



# Innovative detection of road surface conditions in two dimensions by 2DRoad

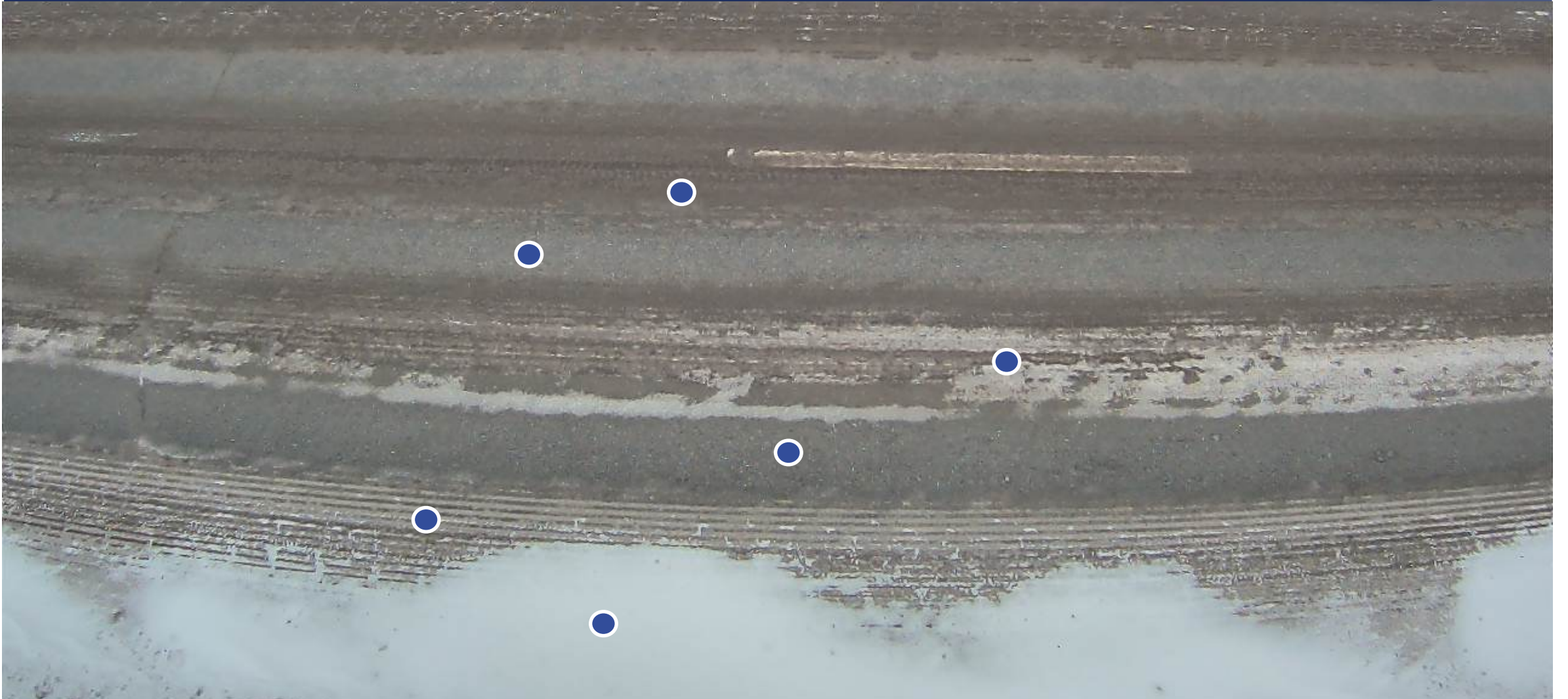
Tomas JURIK, Jörgen BOGREN, Torbjörn GUSTAVSSON, and Peter HAGBERG

