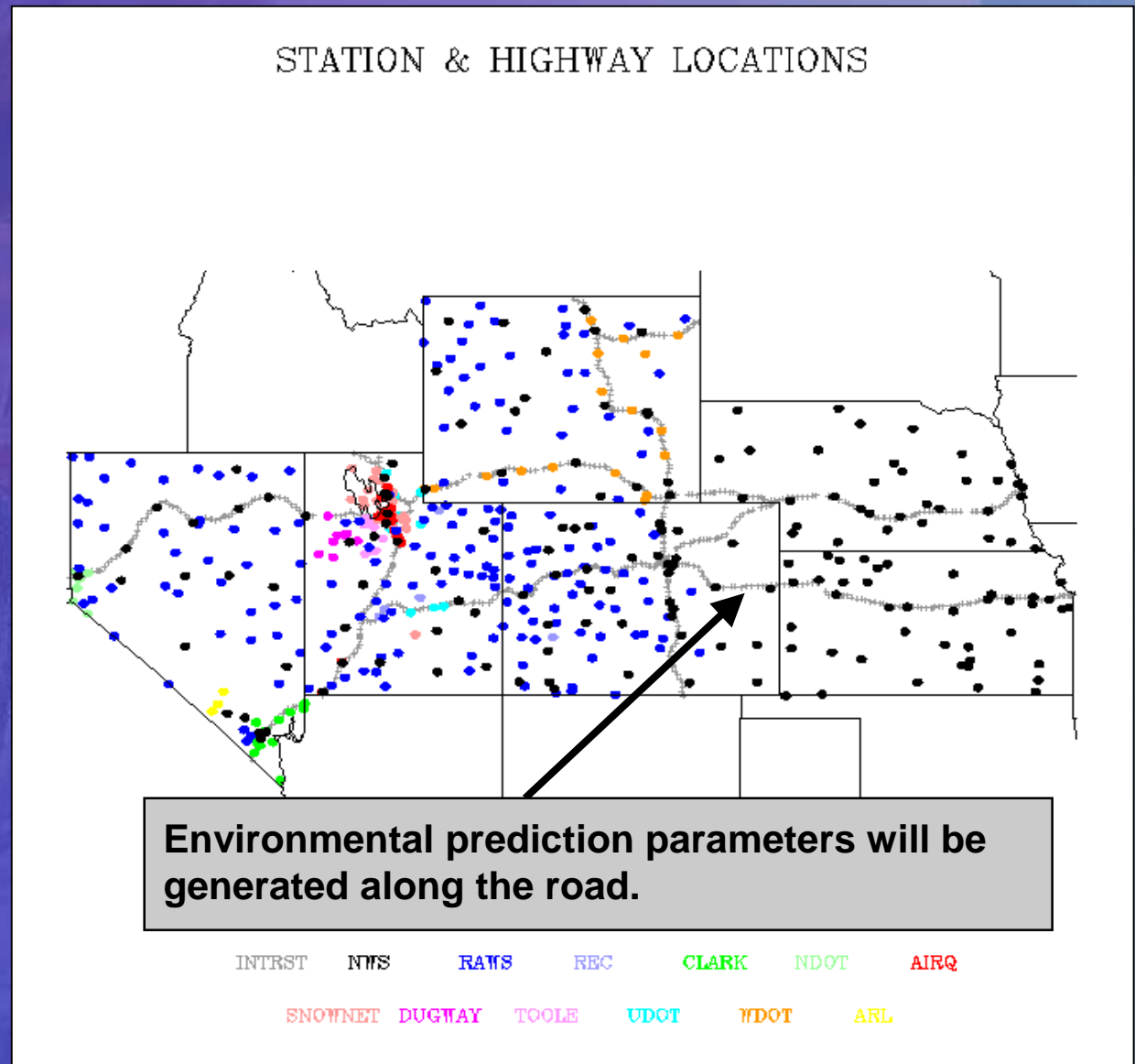
Point
Forecasts



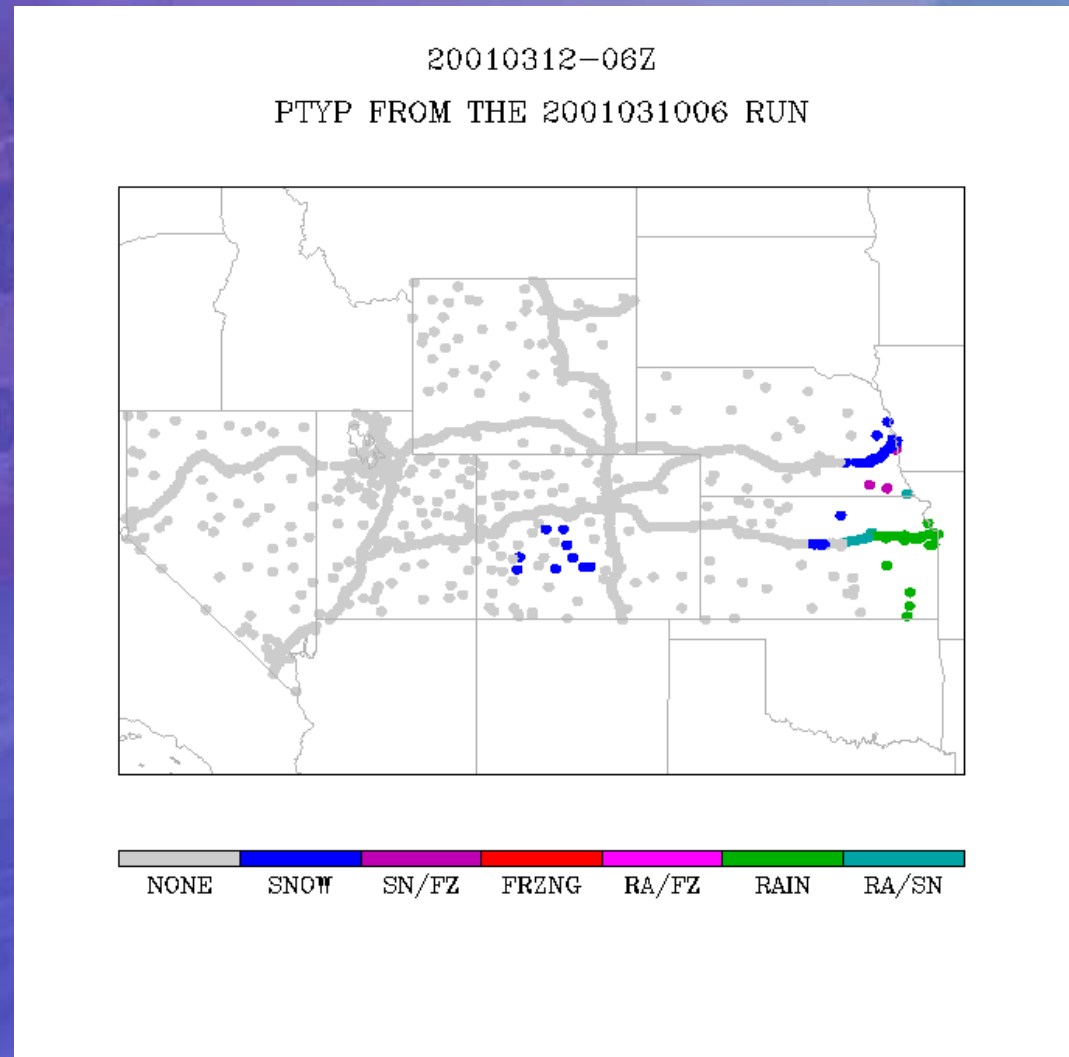
Sample Environmental Prediction Sites

All observational weather data are necessary to improve forecasts!

The system will be designed utilize all data available including: DOT, NWS, DoD, air quality, and hydrology networks.



