

Observing the variability of road and weather conditions with hybrid mobile and fixed sensors

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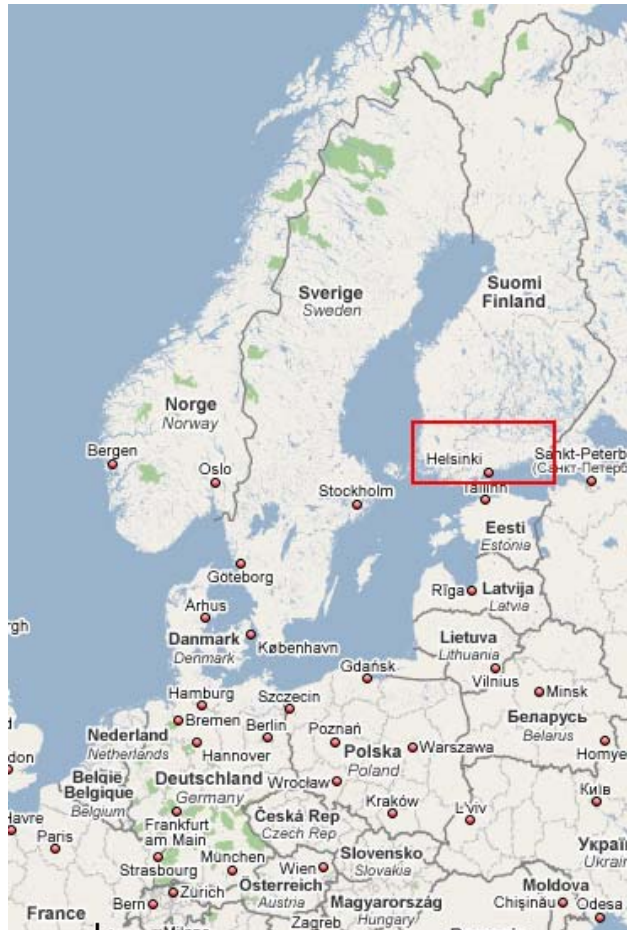
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ColdSpots studied dangerous road stretches

- ColdSpots 2005-2007 co-funded by the Ministry of Transport and Communications Finland, Finnish Road Administration and the three partners Foreca Ltd, Finnish Meteorological Institute and Destia Ltd
- During the first phase new data base formed to find the most dangerous spots on high ways
- Second phase studied the ColdSpots and ways to improve weather and road condition forecast for those spots
- Mobile friction and road condition measurements performed and analysed

ColdSpots mobile measurements



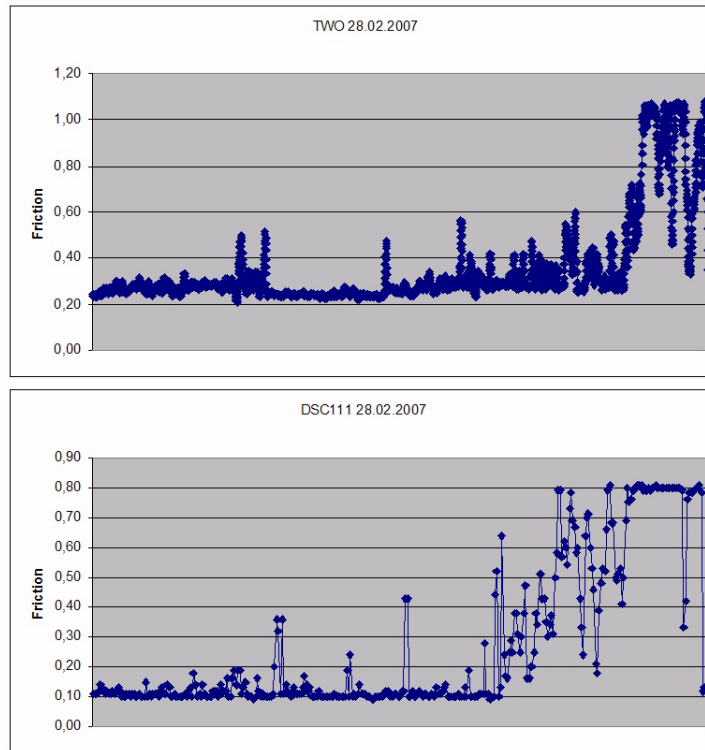
- Eleven cases measured in January-February 2007