MetSense AB, Sweden

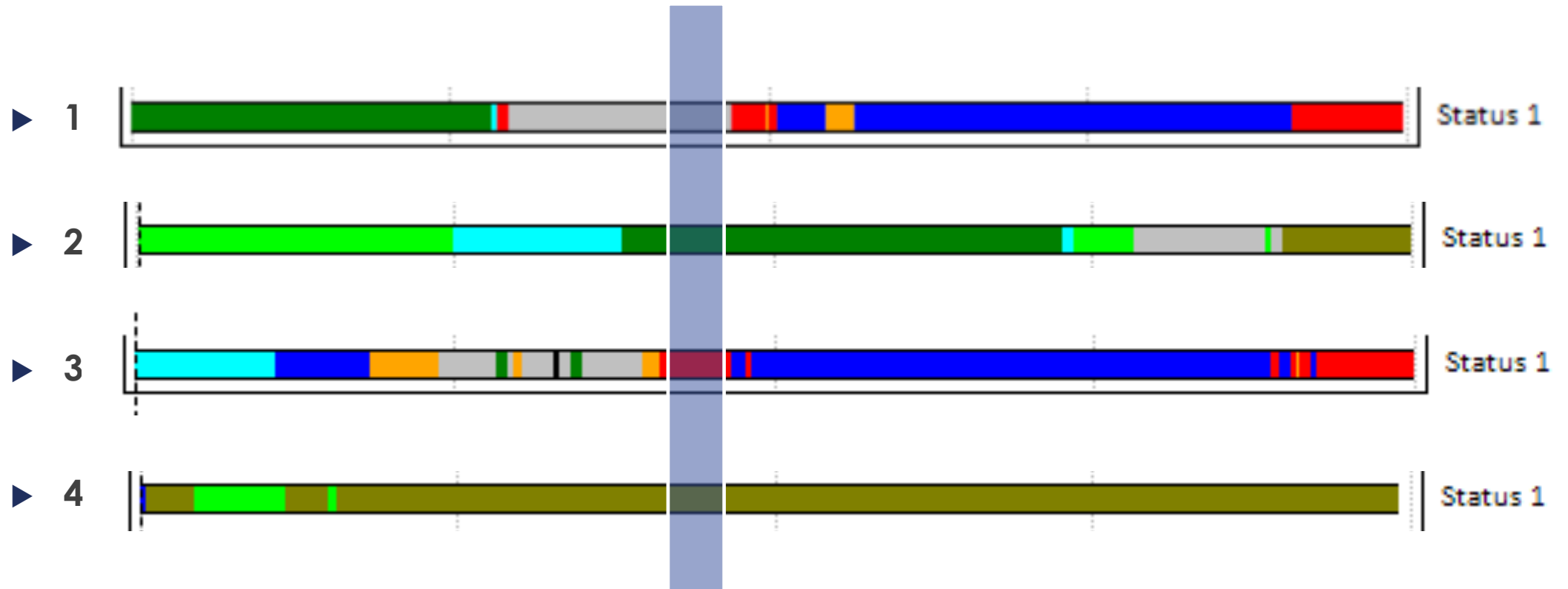
SIRWEC 2018, 19th International Road Weather Conference