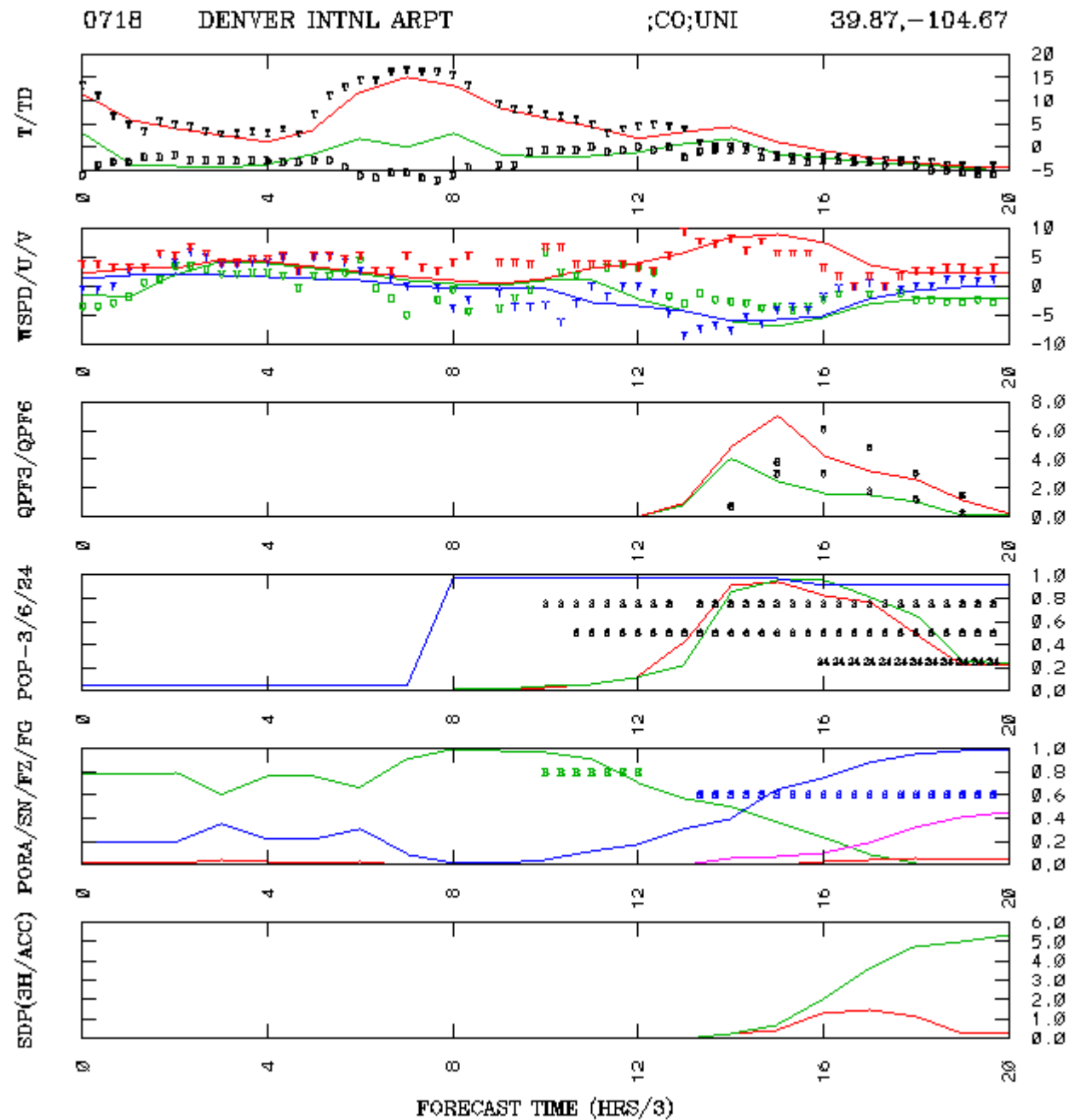
The Road Weather Forecast System will generate point specific forecasts of environmental parameters along road corridors.



Example: Precipitation Type

MDSS

Single Point Time Series

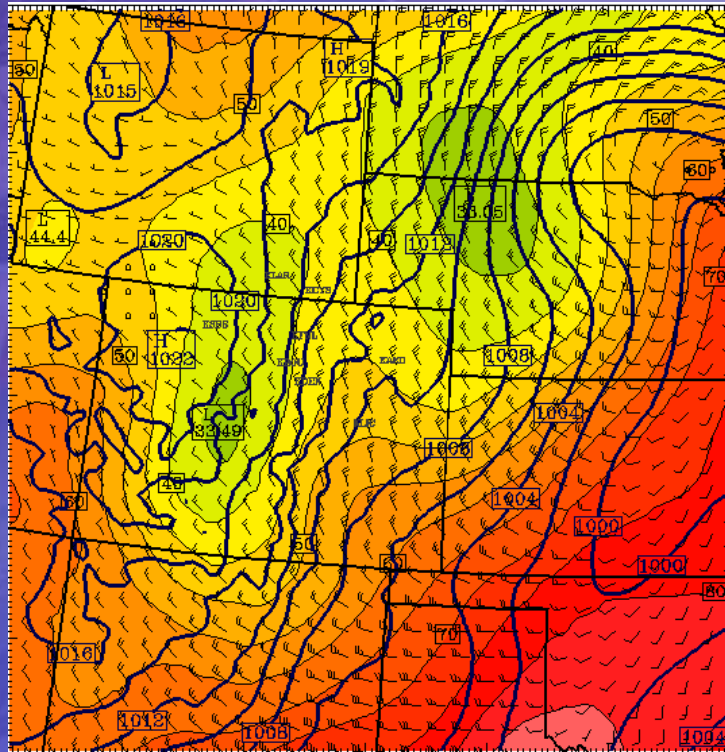


Forecast Systems Laboratory Ensemble Forecasting

Models: Initialization:

WRF
MM5
RAMS

AVN
Eta
RUC



9-Member
Ensemble



To
Road Weather
Forecast System

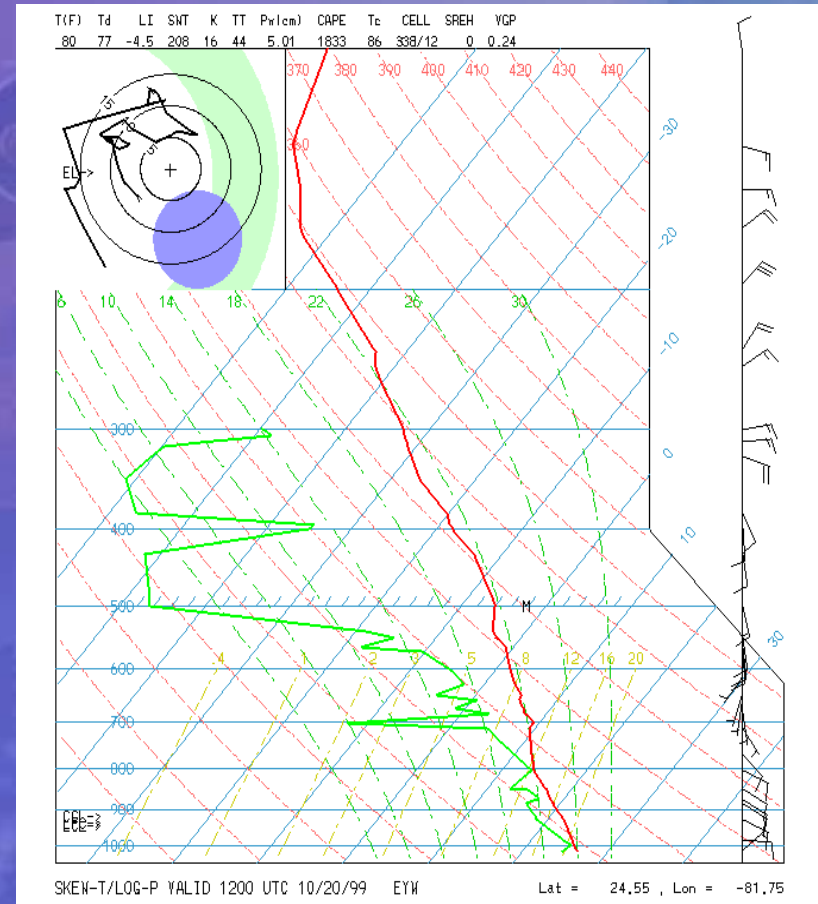


MM5 & Eta models (12 km grid)

NOAA National Severe Storms Laboratory

Precipitation Type Algorithms

Rain?
Snow?
Ice?
Mixed?