Mobile measuring unit



- Vaisala DSC111 and DST111 mounted behind a car
- Palm-sized measuring area few meters behind the right wheel. Average length of one measurement ca. 130 m
- DSC111: Amount of ice, snow and water on the road => friction
- DST111: Road and air temperature, air moisture

Comparison measurements



- DSC111 and TWO friction wheel compared. Very similar results but slightly different measuring ranges

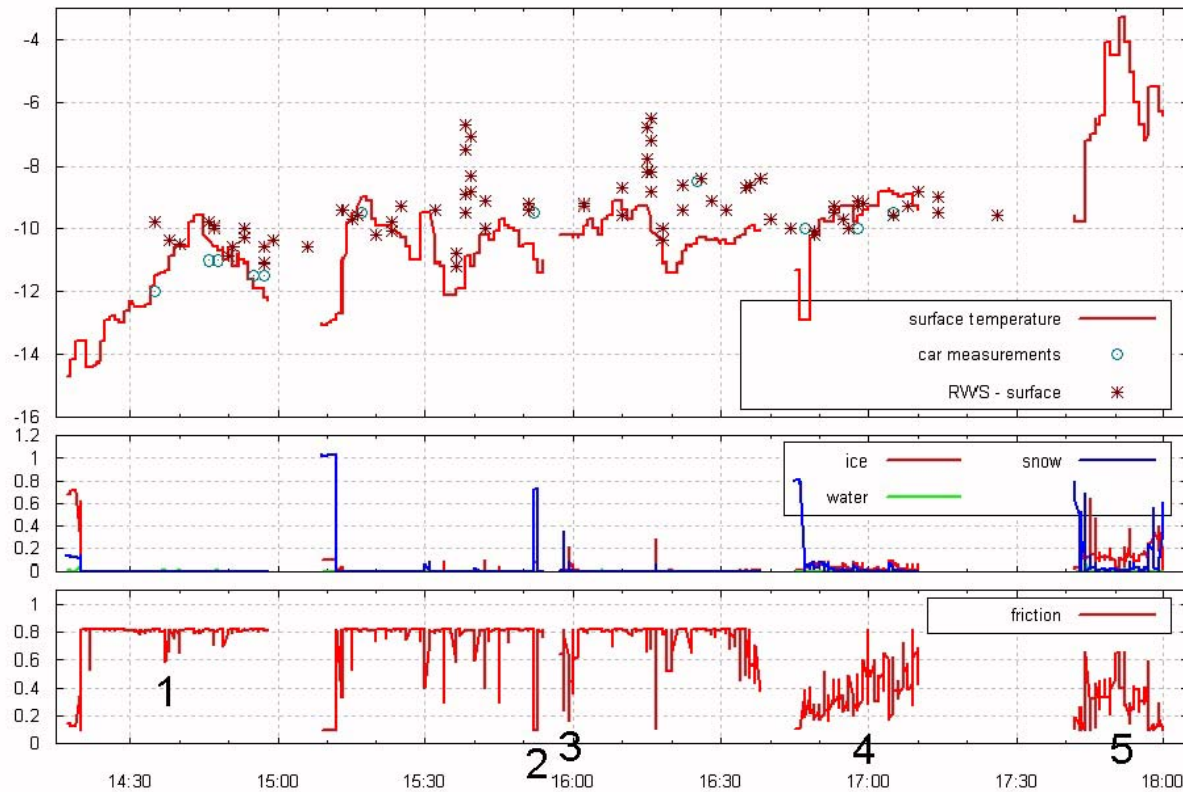
Friction across the road



- Friction may vary considerably across the road or on different roads on a same day
- Measuring and analysing friction on the road network is a very complicated issue!

