



SIRWEC 2018

19th International Road Weather Conference

Test methods for sensors of road weather stations

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Content

- **test field for road weather stations of the BAST**
- **results of the sensors and test methods for selected parameters**
 - **road surface temperature**
 - **road conditions**
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For what are accurate data from road weather stations needed in winter service?

- Determining the beginning of the winter service
- Determining the correct spreading density



Test field at the highway A4



- 8 embedded sensors, 2 types twice
- 4 remote devices
- devices for meteorological parameters

by the companies:
Boschung, Lufft, Vaisala,
Thies



Software (here archive-data) – every minute new values and pictures

Rahmenwerk "kv.aoc.bast.testfeld" Version: 2.0.11.201511161248
Datei: BASTestfeld inovatGTM System Hilfe

Schnelzugriff: BASTestfeld inovatGTM Berechtigungen Parameter Benutzerverwaltung

Online-Daten Online-Kamerabilder Archiv-Daten Archiv-Kamerabilder

Hersteller/Sensoren

- Referenz_REF-1_RLF
- Referenz_REF-2_RLF
- Referenz_REF-1_TFT
- Referenz_REF-2_TFT
- Referenz_REF-1_LT
- Referenz_REF-2_LT
- Referenz_REF-1_STB
- Referenz_REF-2_STB
- Thies
 - Thies_LNM_NS
 - Thies_LNM_NI
 - Thies_LNM_SW
- Vaisala
 - Vaisala_DRSS11-1_FTB
 - Vaisala_DST111_FTB
 - Vaisala_DRSS11-1_GT
 - Vaisala_DRSS11-1_FZW
 - Vaisala_DSC111_FZW
 - Vaisala_PWD12_NS
 - Vaisala_PWD12_NI
 - Vaisala_DRSS11-1_WFD
 - Vaisala_DSC111_WFD
 - Vaisala_RMP155_RLF
 - Vaisala_RMP155_TPT
 - Vaisala_RMP155_LT
 - Vaisala_DSC111_GR
 - Vaisala_DRSS11-1_RS
 - Vaisala_DRSS11-1_TSQ
 - Vaisala_DSC111_FBZ
 - Vaisala_DSC111_SFD
 - Vaisala_DSC111_EFD
 - Vaisala_DRSS11-1_IT1
 - Vaisala_UT_IT3
 - Vaisala_PWT12_SW

| Sensor | 10.12.2017 13:20 | Legende |
|------------------------|------------------|---------|
| Boschung_IT-Sens-1_FZW | (64)glatt | |
| Boschung_IT-Sens-2_FZW | (64)glatt | |
| Boschung_RCO_FZW | (0) trocken | |
| MicKS_IRS31-1_FZW | (32)mass | |
| MicKS_NIRS31-1_FZW | (64)glatt | |
| MicKS_NIRS31-2_FZW | (64)glatt | |
| Vaisala_DRSS11-1_FZW | (32)mass | |
| Vaisala_DSC111_FZW | (64)glatt | |
| Thies_LNM_NS | (70) fester NS | |
| Boschung_PWS_NI | 0,0 | |
| MicKS_WS600_NI | 1,9 | |
| Thies_LNM_NI | 8,1 | |
| Vaisala_PWD12_NI | 4,5 | |
| Boschung_IT-Sens-1_WFD | 0,03 | |
| Boschung_IT-Sens-2_WFD | 0,03 | |
| Boschung_RCO_WFD | 0,00 | |
| MicKS_IRS31-1_WFD | 0,30 | |
| MicKS_NIRS31-1_WFD | 0,00 | |
| MicKS_NIRS31-2_WFD | 0,21 | |
| Vaisala_DRSS11-1_WFD | 0,67 | |
| Vaisala_DSC111_WFD | 0,00 | |

Niederschlagsintensität mm/h

Fimddicke mm

10.12.2017 08:00 11.12.2017 00:00

Maßstab/Stunden: 3 12 24 Winter Sommer

von 09.12.2017 20:00 bis 18.01.2018 00:00

Aktualisieren Exportieren

Kamera 1 Kamera 2 Kamera 3 Kamera 4 Kamera 5

The evaluation is based on the European standard EN 15518-3.

