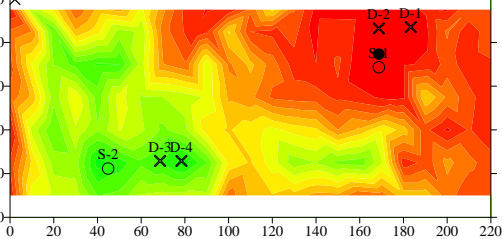


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PaveSuite

NEW PAVEMENT EVALUATION TOOLS

Presenter	Magdy Mikhail (TxDOT), Kevin McGhee (VCTIR)
Title	AASHTO PaveSuite - Pavement Evaluation Tools
Agency/Affiliation	AASHTO Lead States Team
Event	23 rd Annual Road Profile Users' Group (RPUG)
Session Title	Research and Standardization Initiatives
Date	September 27, 2011

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Technology Implementation Group (TIG)

- **Dedicated to sharing high-payoff, market- ready technologies**
- **Committed to promoting technological advancements in transportation**
- **Sponsors technology transfer and encourages its implementation**

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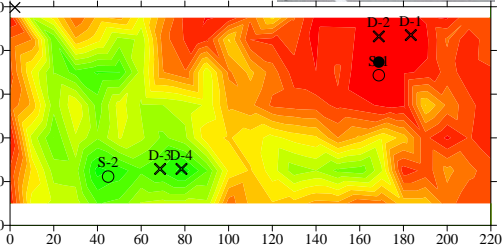
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The Lead States Team

- **Bouzid Choubane, FDOT**
- **Magdy Mikhail, TxDOT**
- **Brian L. Schleppi, ODOT**
- **Kevin McGhee, VCTIR**
- **Emmanuel Fernando, TTI**
- **Mike Jackson, UNF**
- **Darryll Dockstader, FDOT**
- **Abdenour Nazef, FDOT**
- **Charles Holzschuher, FDOT**
- **Andy Mergenmeier, FHWA**

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THE CHALLENGE:

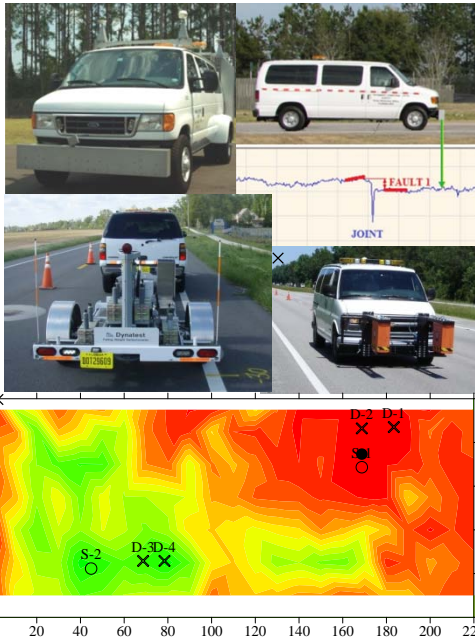
- Improve Worker and Public Safety
- Improve Pavement Evaluation Efficiency and Cost Effectiveness
- Provide Higher Quality of Pavement Data

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PaveSuite

- Automated Cross Slope and Drainage Path Method
- Automated Pavement Faulting Method

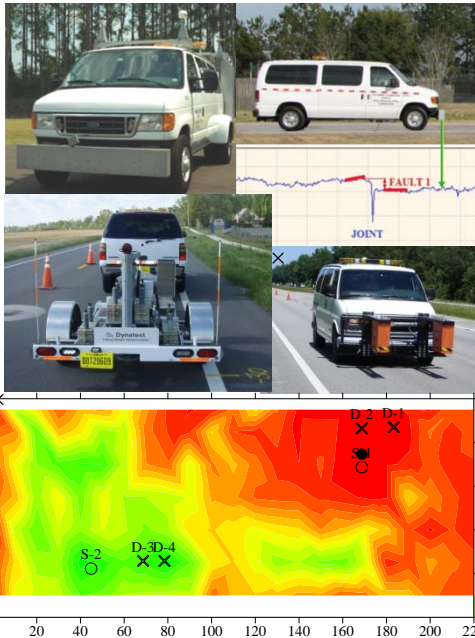


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PaveSuite

- **Intelligent Pavement Surveys Using Non-Destructive Equipment**
- **Vibration Sensitive Work Zone Identification Method**

