



18th ITS WORLD CONGRESS
STOCKHOLM 2009

3195 – TS116 – Weather Monitoring

NEW TECHNOLOGIES IN ROAD SITE WEATHER CONDITION MONITORING SYSTEMS

**ROAD AND MOBILITY SAFETY IMPROVEMENTS
BY RELIABLE COMPACT
WEATHER AND SURFACE MONITORING SYSTEMS**

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2009-09-25





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New Intelligent Sensor Technology

“All in One”
atmospheric
measures



digital standard
Interface with
open protocol

UMB
Technology
= modular
= extendable
= low power

Comm.
Modem

radio- or line-
communication

“All in One”
road condition
measures



digital standard
Interface with
open protocol

Power
Supply

Complete
Road Weather Stations
built up with
a few elements

This technology makes it affordable to densify the data acquisition network in order to enhance the capability of providing optimal Road Weather Condition Information



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Intelligent and compact device for atmospheric measures



WS600

Innovative principle (**R²S**) of measuring precipitation by means of **microwave doppler radar**.

- Type of Precipitation (Hail, rain, snow, drizzle)
- Intensity of Precipitation (mm/h)

Measurement of wind direction and wind speed by means of **ultra sonic** principle.
= precise measurement without mechanical moving parts.

Measurement of air pressure

Protection shield and active ventilation for measurement of air temperature and relative humidity.

Digital communication with open protocol
Power supply in one cable

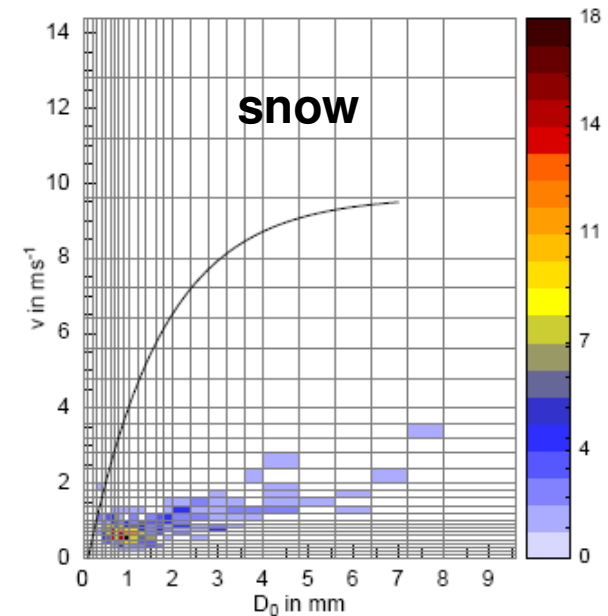
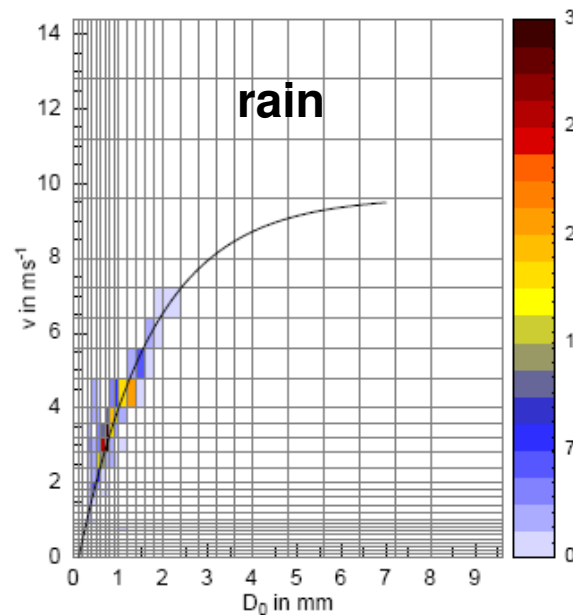


Doppler Radar Precipitation Detector Principle



24 GHz microwave doppler radar measures velocity and dimension of nucleus in order to detect type and intensity of precipitation

Examples of typical distribution of velocity and dimension of precipitation nucleus for different type of precipitation





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Intelligent and compact device for a complete road condition measurement

Maintenance friendly
removable Sensor inlet



Innovative **microwave radar** measurement
of waterfilm depth up to 4 mm
- Resolution: 0,01 mm
- Accuracy: 0,1 mm + 20%

Passive Measurement of salt concentration
and Freeze Temperature
by means of **conductivity** allow for
waterfilm depth

Surface condition detection by means of
measuring the **dielectric** characteristic
→ dry, moisture, wet, ice, snow, slush

Surface Temperature and also 2 Sensor
Interfaces for Subsurface Temperature
(e.g. 30 cm)

Digital data communication Interface
(RS485) with **open protocol**

IRS31-
UMB



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Active Measurement of Freeze Temperature by a compact Road Surface Sensor

Maintenance friendly
removable Sensor inlet



“Active” Measurement of Freezing Point
Temperature by means of cooling down and
heating up of a very small area in order to
detect the “enthalpy change” of forming ice
without a significant impact of the surface
condition.

