A Revolutionary New Initiative

On a snowy morning this past winter, a driver lost control of his vehicle and collided with a tractor-trailer traveling the opposite direction, resulting in his untimely death. This particular crash occurred on Highway 287 in Colorado, but the script is repeated again and again across our nation. Every year, there are 1.5 million weather-related vehicle crashes in the U.S., leading to 385,000 injuries and over 4,700 fatalities. Adverse weather and the associated poor roadway conditions are responsible for 554 million vehicle-hours of delay per year in the U.S., with associated economic costs reaching into the billions of dollars.

Adverse weather conditions continue to plague the transportation network, but ongoing research and development promise a new system to improve driver safety and mobility.

Can these weather-related crashes be prevented? We believe they can, at least some of them, and a revolutionary new initiative spearheaded by the USDOT RITA will lead the way. This multimodal initiative will enable wireless communications among vehicles, infrastructure, and personal communication devices. It offers the promise of enhancing our safety, mobility, and quality of life, while also helping to reduce the environmental impact of surface transportation.

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The challenge for the weather community is to harness the promise of these mobile observations and provide useful applications to the driving public. To meet this challenge, RITA, the FHWA Road Weather Management Program, and NCAR are collaborating on a multi-year study. The main foci of this project are to (1) assess the accuracy and bias of mobile sensors; (2) develop algorithms and capabilities to translate mobile data into useable weather and road hazard products; and (3) incorporate these observations into effective weather-responsive roadway management systems and advanced decision support tools.

Early results suggest that vehicle-based measurements of air temperature are reasonably accurate (mean absolute errors around 1°C). More importantly, there is little evidence to suggest that variations in environmental conditions, such as wind speed, the occurrence of precipitation, or ambient air temperature, affect the accuracy or bias of vehicle measurements.

Handling the Data

With respect to developing algorithms, preliminary research confirms that vehicle data can be combined with traditional meteorological observations in intelligent ways to produce road and atmospheric hazards. However, two key data challenges remain. With 230 million vehicles on the nation’s roads logging 3 trillion miles driven annually, the sheer volume of data could be overwhelming if even a fraction of them are transmitting data. Additionally, a foundational component of this program is ensuring anonymity for drivers, which could present a challenge for data integrity.

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Even after developing ways to use vehicle data, we must ensure that the applications are usable for society. It is not enough to think our job ends when the information is released; rather, we need to understand what happens next. Actualizing the integration of vehicle-based road and atmospheric hazard applications for the public will not be an easy task. Only as a unified enterprise, consisting of all creators and users of data, can we develop the necessary tools that can be transferred to the public and utilized in ways that will lead to increased safety and mobility. This is particularly true when focusing on ways to introduce information to the driver without also adding a dangerous distraction. Fortunately, the weather enterprise has considerable experience in this regard.

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We anticipate that vehicle data will be valuable in positively contributing to the generation of improved weather and road condition products because of the uniqueness of this potentially large volume of data, the wide-ranging distribution of observations, and the frequency with which the observations occur. The weather and transportation communities are encouraged to participate in this exciting endeavor.

### For More Information, Contact:

- **Dr. Sheldon Drobot**  
  National Center for Atmospheric Research  
  Research Applications Laboratory  
  PO Box 3000 Boulder CO 80307-3000  
  303-497-2705  303-497-8401 fax  
  drobot@ucar.edu  www.ral.ucar.edu

- **Paul Pisano**  
  Federal Highway Administration  
  Office of Operations  
  202-366-1301  
  Paul.Pisano@dot.gov