Cold Regions Research and Environmental Laboratory

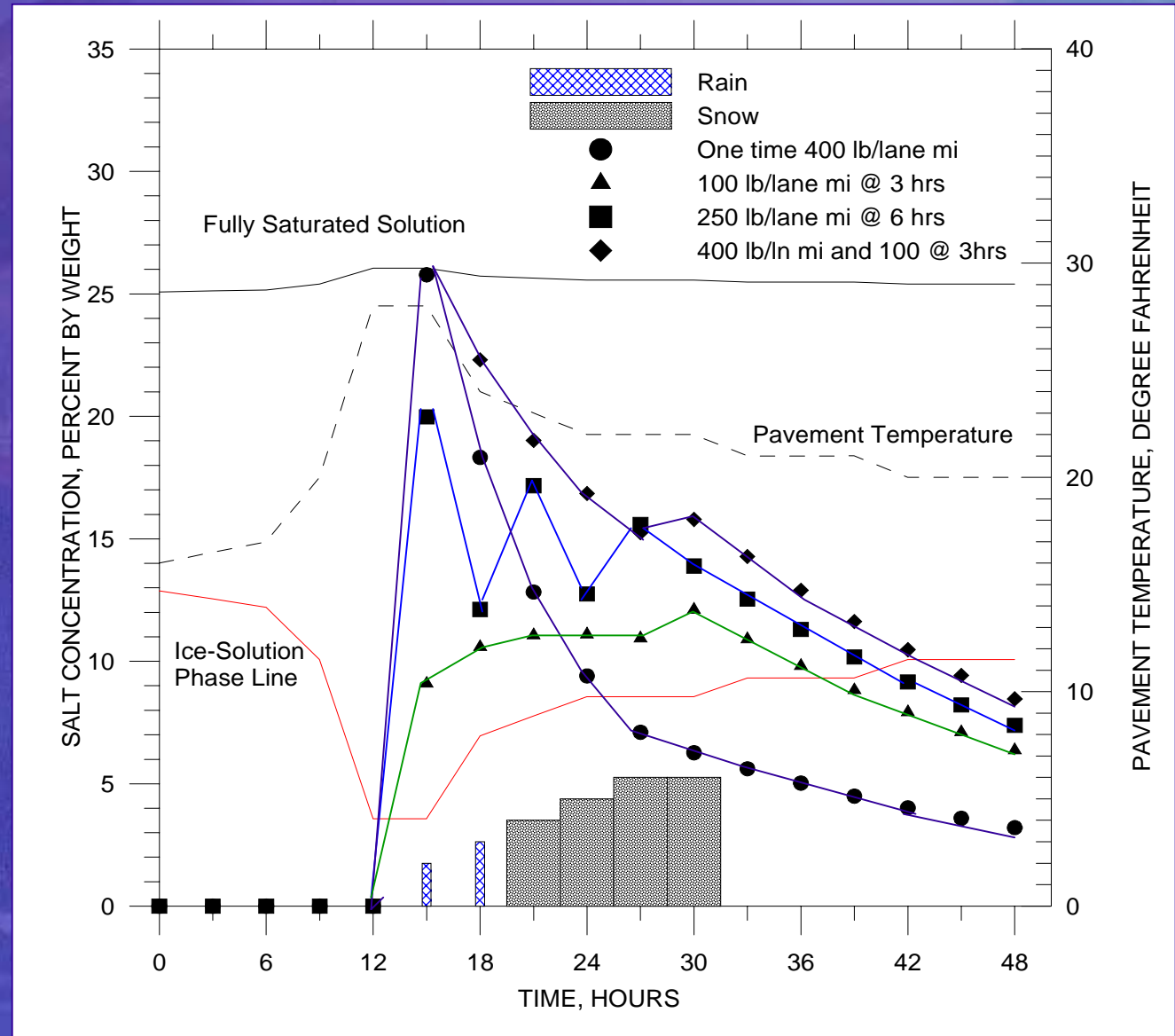
CRREL



Welcome to the US Army Corps of Engineers
Engineer Research and Development Center
Cold Regions Research and Engineering Laboratory