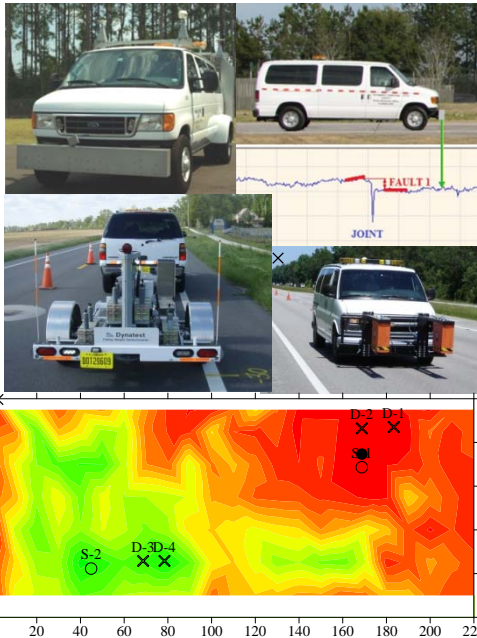


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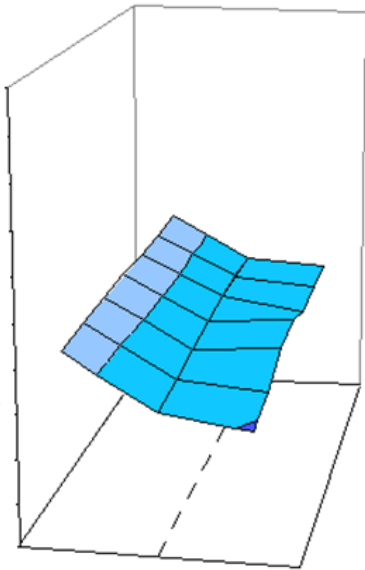
PAVESUITE BENEFITS

- Improved safety
- Increased efficiency and cost effectiveness
- Increased data quantity and quality



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Automated Cross Slope and Drainage Path Method

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Factors that contribute to hydroplaning

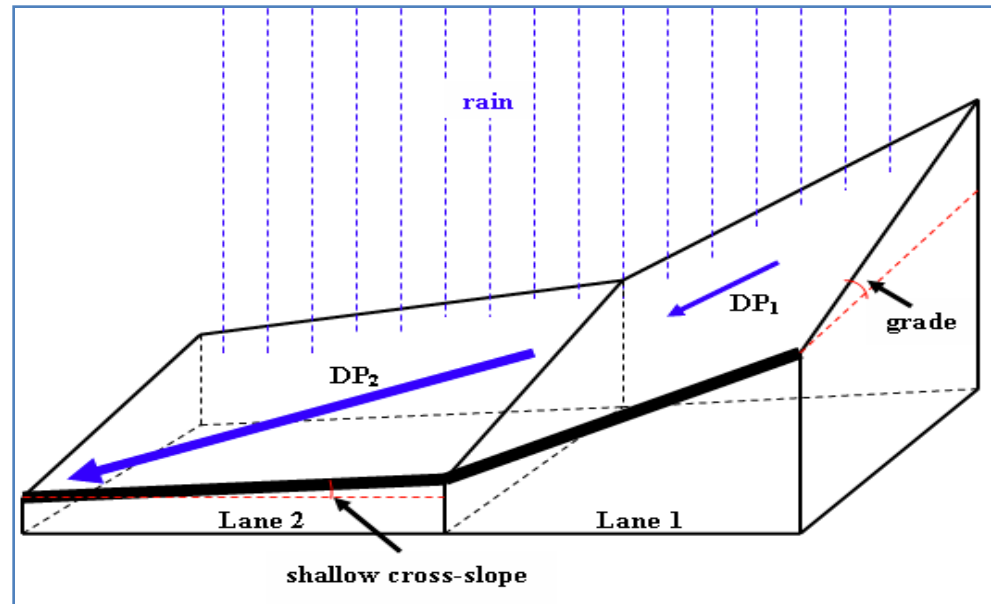
- **Driver**
- **Vehicle**
- **Environment**
- **Pavement Surface (geometry, and condition)**