Surface condition detection by means of
measuring the **dielectric** characteristic

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Digital data communication Interface
(RS485) with **open protocol**



Proof of the Quality and Calibration Certificates

LUFFT Mess- und
Regeltechnik GmbH



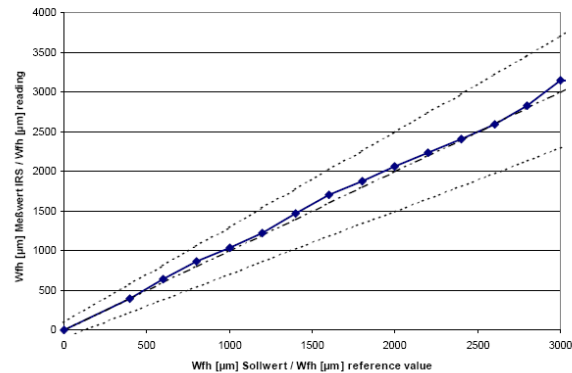
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Herstellerprüfzertifikat M nach DIN 55350-18-4.2.2
Manufacturer test certificate M according to DIN 55350-18-4.2.2
Sensornummer / Sensor number: 1234

Kalibrierung Leitfähigkeit / Calibration conductivity

Verwendete Salzlösung <i>Used saline solution</i>	Sollwert reference value	Messwert reading
H ₂ O + NaCl	2,0 %	2,0 %
H ₂ O + NaCl	4,0 %	4,0 %
H ₂ O + NaCl	12,0 %	12,1 %

Kalibrierung Wasserfilmhöhe / Calibration water film height



Funktionstest / Function test

Prüfpunkt <i>Test point</i>	Prüfbedingung <i>Test conditions</i>	Bestanden <i>Passed</i>	
		Ja <i>Yes</i>	Nein <i>No</i>
Temperaturzyklus von -30°C...+70°C <i>Temperaturecycle from -30°C...+70°C</i>	Alle Messwerte korrekt <i>All measured values correctly</i>	X	

Accurate measure of Waterfilm depth is important not only for road condition but also for passive measure of Freeze Temperature!

Every Sensor is shipped with a test certificate



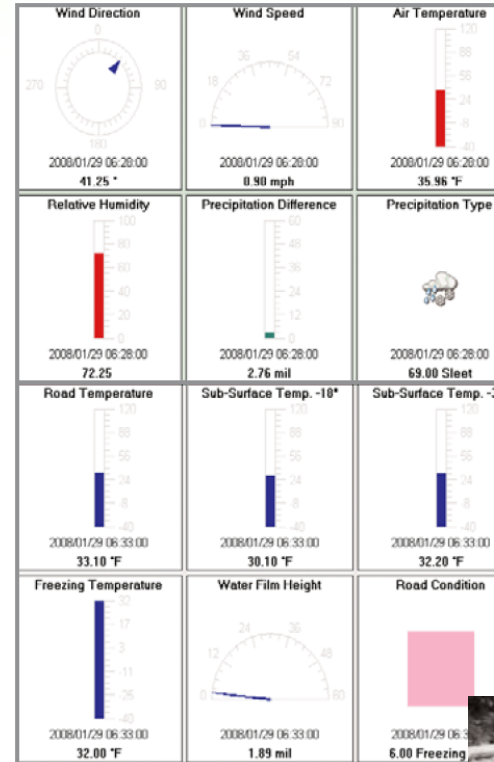
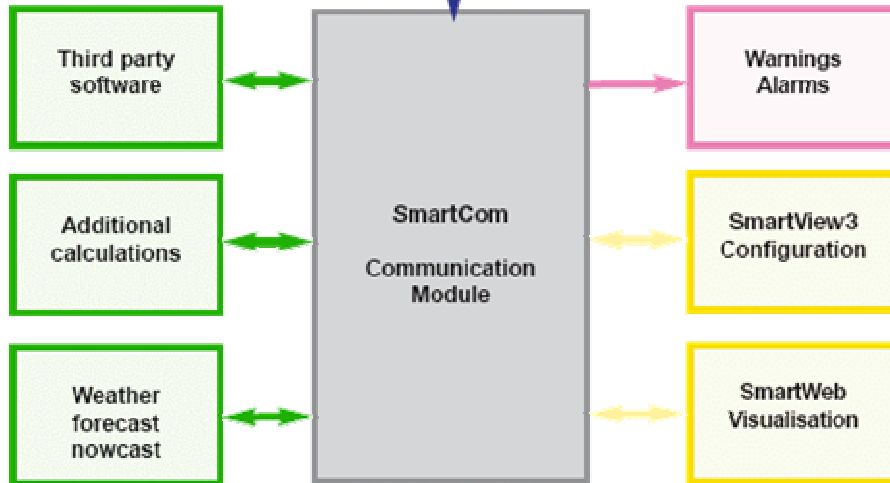
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Stand Alone solutions with SmartView central computer Software