May 29 – June 1, Smolenice, Slovakia

# 2011 Question: "Where to Measure?"



# What is the Surface Status?

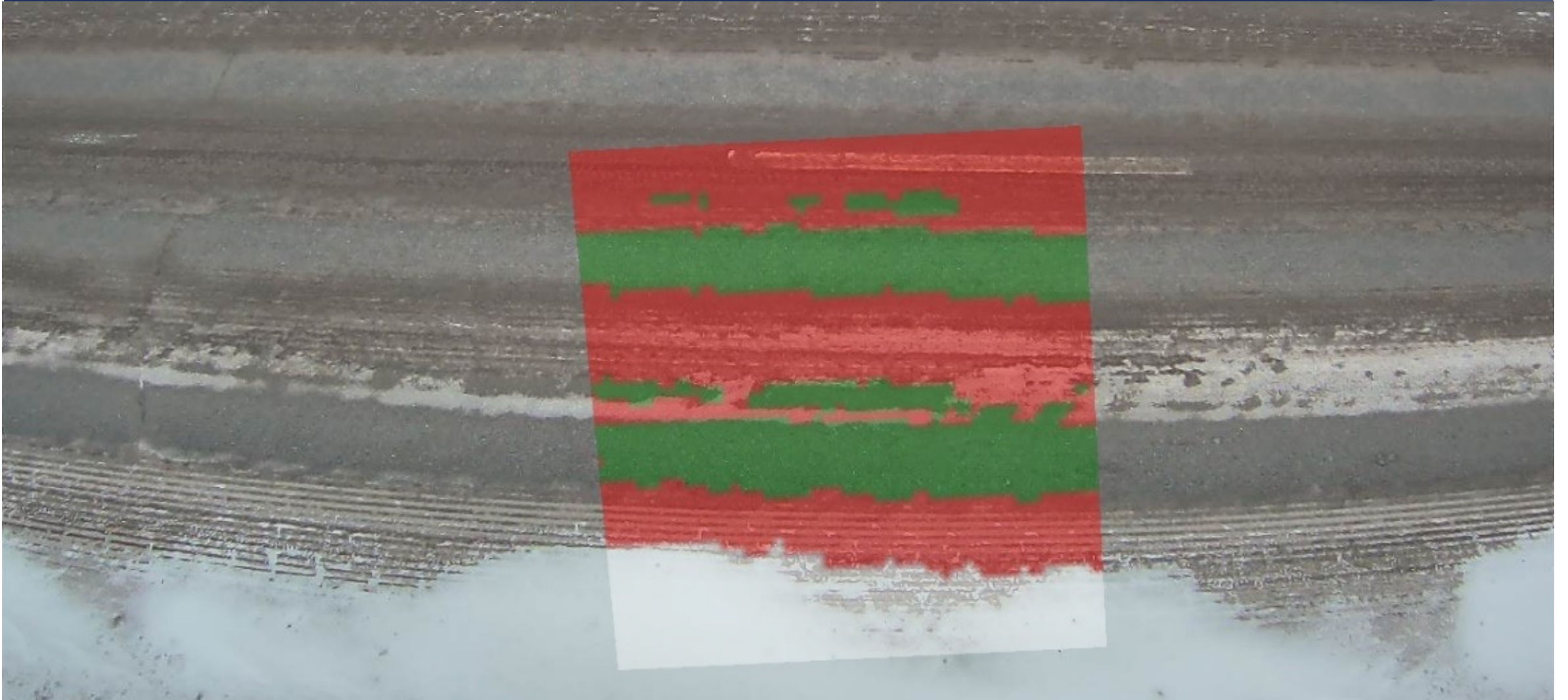


# What is the Surface Status?

- ▶ 5 None of the above



# What is the Surface Status?



# What is the Surface Status?

In a given moment during a regular winter day, a slice of road can often exhibit more than 3 surface statuses simultaneously, depending on the position across (along) the road.




# Accept only the full picture


Dry

Moist Wet

Slush Snow

Bright ice Dark ice

 0.42

 -2.2 °C





# Introducing the 2DRoad

- ▶ **Innovative meteorological camera for 2D detection of road conditions**
- ▶ 5-in-1 device that delivers:
  - ▶ 2D Surface Status (NIR chip with 64 x 64 pixel resolution)
  - ▶ 2D Friction (Row based, i.e. 64 data points)
  - ▶ Overview Background Image
  - ▶ Single Point Surface Temperature (pyrometer)
  - ▶ Data Logging (integrated logger with ETH / LTE connectivity)





# Tradition vs. Future

## 2DRoad

- ▶ Full multi-lane description of road conditions
- ▶ Option to set the extent of the scanned area, incl. hard shoulder **up to 6 x 6m**
- ▶ 2D image allows analysing more complex situations with different conditions in different parts of the road (e.g. wheel tracks)

## Other (remote) sensors

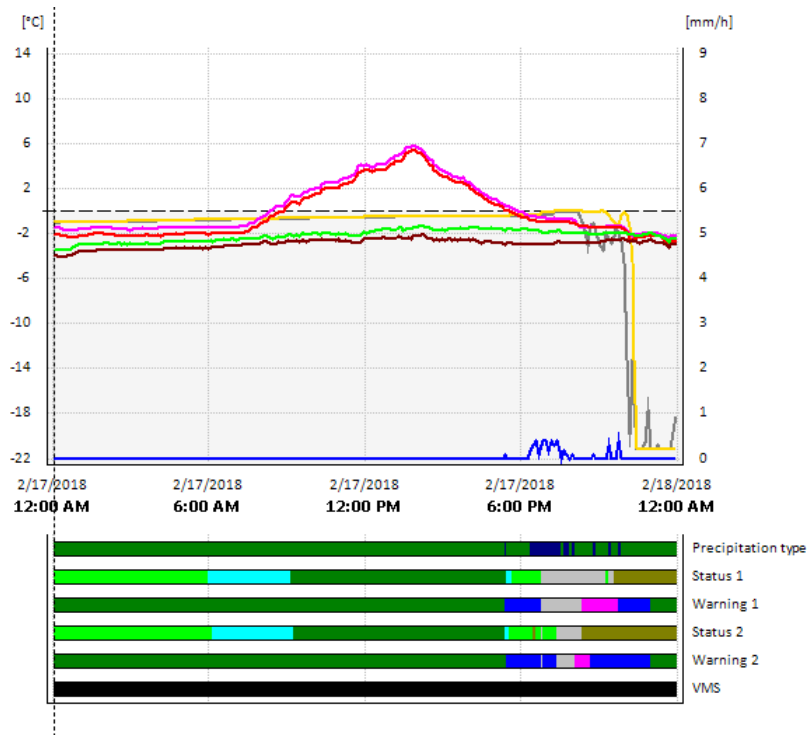
- ▶ Detection by a single spot or a small area **of around 30cm diameter**
- ▶ Crucial decision where to install / focus the sensor
- ▶ Uncertainty about the rest of the road