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Pavement Surface Characteristics

- Cross-slope
- Grade
- Rutting



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Automated Cross Slope and Drainage Path Method

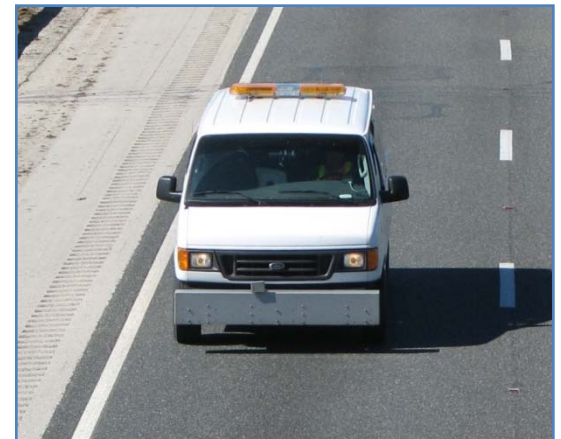
- Identifies problem prone areas
- Eliminates manual data collection
- Increases speed, safety, and cost effectiveness

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Cross Slope Survey Equipment

- **Inertial Roadway Profiler**
- **Position and Orientation System (POS)**
 - **Inertial Measurement Unit (IMU)**
 - **Differential Global Positioning System (DGPS)**



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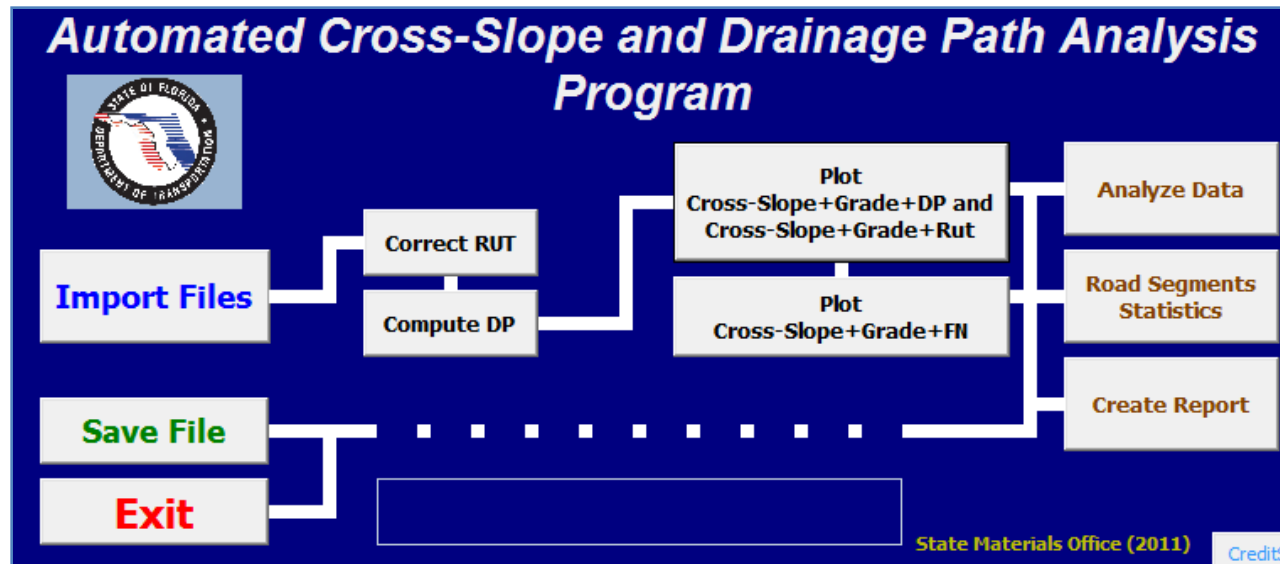
Automated Cross Slope Analysis Program (ACAP)

- **Imports and processes data**
- **Calculates drainage path**
- **Generates reports, tabular and graphical outputs**