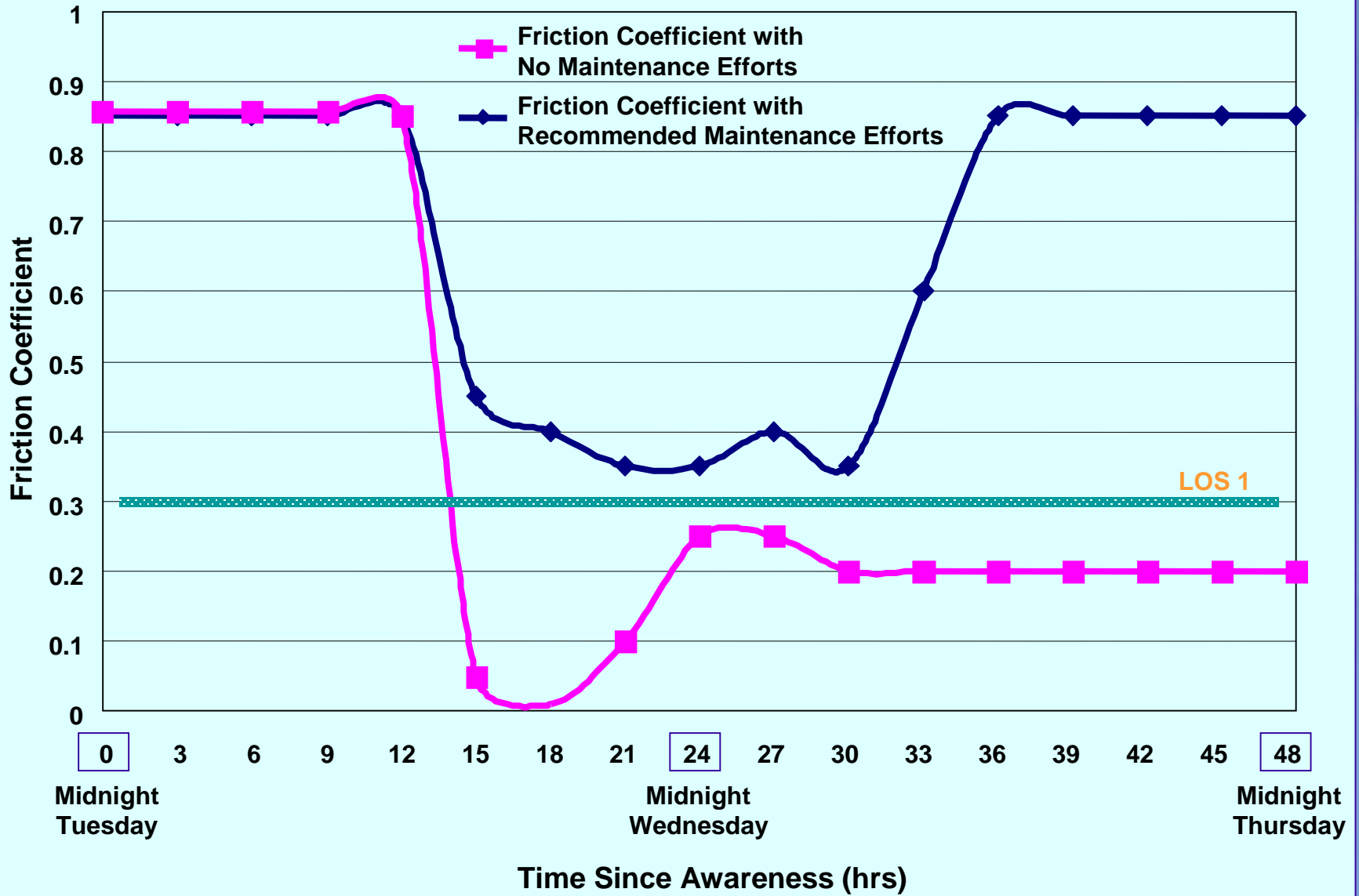
CRREL - Salt Concentration Model

Illustrates the sensitivity of salt concentration with time during a predicted weather event for multiple treatment options.

