Road weather services tailored to autonomous traffic

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Background

6G VISIBLE - Seeing Invisible as a 6G infrastructure Service for Autonomous Vehicles

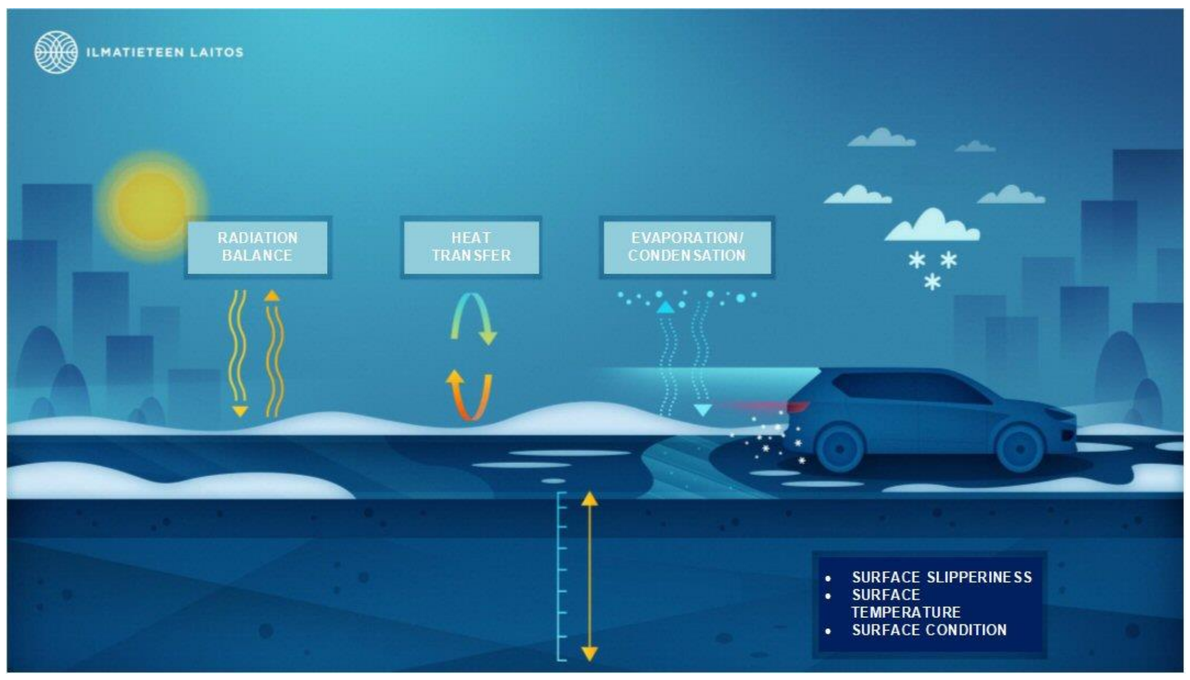
Co-research between Finnish Meteorological Institute (FMI) and University of Oulu targeting to improve intelligent traffic road weather services for autonomous driving

The project develops enhanced solutions for autonomous driving. The objectives include:

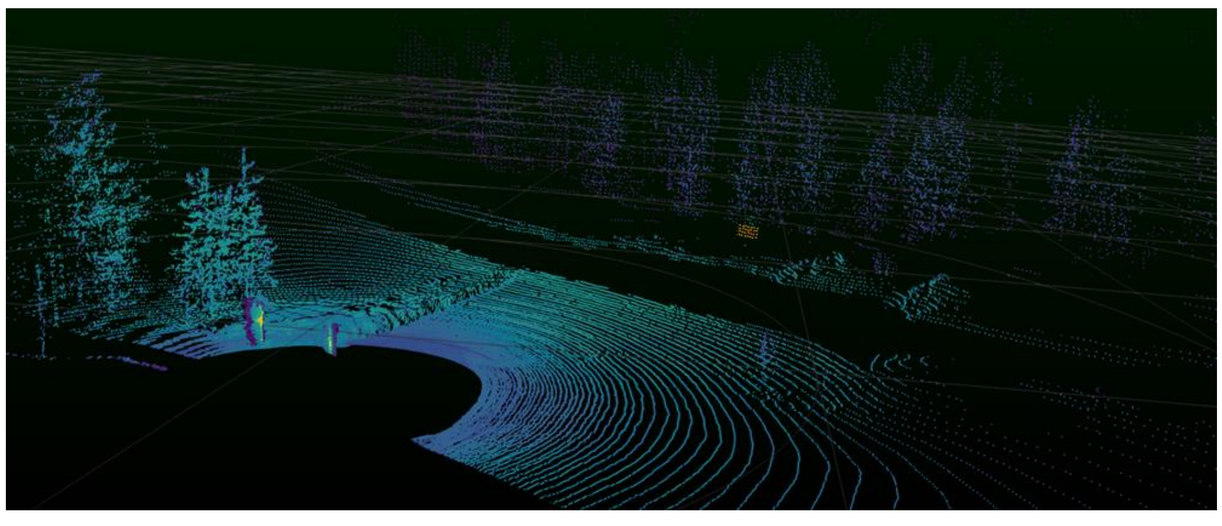
- Evaluation of autonomous vehicles' sensor systems sensitivity to harsh weather conditions
- Development of road weather services for autonomous driving
- Development of precipitation nowcasting alongside the road weather services for autonomous vehicles.

