ROSTMOS – Remote sensing techniques to monitor driving conditions in wintertime

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Learning outcomes

- Real time information about driving conditions is an important data input in traffic information and maintenance decision support systems
- Optical sensors are a useful tool to monitor the road state
- Optical sensors give a reliable friction estimate
- Combining different data sources for monitoring the road state
- Routines for quality check of data

Background

- Real-time information of driving conditions and forecasts for road state development on the road network will enable contractors and road owner to take action in the right place at the right time with the right method and with proper effort
- Included in the information systems available for the drivers, such systems will also have a major traffic safety potential
- The data can come both from RWIS stations, vehicle-mounted sensors and from cars where the vehicle act as sensor systems detecting slippery road conditions

The ROSTMOS project

- ROSTMOS is a Nordic project (2014-2016) with partners from Norway, Denmark, Sweden and Iceland
- Work packages:
  - State-of-the-art in terms of methods of monitoring/recording road state
  - Testing and evaluation of various methods to monitor road surface conditions
  - Examples of systems for decision support – status in the Nordic countries and internationally
  - Recommendations for a system with different sources for road state information

Objective

- The project objective is to develop a system for the registration / verification of road state that with high precision can monitor the condition of the road network in almost real-time

- The system of registration / verification of road state should include data from various sources and could be incorporated into a decision support system where forecasting will be an important element

Concept under testing

- There is a need for more testing and experience with mobile use of optic sensors under winter conditions and with an operational perspective
- This is why it is taken a Nordic initiative to carry out a project on remote sensing of the road state by use of mobile units
- In addition to data quality, one requirement for the equipment was that the measuring device must be easy to mount and could be placed on passenger cars as well as trucks and trailers

Focus areas

- The study includes both fixed mounted nonintrusive sensors and vehicle mounted sensors for mobile monitoring of the road surface conditions
- Most emphasis is put on optical sensors for mobile measurements
- Other technologies investigated are techniques like image analysis

Focus areas

- The idea is that the solutions studied in the project will support both strategic and operational decisions made by the road owner, contractors and traffic information centers
- In addition to contributing to making winter operations more effective and improve traffic information systems, the project will also demonstrate how ITS can be used in quality control and documentation

Methodology

- The performance of different technologies for monitoring the road state and data quality is one of the main issues in the ROSTMOS project

- The testing of optical sensors includes:
  - Experiments in laboratory
  - Field-tests on closed tracks
  - Field-tests on ordinary roads