Case 1: Cold and fair turning into snow

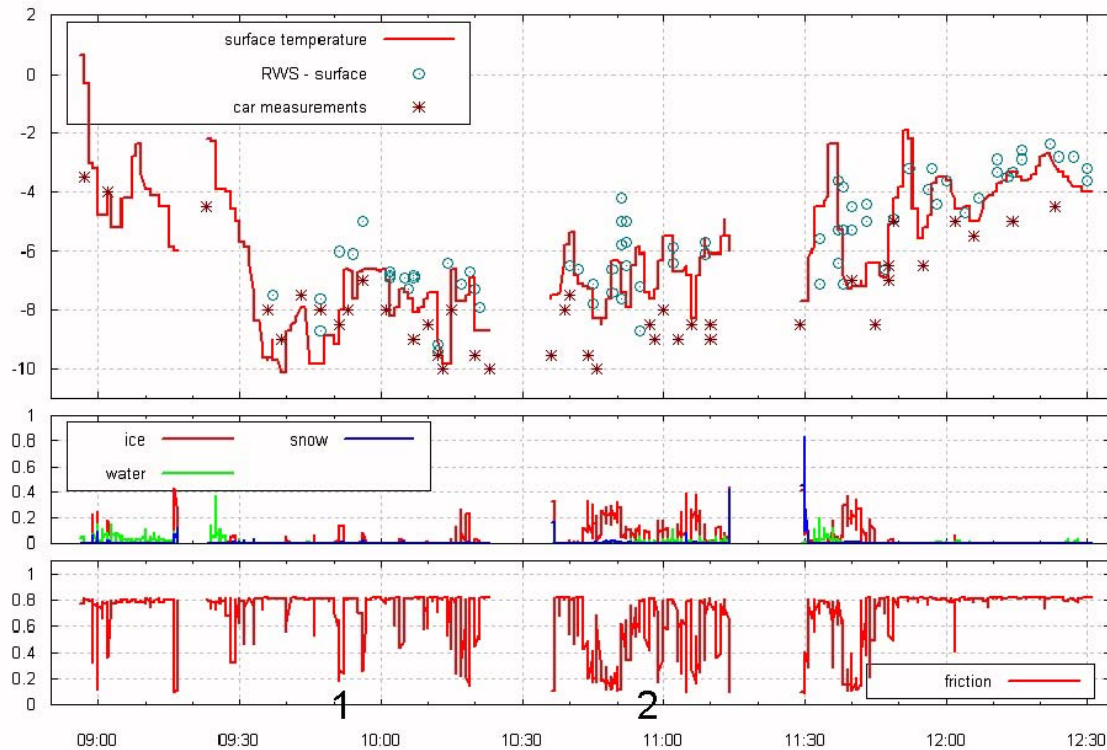
Case: Cold slippery and snow 23.01.2007 Vt 1