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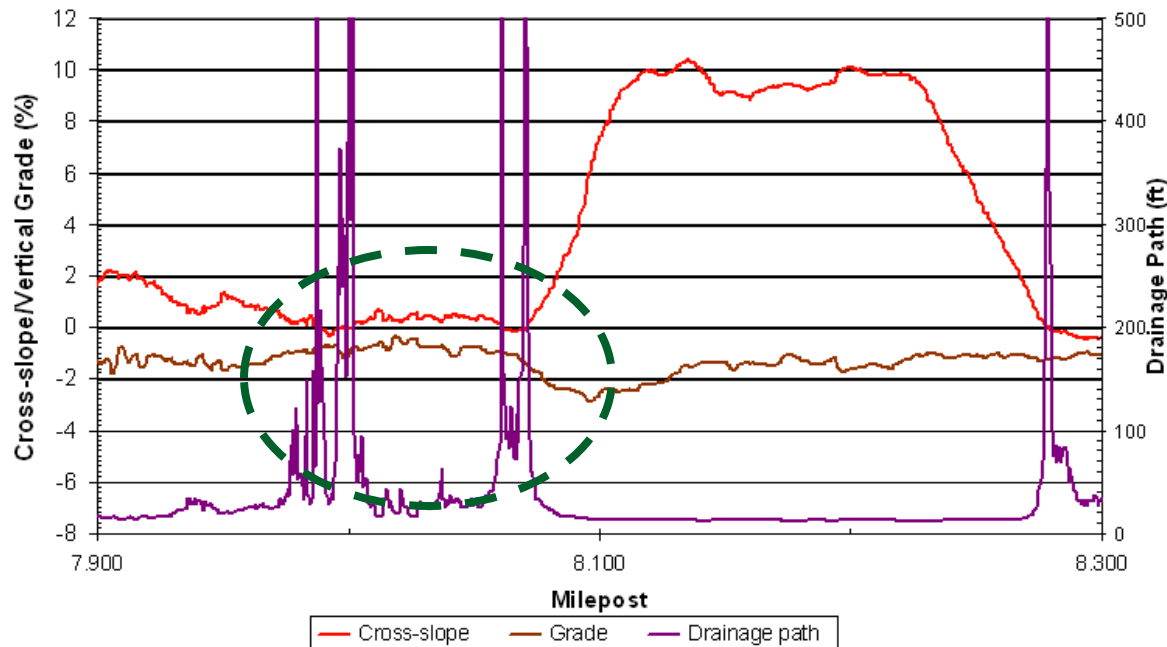
Automated Cross-slope Analysis Program (ACAP)



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ACAP 2D Graphical Output

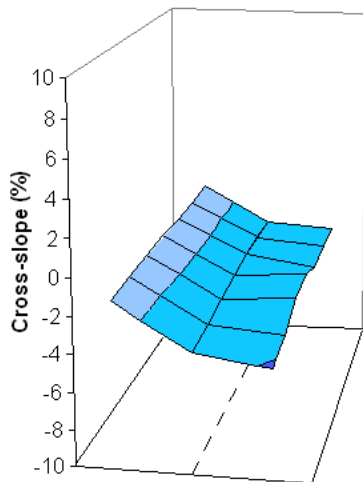


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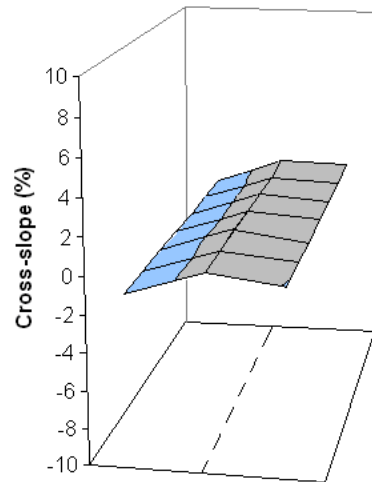
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ACAP 3D Graphical Output (work in progress)