Optical sensors

Optical sensors

Optical sensor mounted on inspection vehicle

Optical sensor mounted on a maintenance truck

Optical sensor mounted on friction trailers

Traction Watcher One

ViaFriction

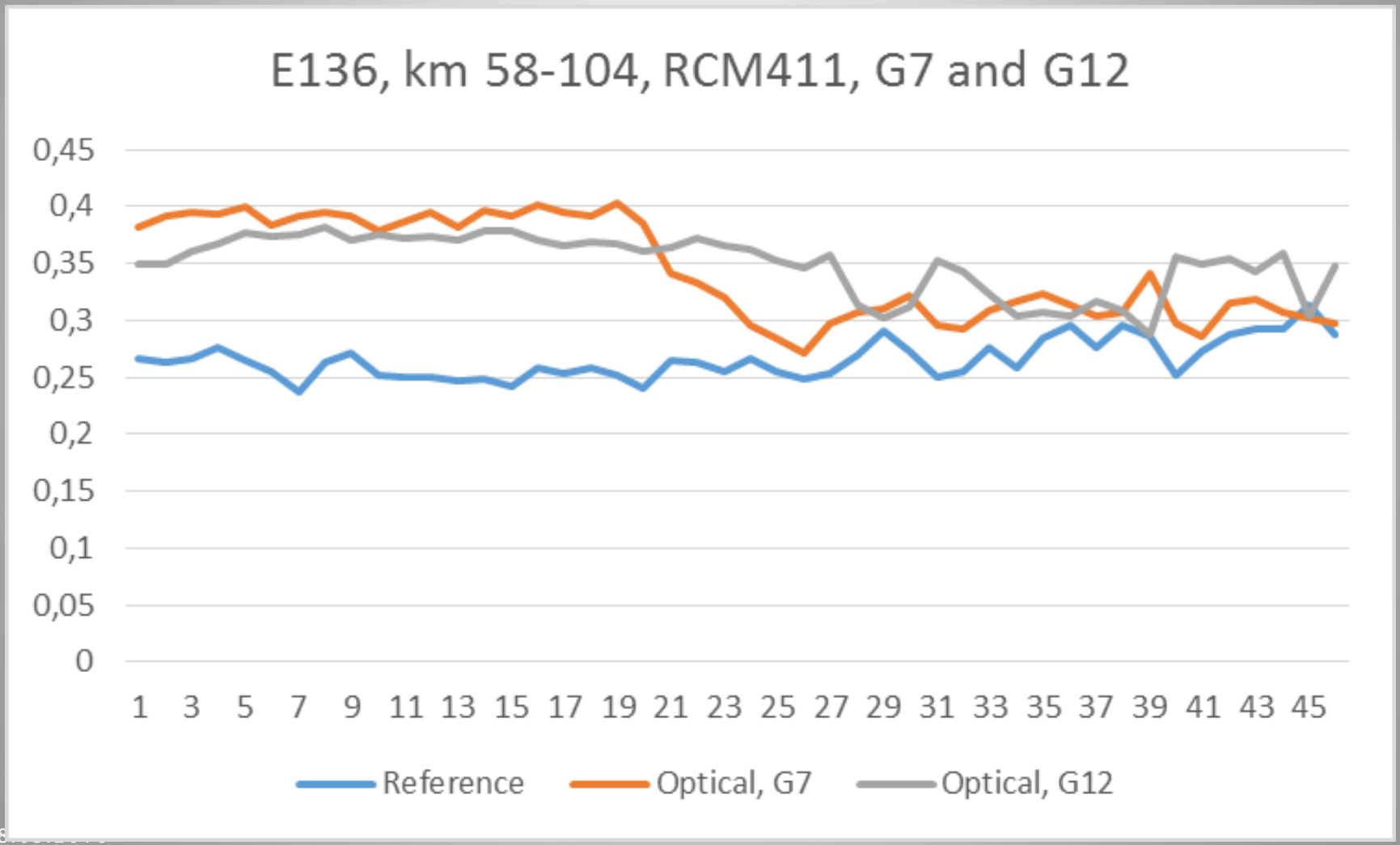
ROAR trailer – used as friction reference