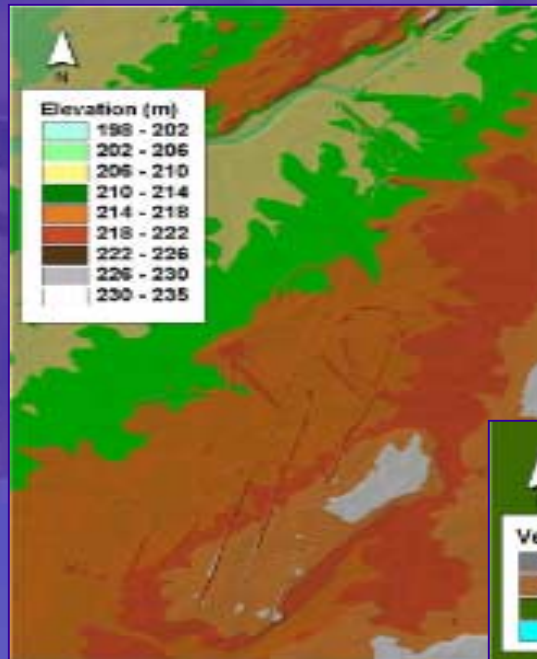


CRREL

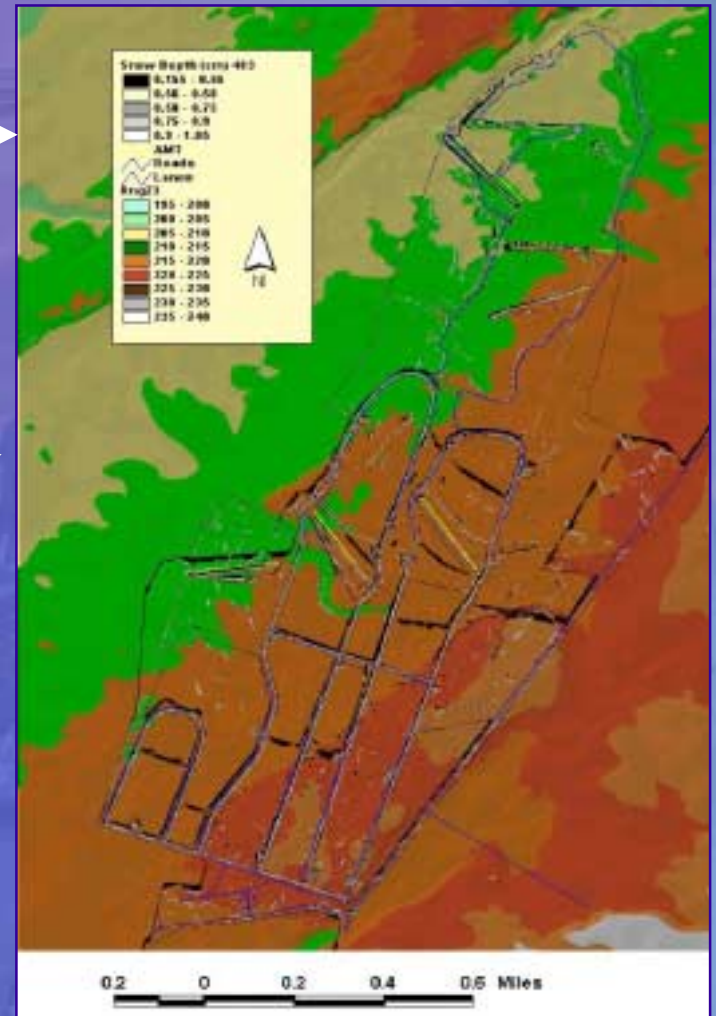
Two-Day Friction Coefficient History With and Without Treatment Prediction Point #3