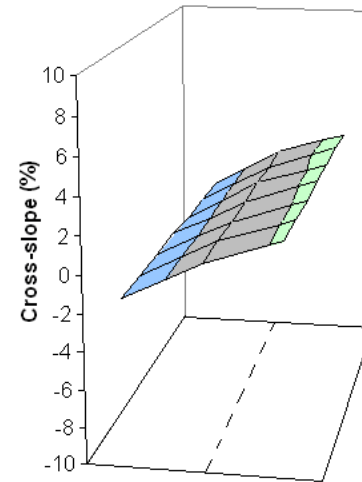
(a) MP = 4.088



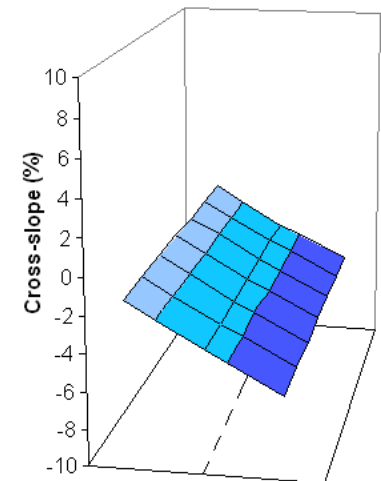
(b) MP = 4.503



(c) MP = 4.877



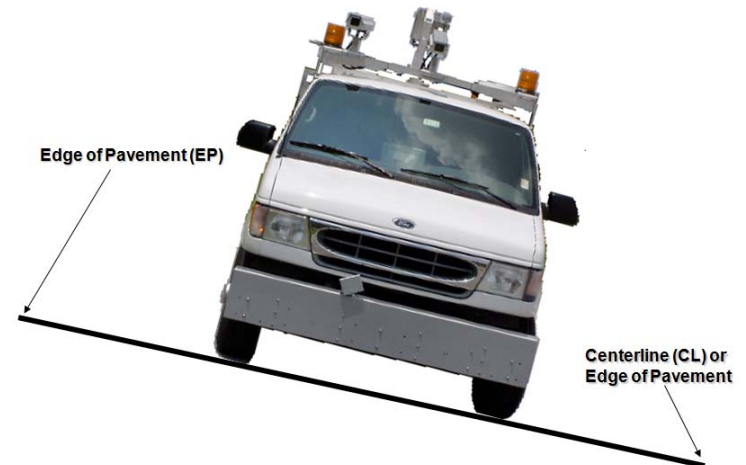
(d) MP = 5.286



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Accuracy and Repeatability



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Case History: 6-lane rural interstate

Problem

- Poor pavement drainage

Consequence

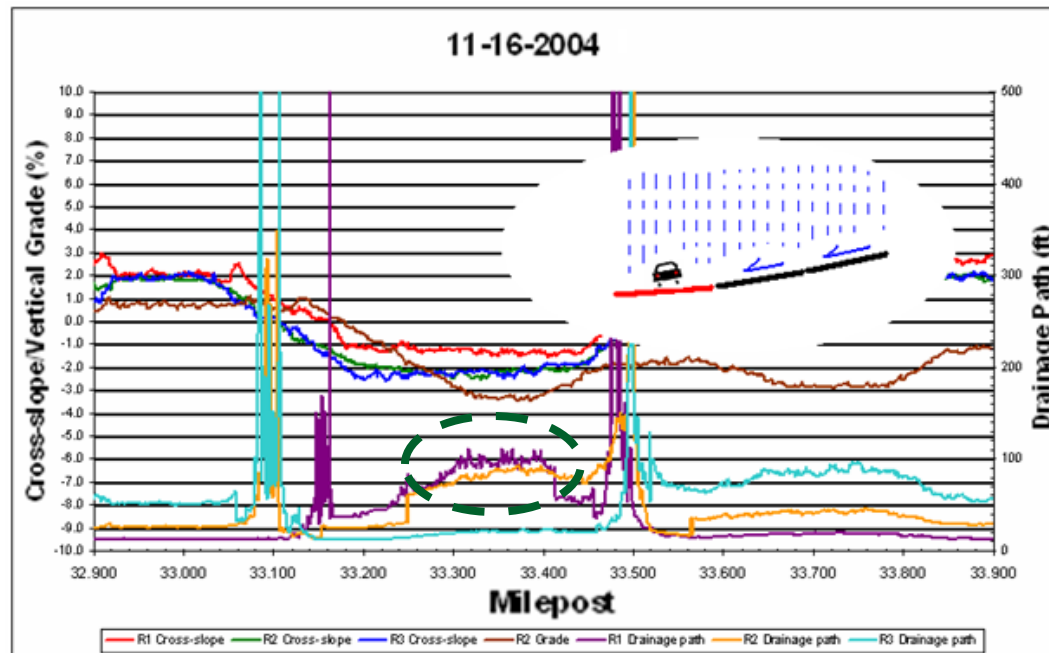
- Vehicle departures



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Before Corrective Action



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Short Term Corrective Action