Data collection / polling / GPRS

MYSQL Database



Indicator display of Measurements

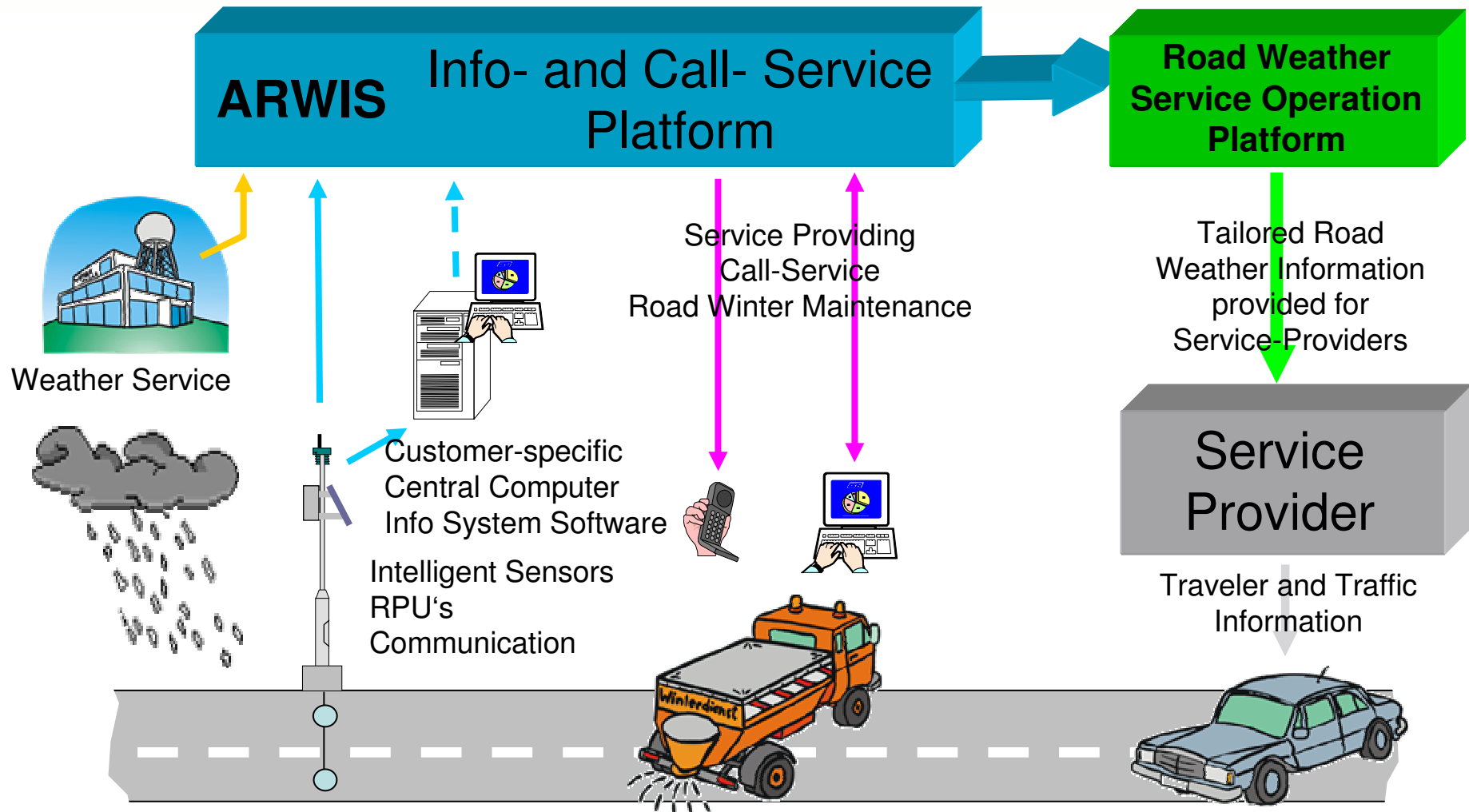
Camera pictures of road condition





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The Road Weather Information Policy