Optical sensors – data output and quality check

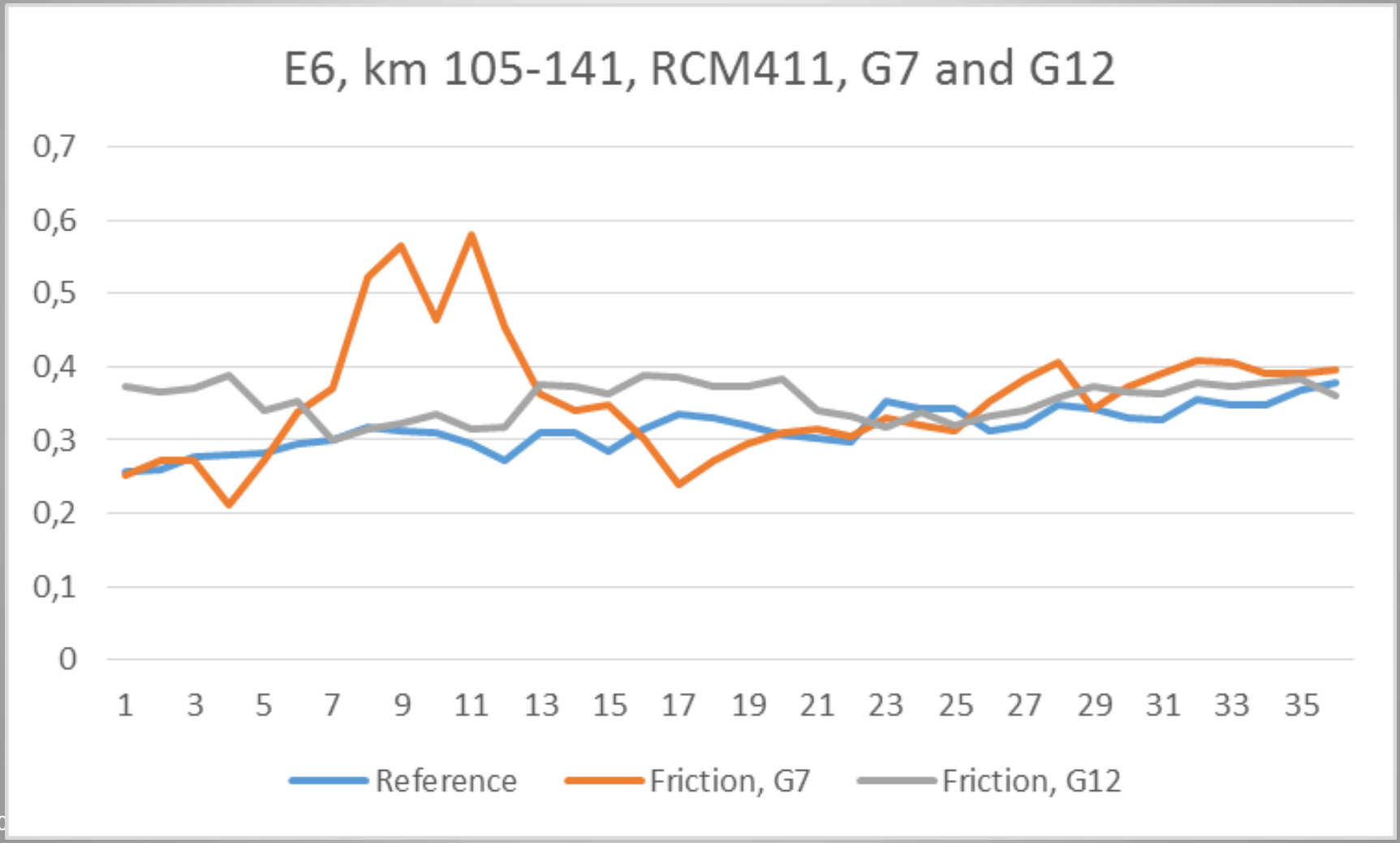
- The optical sensors give the following type of parameters:
  - Temperature (air and road surface)
  - Water film thickness
  - Road State (categories vary for different products)
  - Friction estimate

- Quality control of data will mainly be based on reference measurements. The reference systems is customized to the technology being tested and the test environments.