Road weather forecast

FMI's road weather model RoadSurf is a one-dimensional heat balance model predicting road weather conditions. It requires a forecast of atmospheric variables as input and as output it gives road surface temperature, amounts of ice, snow and water on the road, friction and road condition (wet, icy, snowy).

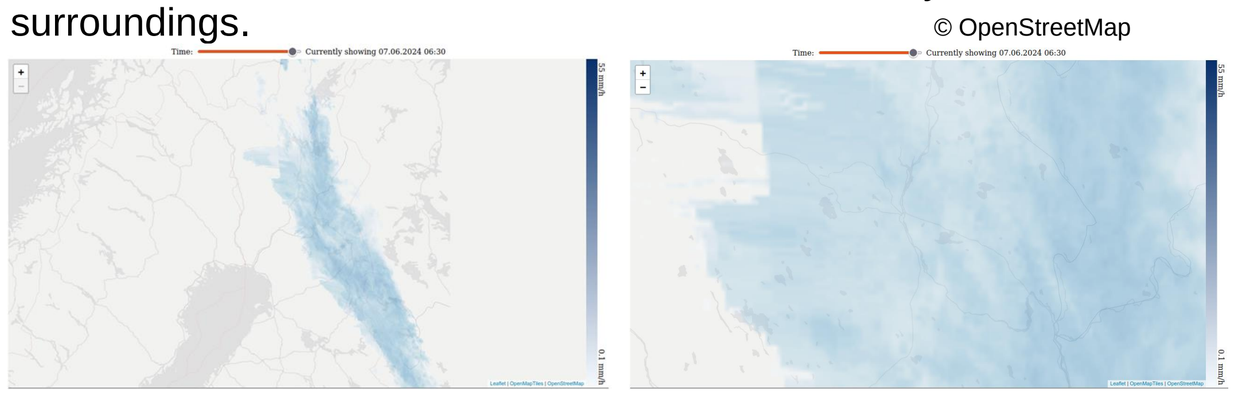


The forecasts will consider the autonomous vehicle's sensor system e.g. vehicle LiDAR, (see Figure below) and its sensitivity to weather conditions to provide more sophisticated instructions in harsh weather conditions. The forecasts will be piloted in the Oulu region. Forecast points have been selected every 50 m along major roads and the forecasts will be updated every hour. The forecasts will take into account the surrounding environment's effects to radiation via sky view factor and shadowing algorithm.



Nowcasting

Precipitation nowcasts are produced by Pysteps, an open-source Python library. The nowcasts are based on extrapolation of radar observations along the motion field estimated from past observations. Nowcasting provides better results than NWP (Numerical Weather Prediction) based models on short 0-6 hours time ranges. Nowcasting is expected to provide accurate information about precipitation for autonomous vehicles, as snowfall and heavy rainfall affect road conditions and the sensors' ability to observe the surroundings.



Nowcasting Sodankylä testbed

Project services are ultimately piloted in the city of Oulu, but in the Nowcasting testbed the analysis of the services will be conducted with simplified traffic entity replica in Sodankylä test track, where there is very extensive road weather and communication instrumentation. Testbed allows versatile co-existence of roadside, aviation and radar-network weather measurements along with various intelligent traffic communication systems.

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