- Grooves



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Short Term Corrective Action

- **Variable Message Sign**

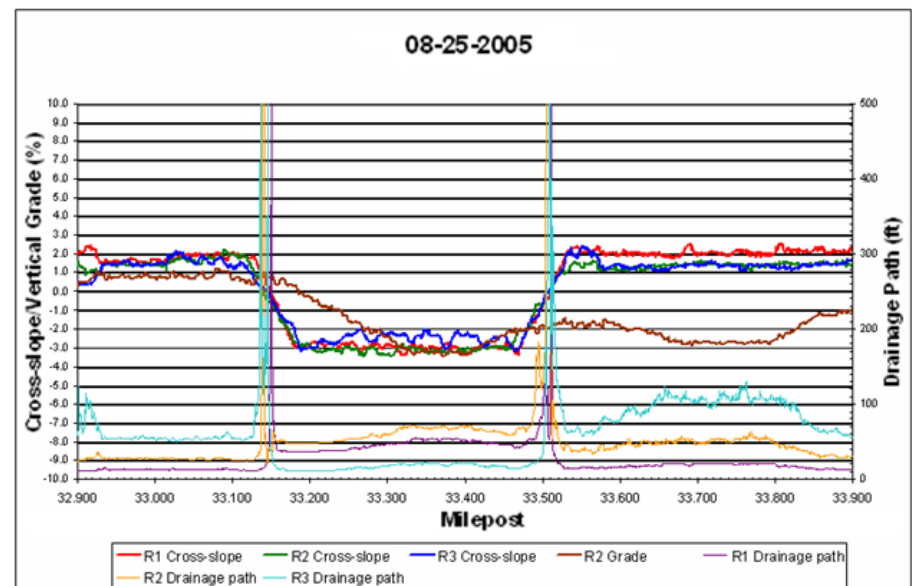


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Long term Corrective Action

- Milling and Overbuild



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Observations After Corrective Action

- **Substantial cross-slope improvement**
- **Smoother transition in and out of horizontal curve**
- **Elimination of surface drainage problem**
- **No new roadway departures reported**

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Summary

**The Automated Cross Slope and Drainage Path
Method is a ...**

**Safe, fast and cost-effective method for identifying
and evaluating problem prone areas.**

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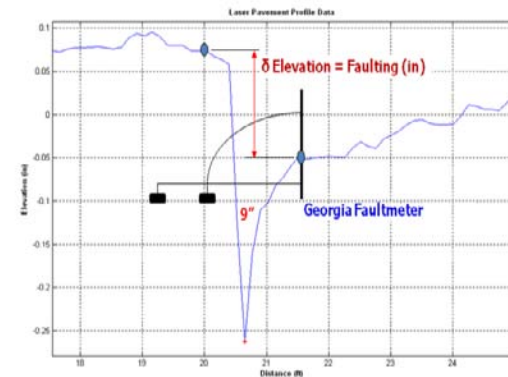
Automated Pavement Faulting Method

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Faulting is ...

- Difference in elevation across a joint
- Important Indicator of pavement performance
- Major impact on pavement life-cycle cost

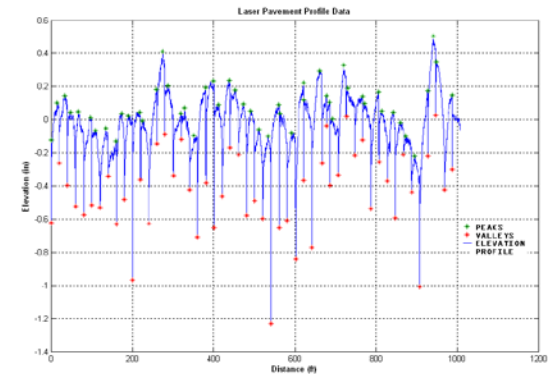


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Automated Faulting Measurement