CRREL - 3-Dimensional Snow Drift Model



Model Output →



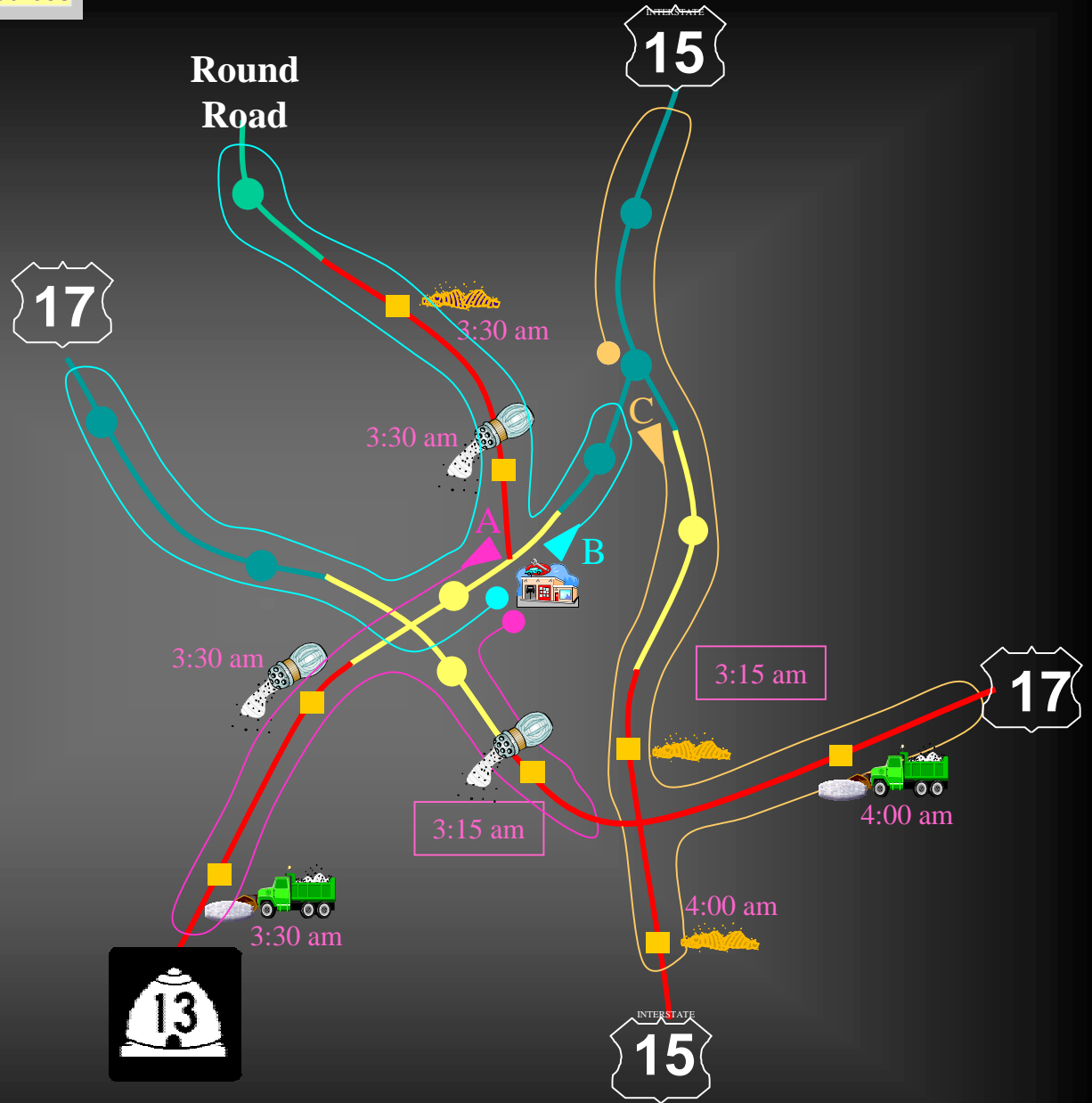
Snow depth overlay

Model Input:

- DEM (10 m)
- Vegetation
- Met data

Game Plan

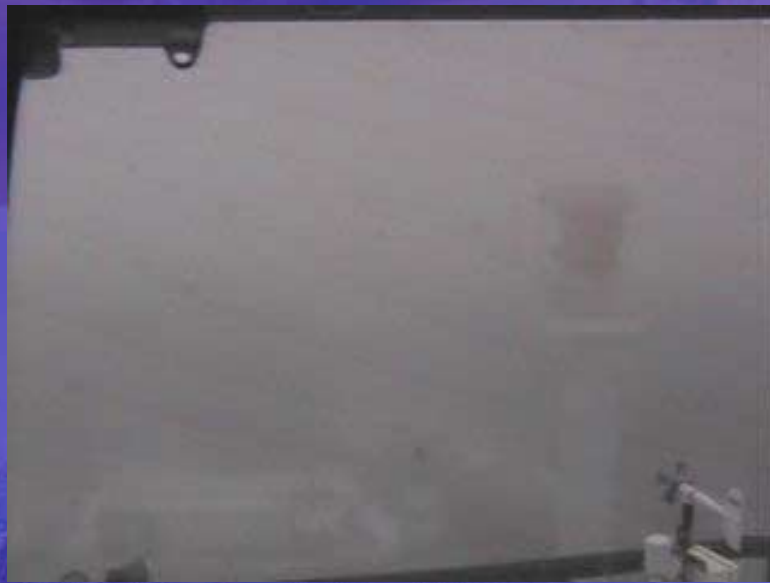
-  Crew
-  Trucks
-  Material Stocks
- Truck Routes
 - Standard
 - Custom
- Road Status
- Logistics Matrix



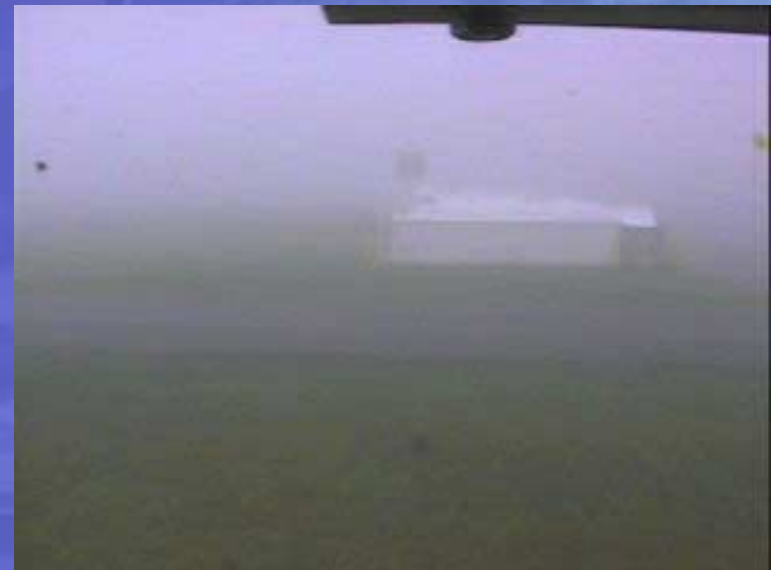
Sample: Route Specific Guidance

MIT Lincoln Laboratory

Video Image Analysis



Video Visibility



LL Video Image Edge Detection Processing