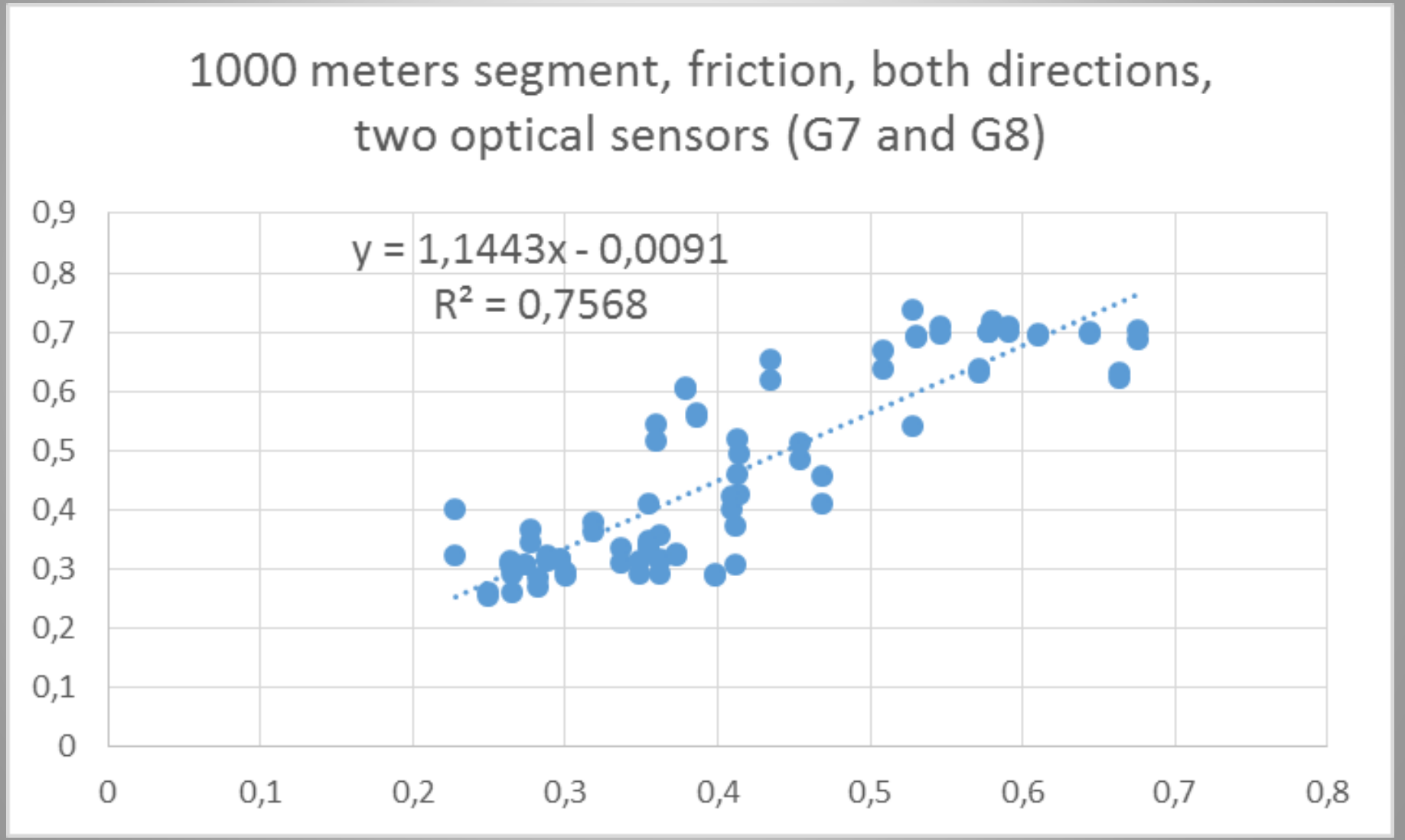
Test 1, 15. January 2015, Roar5 as reference



Test 1, 15. January 2015, Roar5 as reference



Test 3, 24. March 2015, Roar5 as reference (x)