1 = bridge, 2 = roadside, 3 = passing lane, 4 = snowfall, 5 = city

Case 2: Dry but foggy

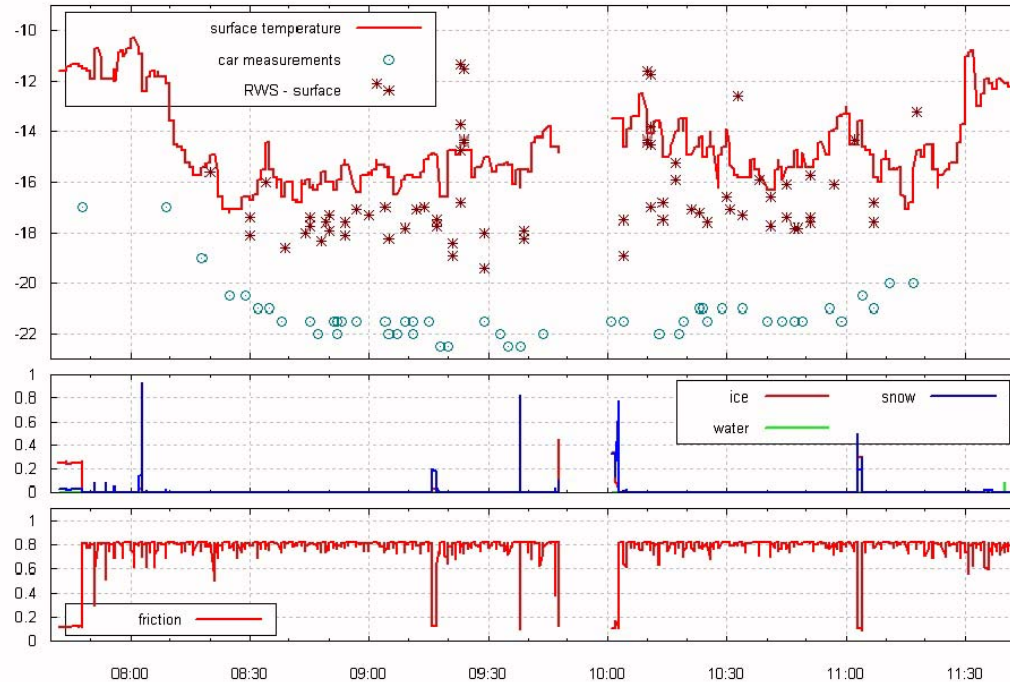
Case: Dry but foggy weather 05.02.2007 Yt 1



1 = ColdSpot: very slippery hill side, 2 = foggy, hoar frost and salt

Case 3: Very cold and dry

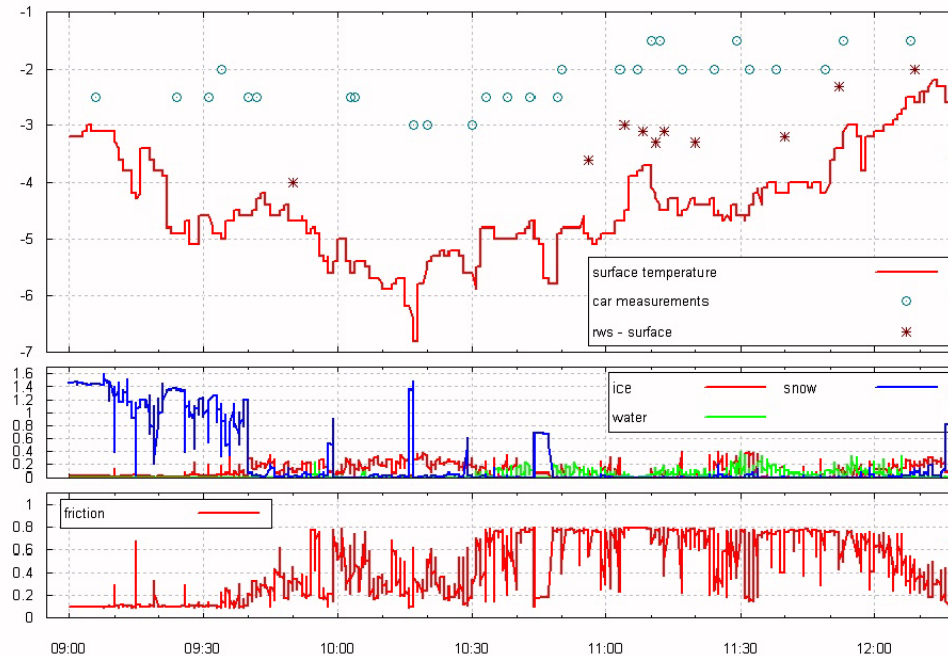
Case: Cold slippery 06.02.2007 Vt 1



- Friction mostly good, low values only on road sides
- Road body temperature high due to very warm previous day. This explains warmer DST111 measurements