# Testing in Winters 16/17 & 17/18

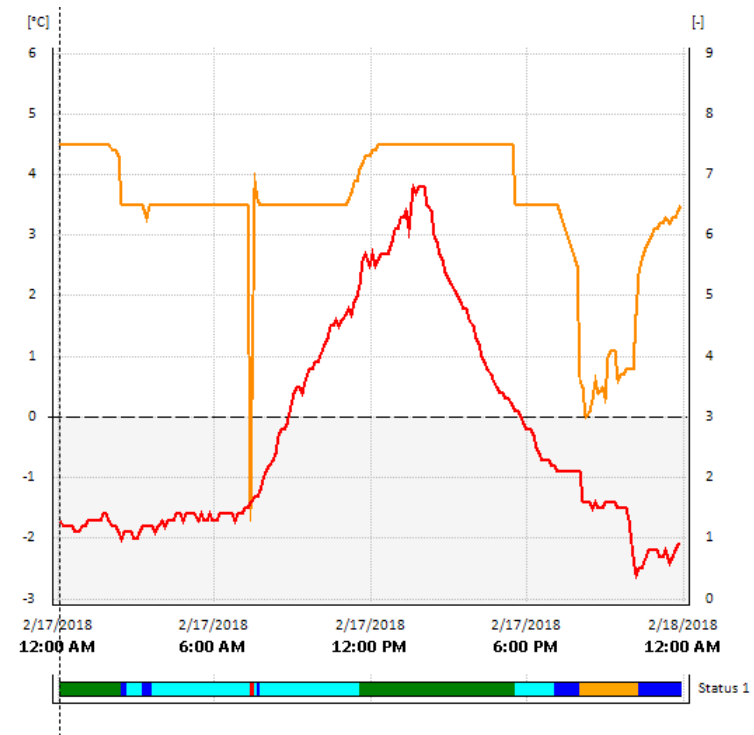
- ▶ Extensive testing on sites with existing RWSs
- ▶ Manual observation of road surface status
- ▶ Follow up comparisons + evaluation of manual observations w.r.t. 2DRoad and other sensor outputs
- ▶ Improvement of evaluation algorithm of 2DRoad