- Safe
- Fast
- Efficient and cost effective
- Does not require traffic control



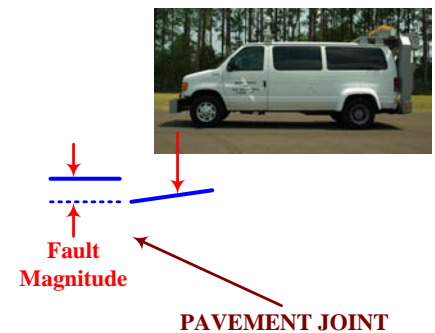
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Automated Faulting Program (AFP)

- Uses longitudinal roadway profile
- Locates transverse joints
- Calculates faulting automatically

SURFACE PROFILE



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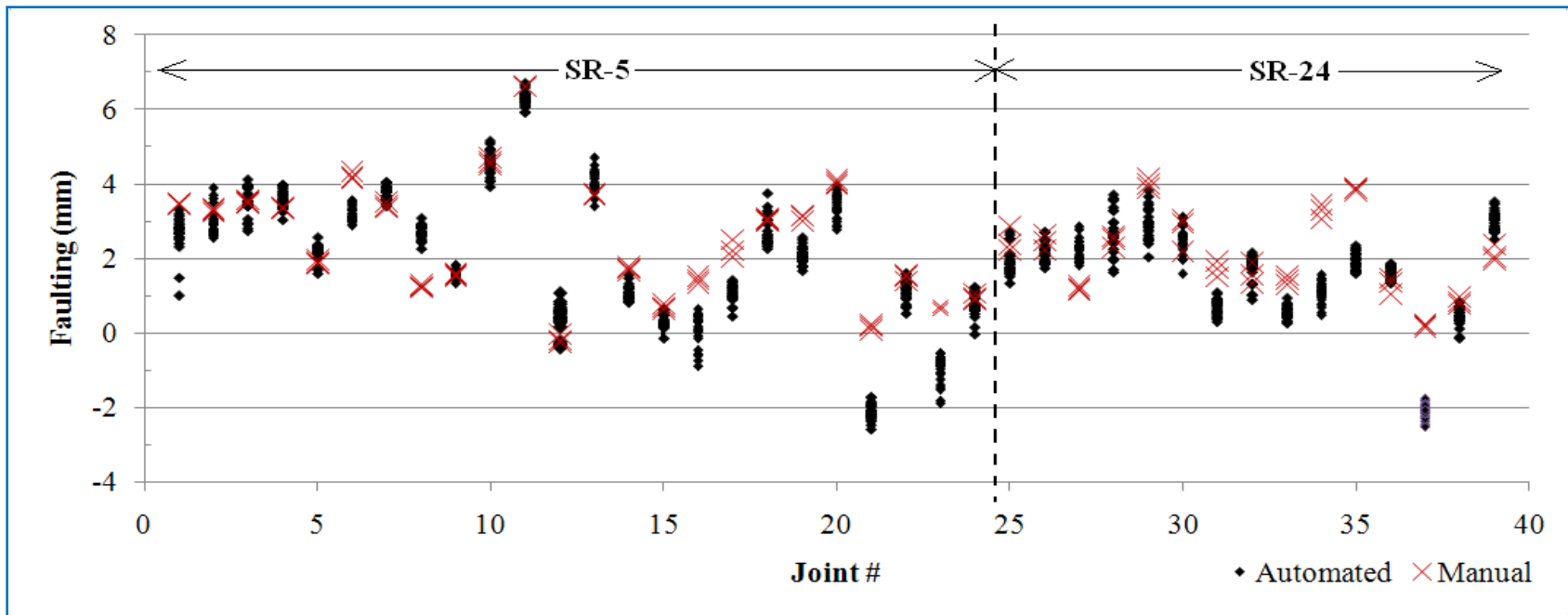
Accuracy and Precision Evaluation

How accurate, repeatable and reproducible ?

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Automated (Profiler) vs. Manual (Faultmeter)



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Automated Faulting Precision

- **Bias: 0.2 mm (0.01 in.) to 0.7 mm (0.03 in.)**
- **Repeatability: 0.6 mm (0.02 in.)**
- **Reproducibility: 0.9 mm (0.04 in.)**

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Summary

The automated faulting method is ...

- **Efficient and Cost Effective**
- **Suitable for Construction, Maintenance and Forensic Investigation Projects**
- **Implementable at Project and Network Level**



Questions?

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