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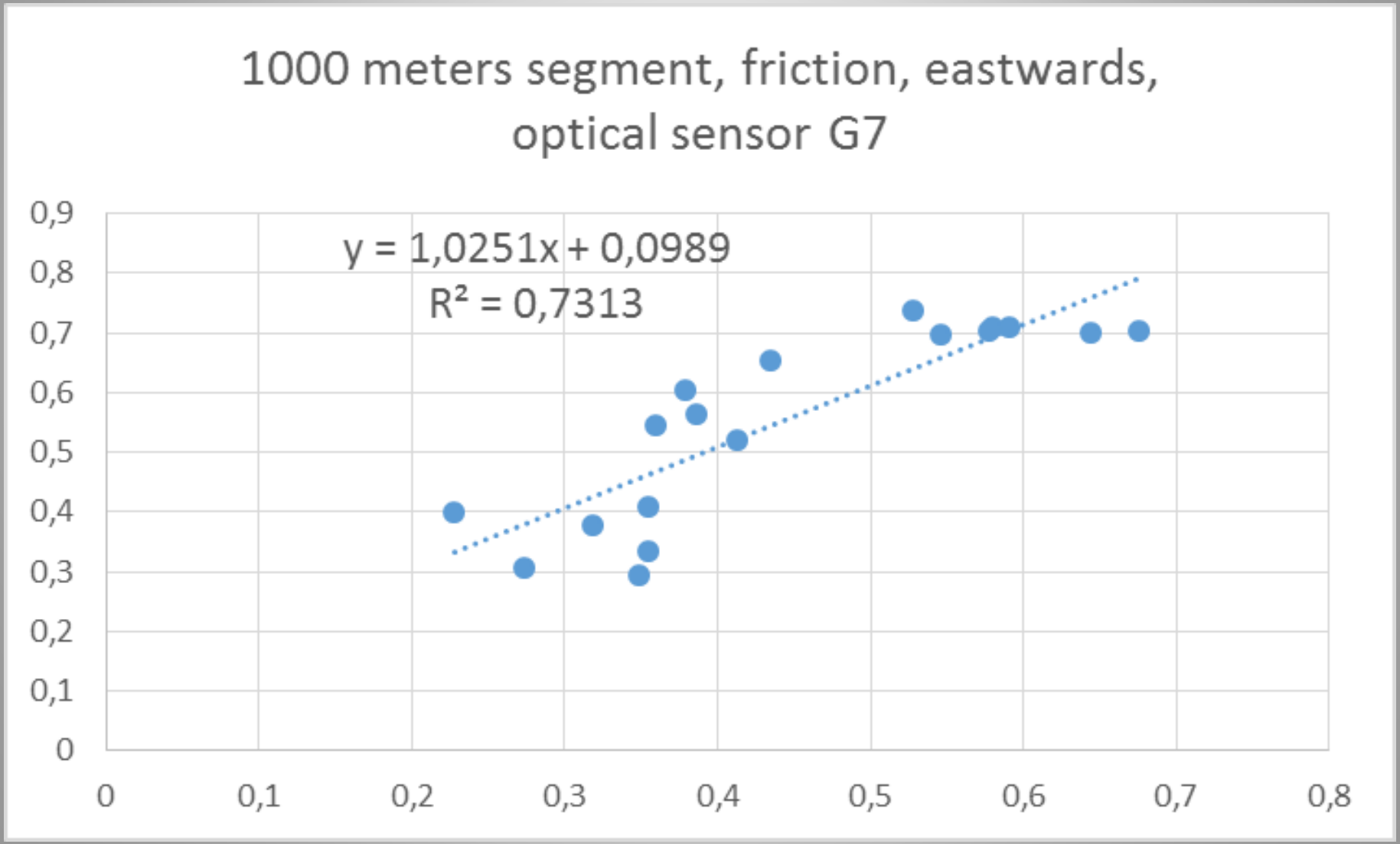