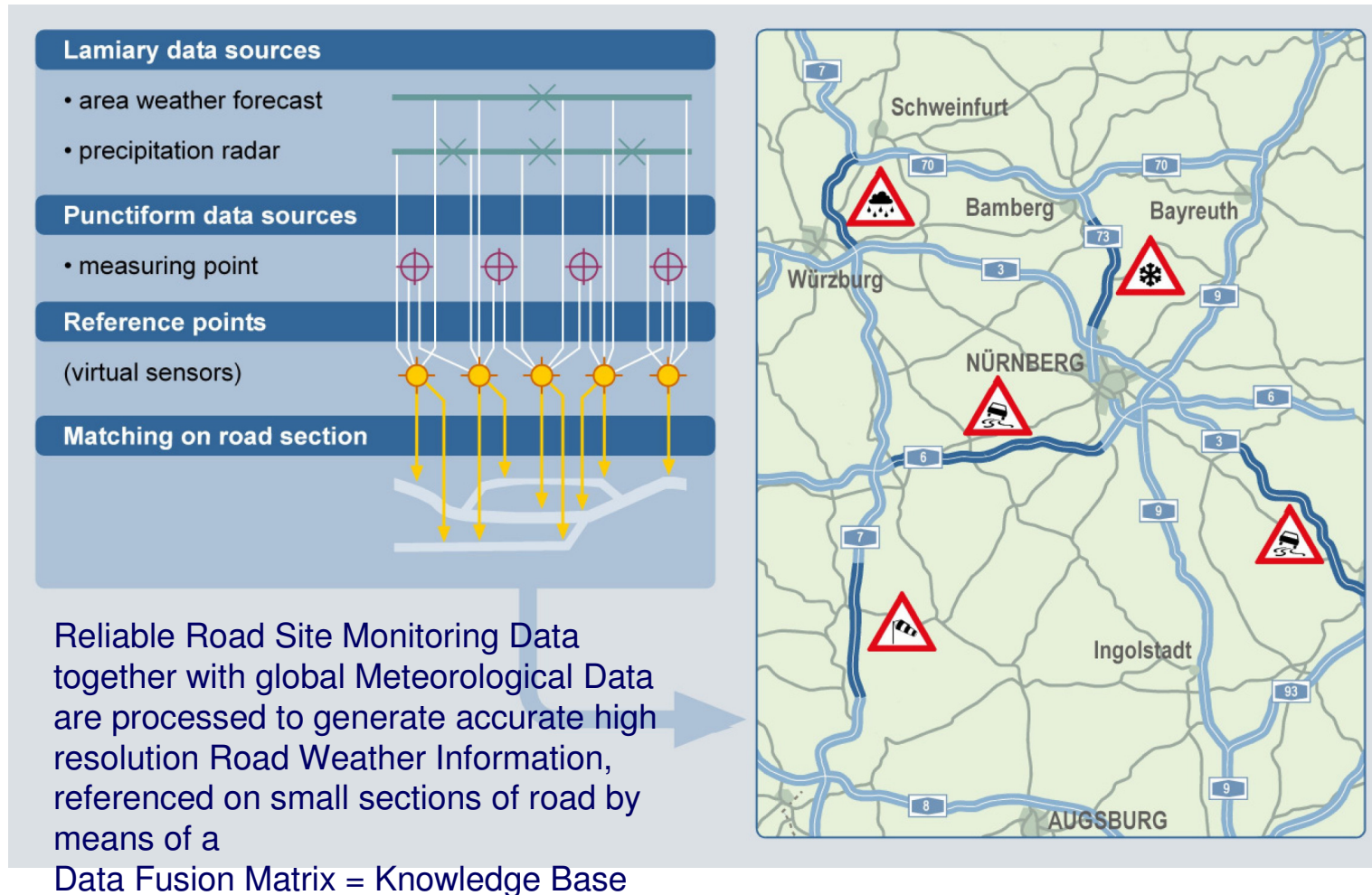




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Road Weather Service Operation Platform

Road site weather monitoring data together with global Meteo Data
= road condition warnings on short road sections