# Case Study at Opatov Site

## Regular weather station



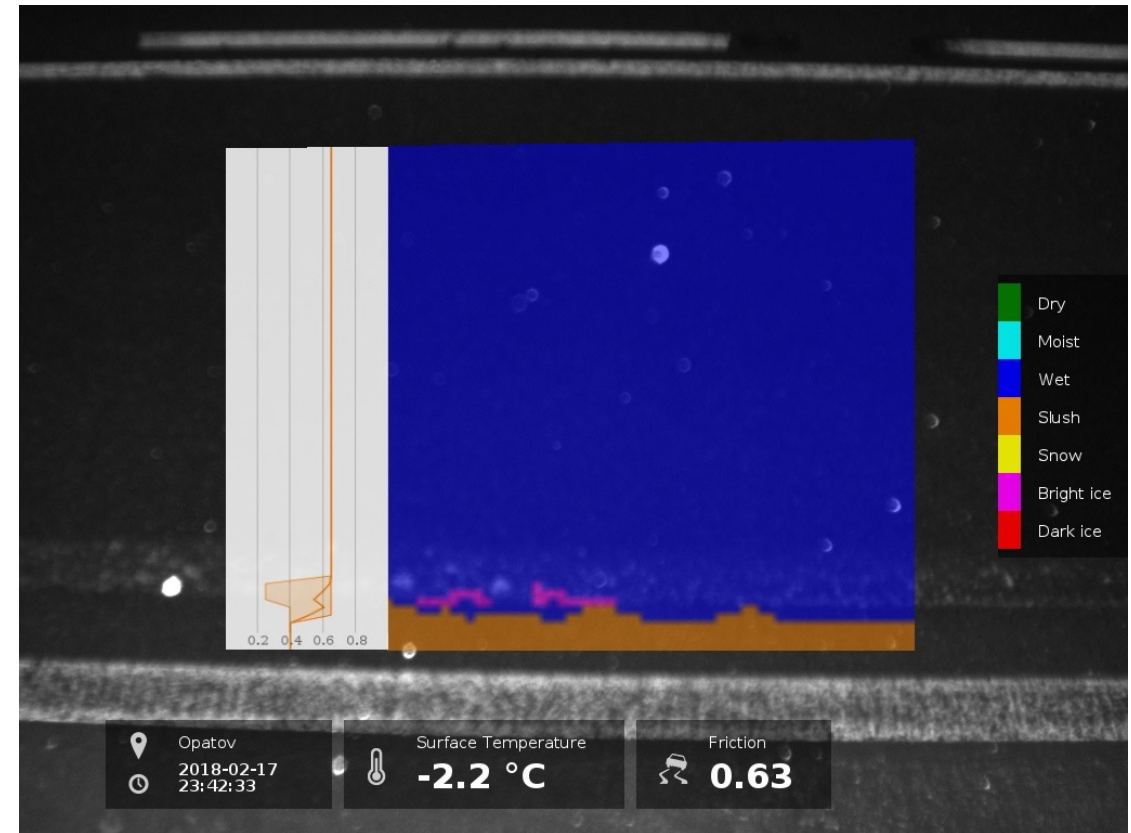
## 2DRoad





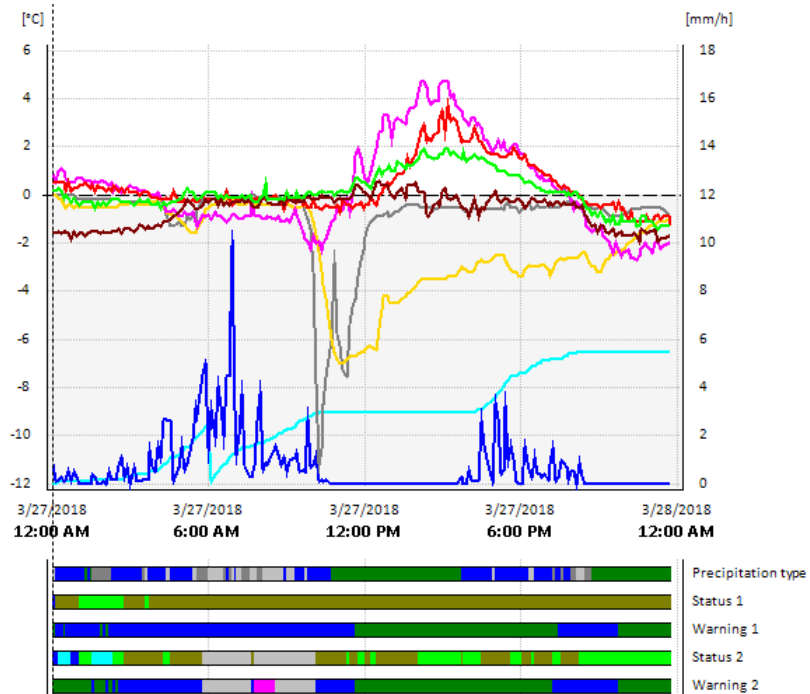
# Opatov

February 12, 2018

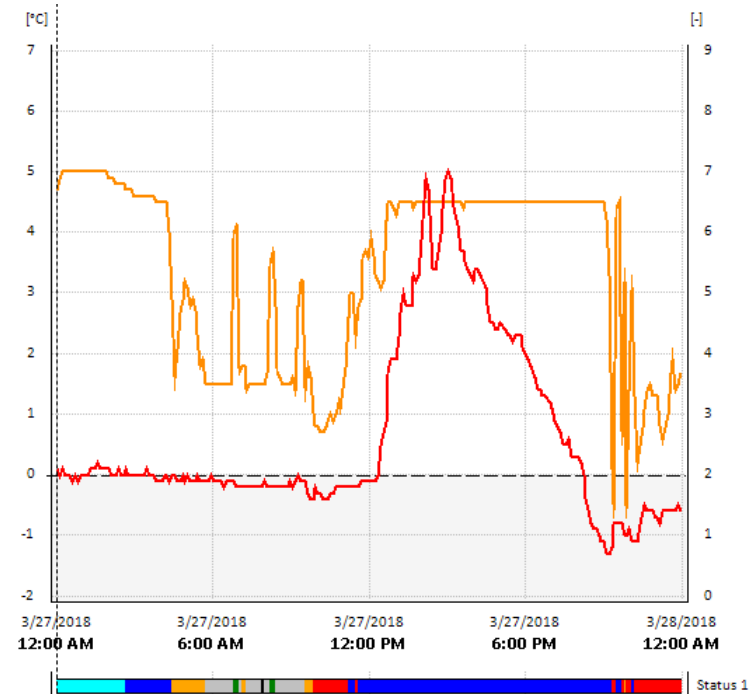


# Case Study at Sance Site

## Regular weather station

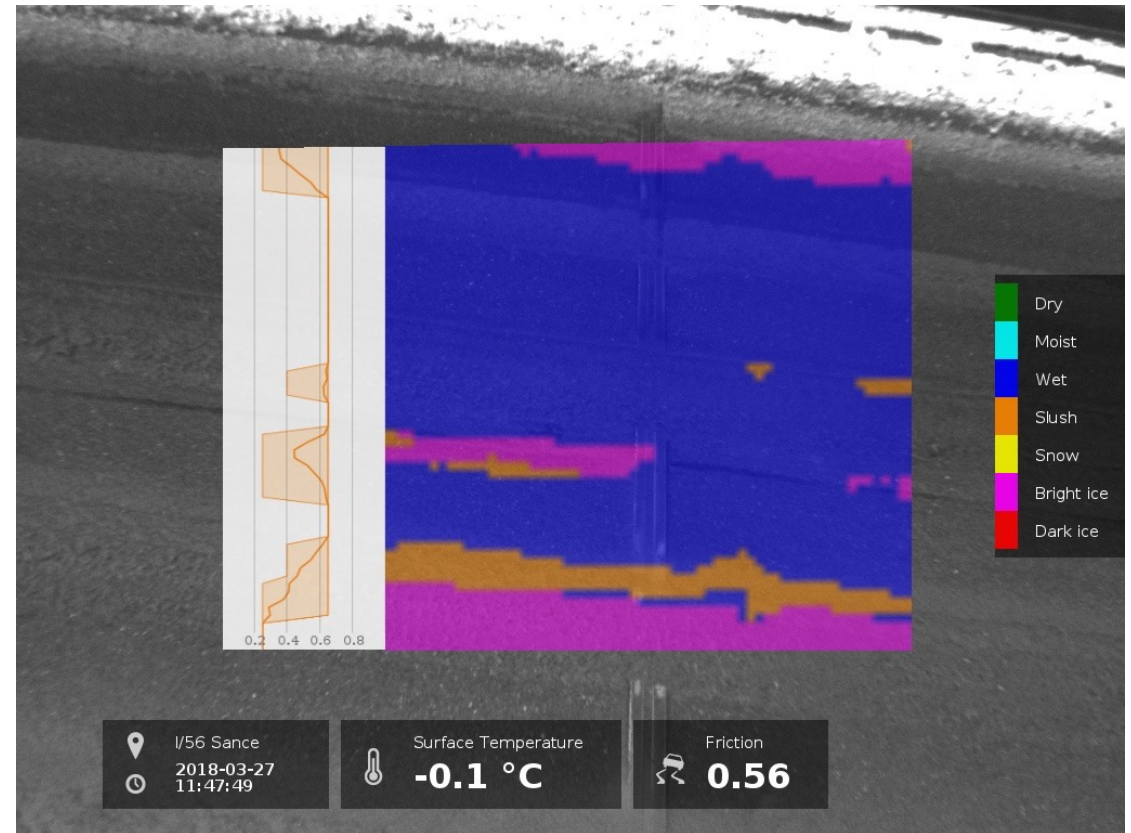


## 2DRoad



# Sance

March 27, 2018





# Scientific Conclusion

- ▶ The classification algorithm is universal. Only minor setup during dry conditions is required for each site.
- ▶ The accuracy of the surface condition detection (correct status determination) is very high in the current version of the 2DRoad
- ▶ Exceptionally, states without classification occur, which are analysed and the classification algorithm is updated
- ▶ Another status to be separated is frost and light snow
- ▶ The boundary between individual surface conditions is sometimes controversial, e.g. snow vs. ice

# User Conclusion

- ▶ Highly innovative and promising technology
- ▶ Easy installation and setup
- ▶ Clear graphic output
- ▶ Completely new surveillance options for winter maintenance personnel

“

Please visit our stand for a live demo

”

Tomas JURIK, [tomas.jurik@mitsense.com](mailto:tomas.jurik@mitsense.com)

[www.mitsense.com](http://www.mitsense.com)





# 2DRoad

REVOLUTIONARY  
INNOVATION