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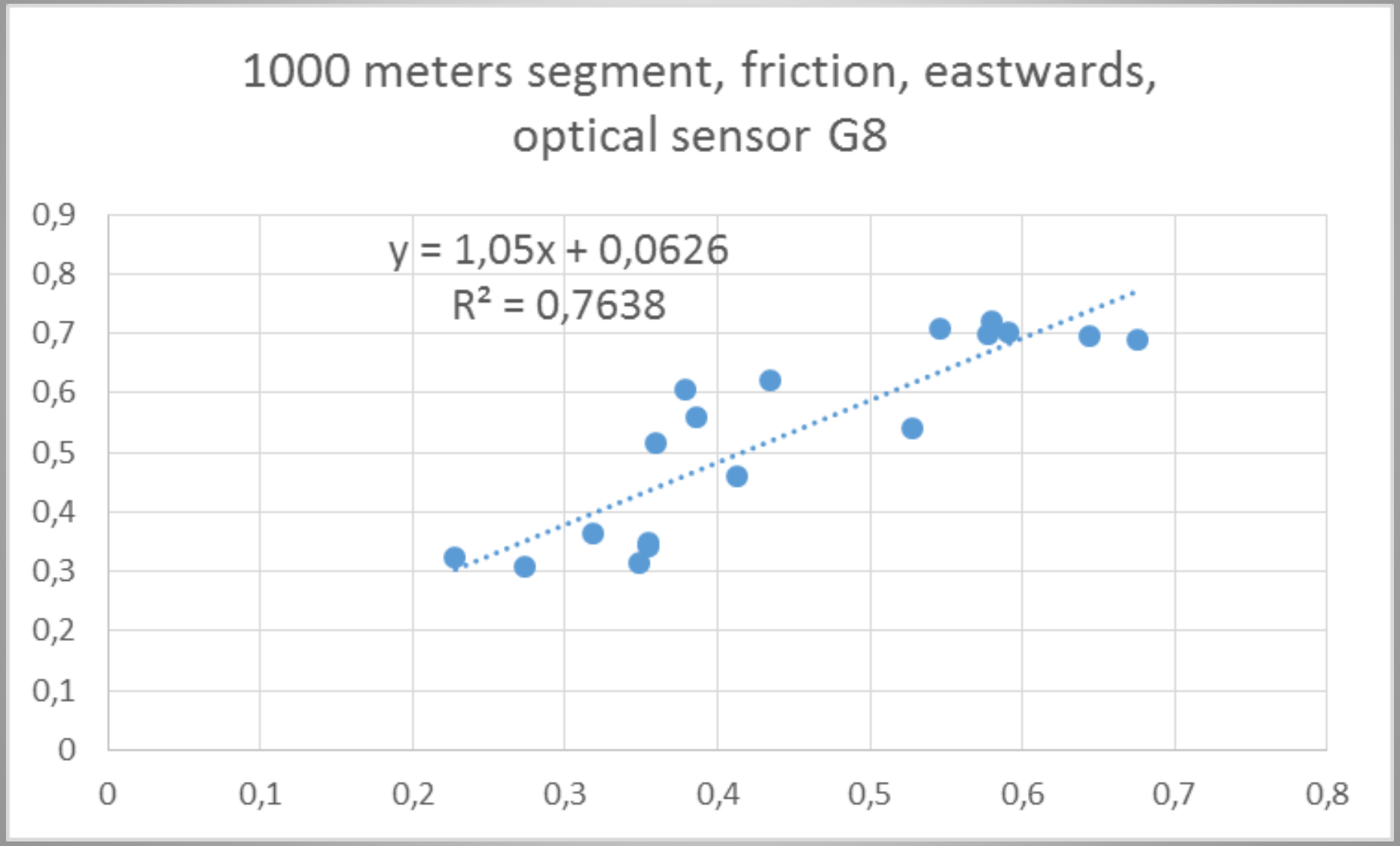