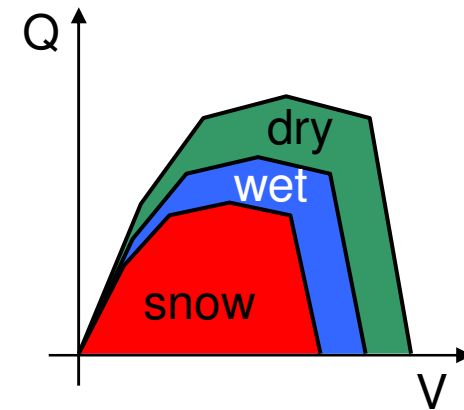
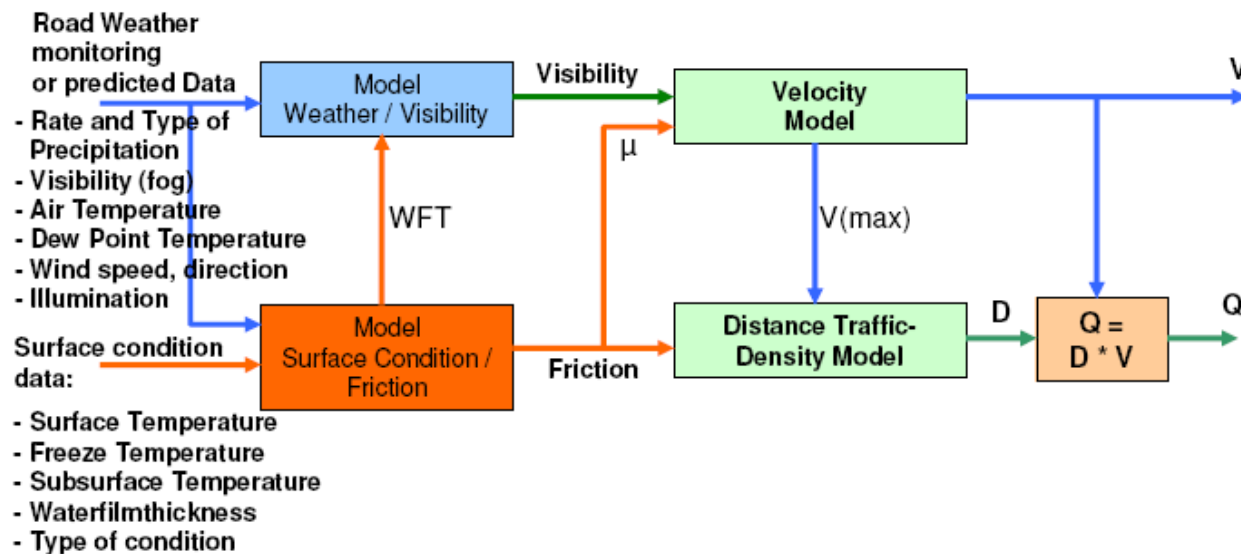
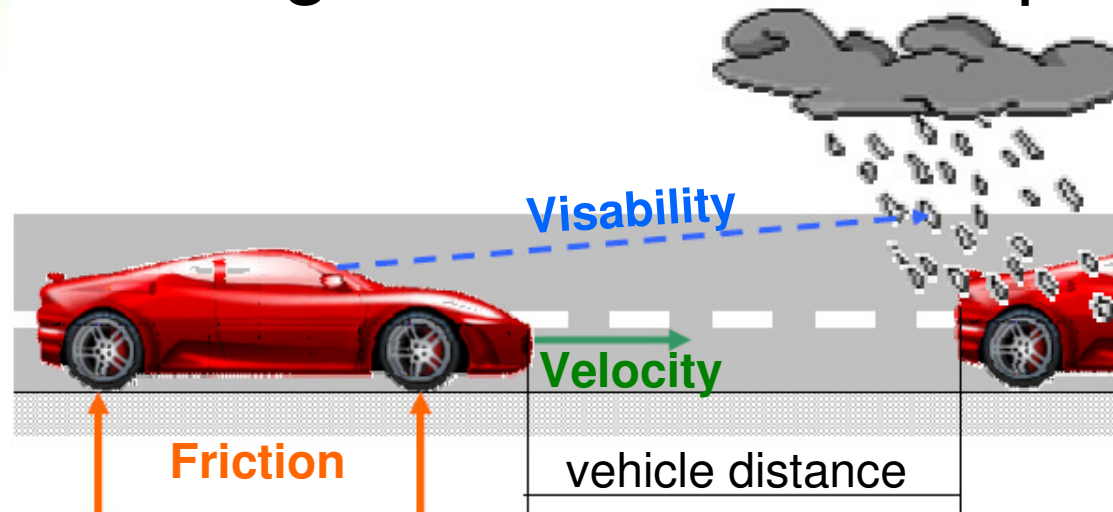




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Current work:

Modeling Road Weather impact on Traffic Flow





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Thank you for your attention.

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