Case 4: Thawing and heavy snowfall

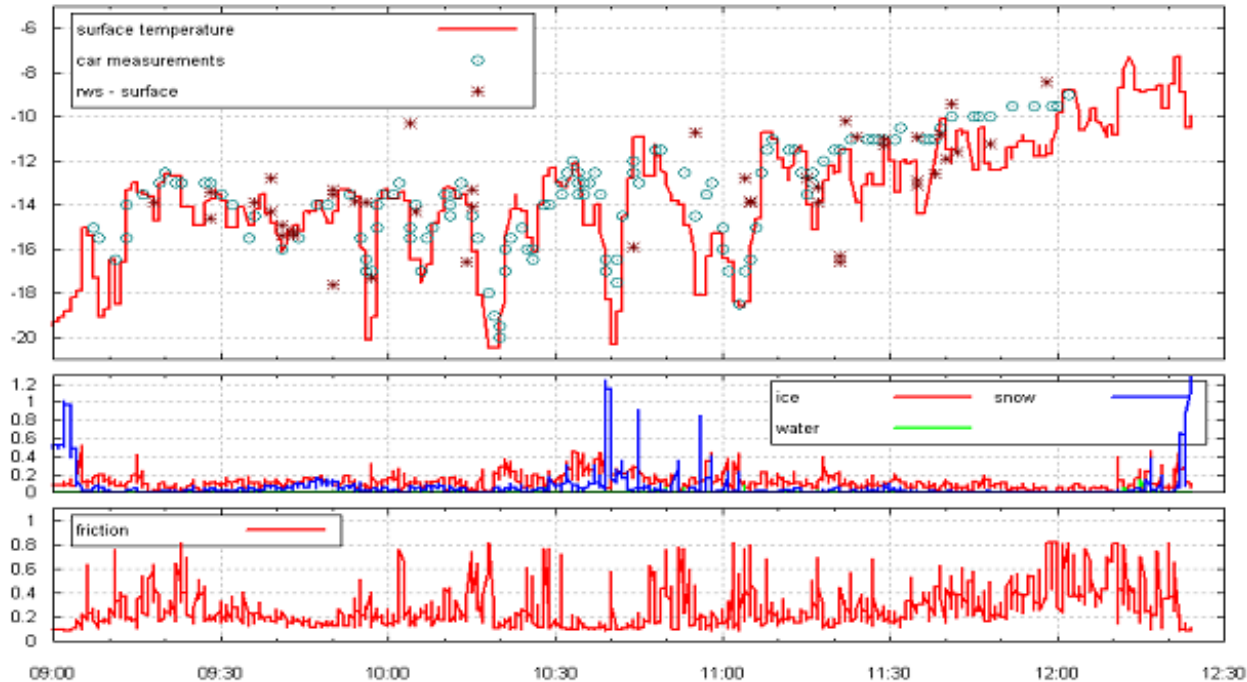
Case: Thawing and snowing 26.01.2007 Vt6 and Vt7



- Low friction on the left is local snow packed road.
- Road body temperature cold shown in DST111 measurements
- Accumulated snow and water on the right during heavy snowfall

Case 5: Very cold, large variations

Case: Cold slippery 30.01.2007 - Highway 1



- Morning after very cold and clear night
- Large local variations, cold air pools
- Ice on road, friction dangerously low



Conclusions and recommendations

- Mobile measurements showed many interesting local details and sometimes large variability
- Friction varied considerably along the roads and across the roads
- DSC111 and DST111 sensors were very sensitive, giving reliable results
- Fixed station network cannot resolve local features found in mobile measurements
- Best solution is to combine fixed network with available mobile measurements into a hybrid network
- Road body temperature may sometimes cause difficulties when comparing the measurements from different sensors
- More observational comparison studies needed in various weather situations and with different kind of sensors