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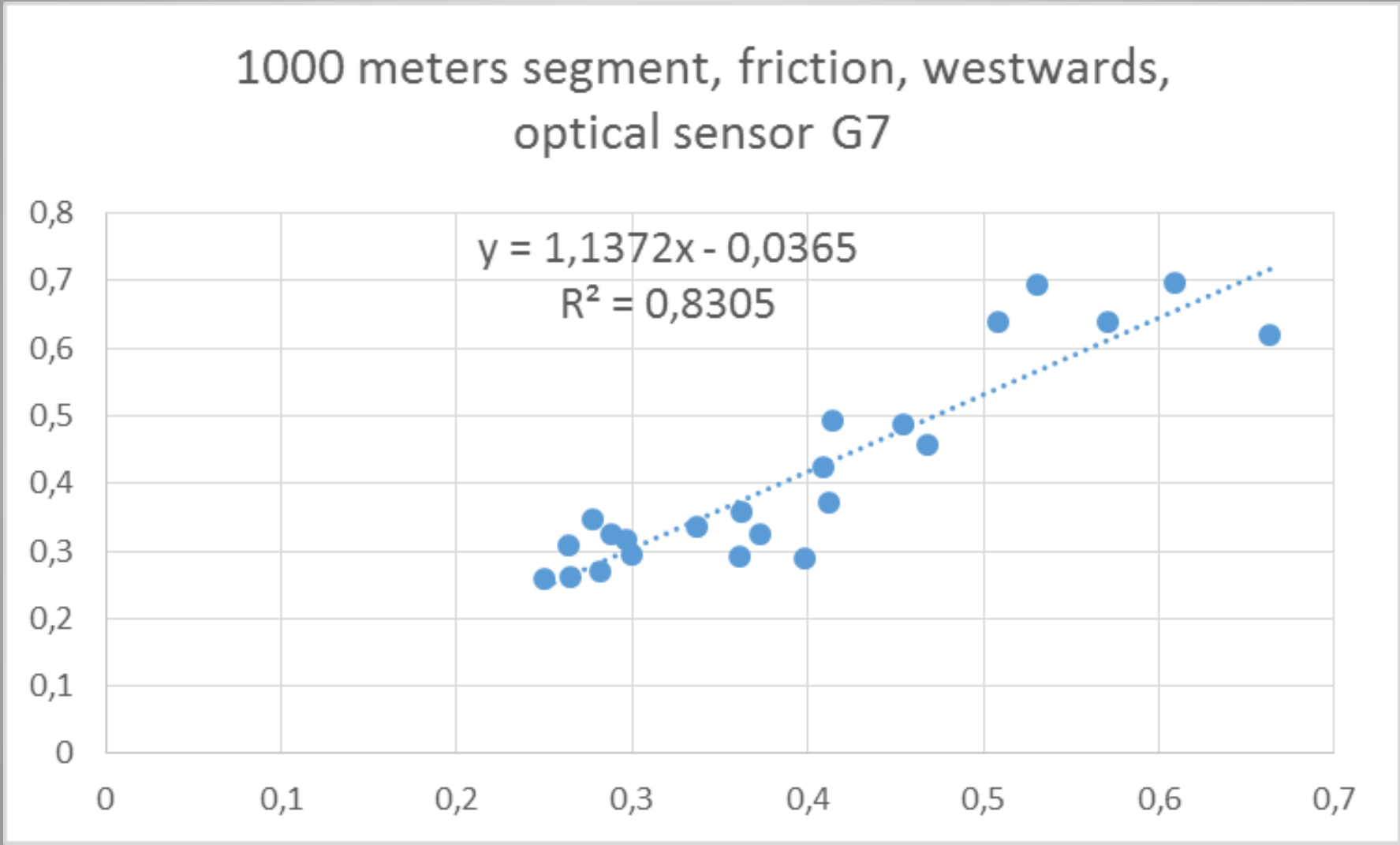

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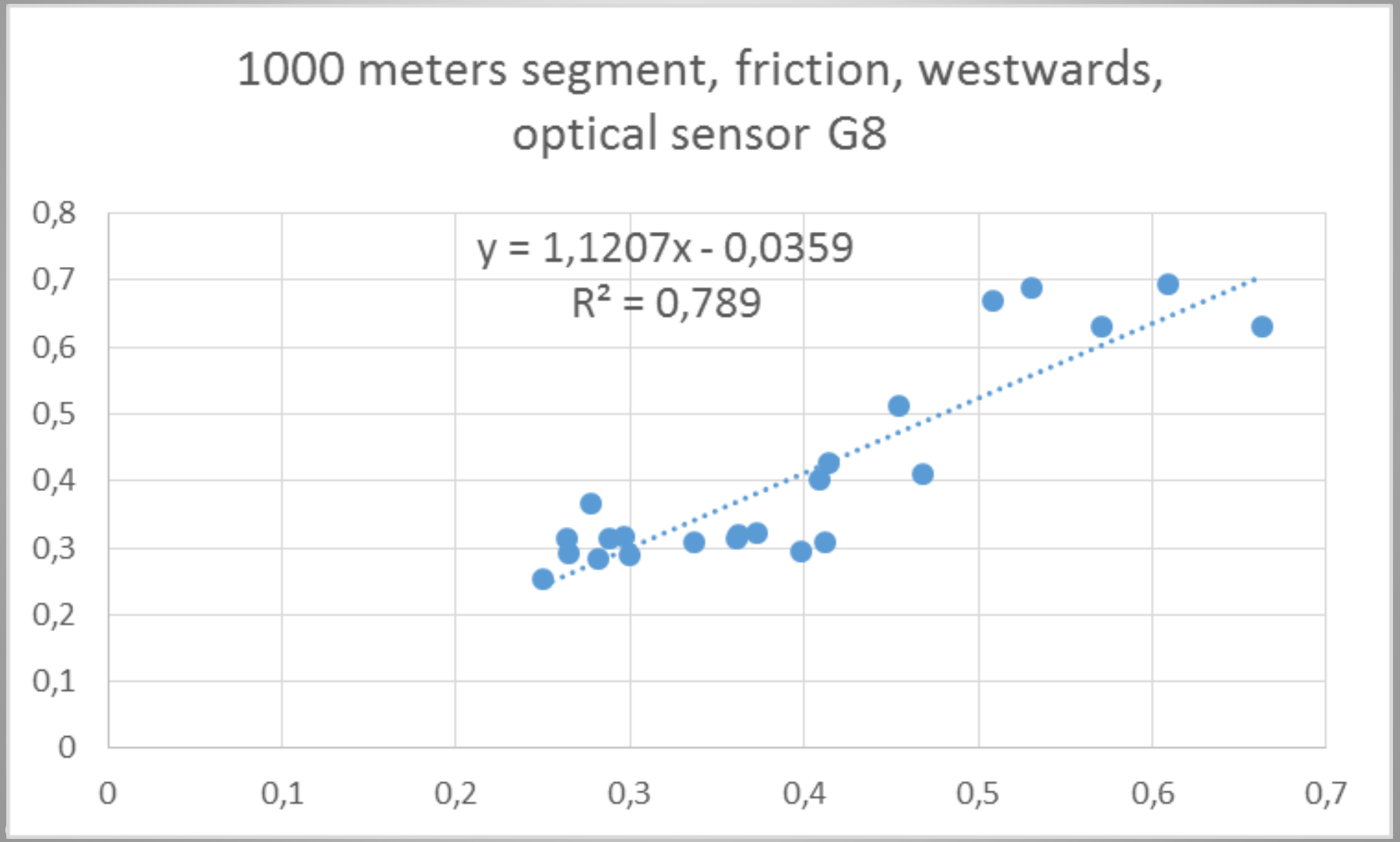

Remote Sensing of Road State and ITS Applications

- For winter road maintenance the optical sensors can be used for better knowledge of the current situation on the roads, improved prognoses, and planning of salting and ploughing

- Other applications:
  - Weather controlled speed limits
  - Traffic management more in general
  - Planning tools for transport companies

Remote Sensing of Road State and ITS Applications

- New data sources in addition to the RWIS network
  - Optical sensors
  - Camera vision
  - The car as a sensor (ABS, TCS, etc.)
- There are challenges both in terms of technology, interpretation of data and integration into different type of applications and information systems

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Learning outcomes

- One major institutional challenge will be to build an organization that maintains the infrastructure, manages, and interprets the huge amounts of data from various sources
- Lessons learned so far is that the new technologies studied in the ROSTMOS project provide a significant contribution to monitor driving conditions on the road network and give important input to improve the prognoses tool for development in the road state
- Future work look into integration of real time road state data into the models in WMDSS and traffic information systems

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