Road surface temperature

Requirements according EN 15518-3:

Accuracy for embedded sensors in the range -15°C to 10°C :

$\pm 0,2^{\circ}\text{C}$, otherwise $\pm 0,8^{\circ}\text{C}$

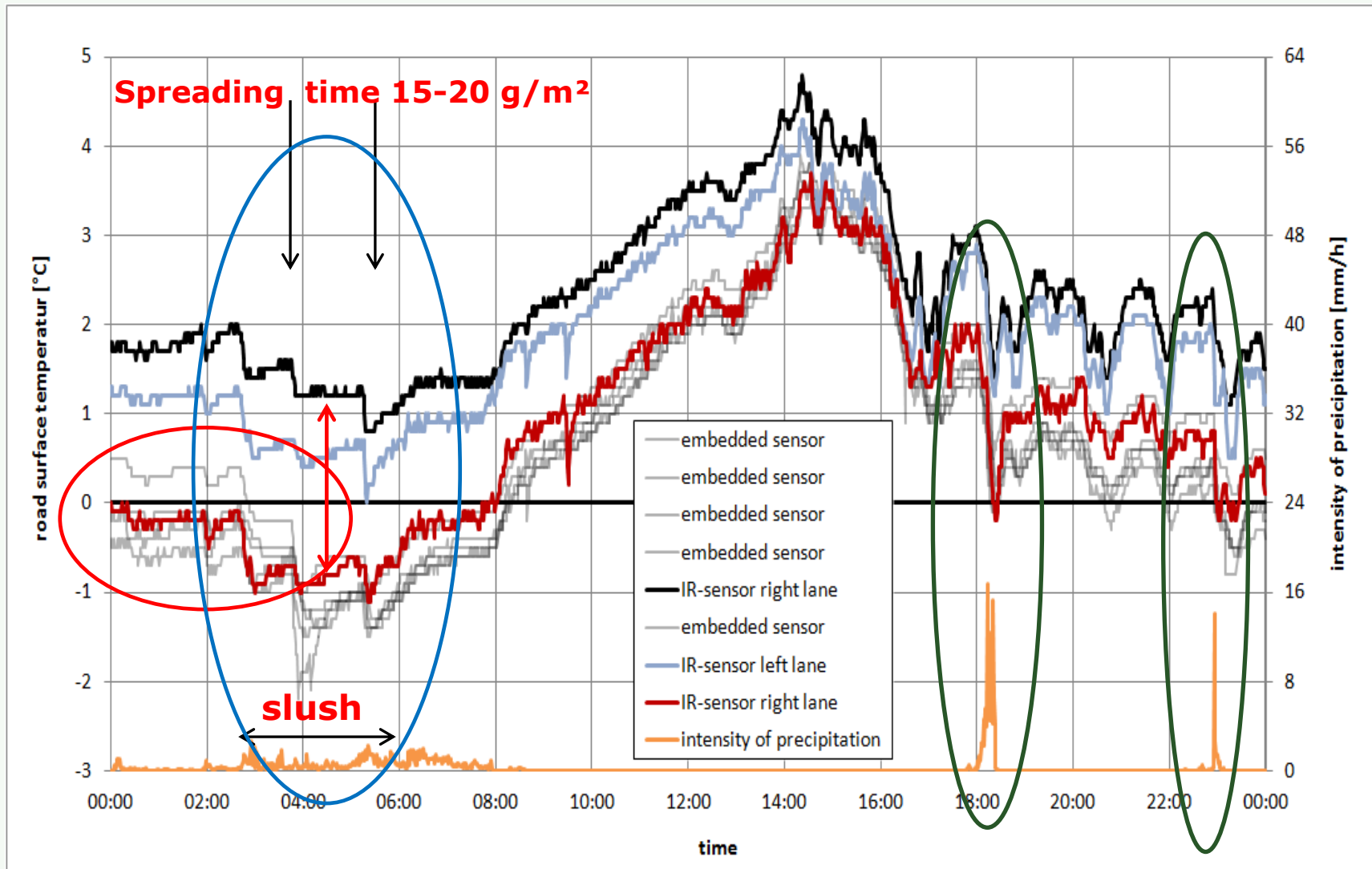
New: Accuracy for remote sensors (infrared sensors) in the range -15°C to 10°C :

$\pm 0,8^{\circ}\text{C}$, otherwise $\pm 1,0^{\circ}\text{C}$

The embedded sensors have a very high accuracy in a liquid bath according CEN/TS 15518-4

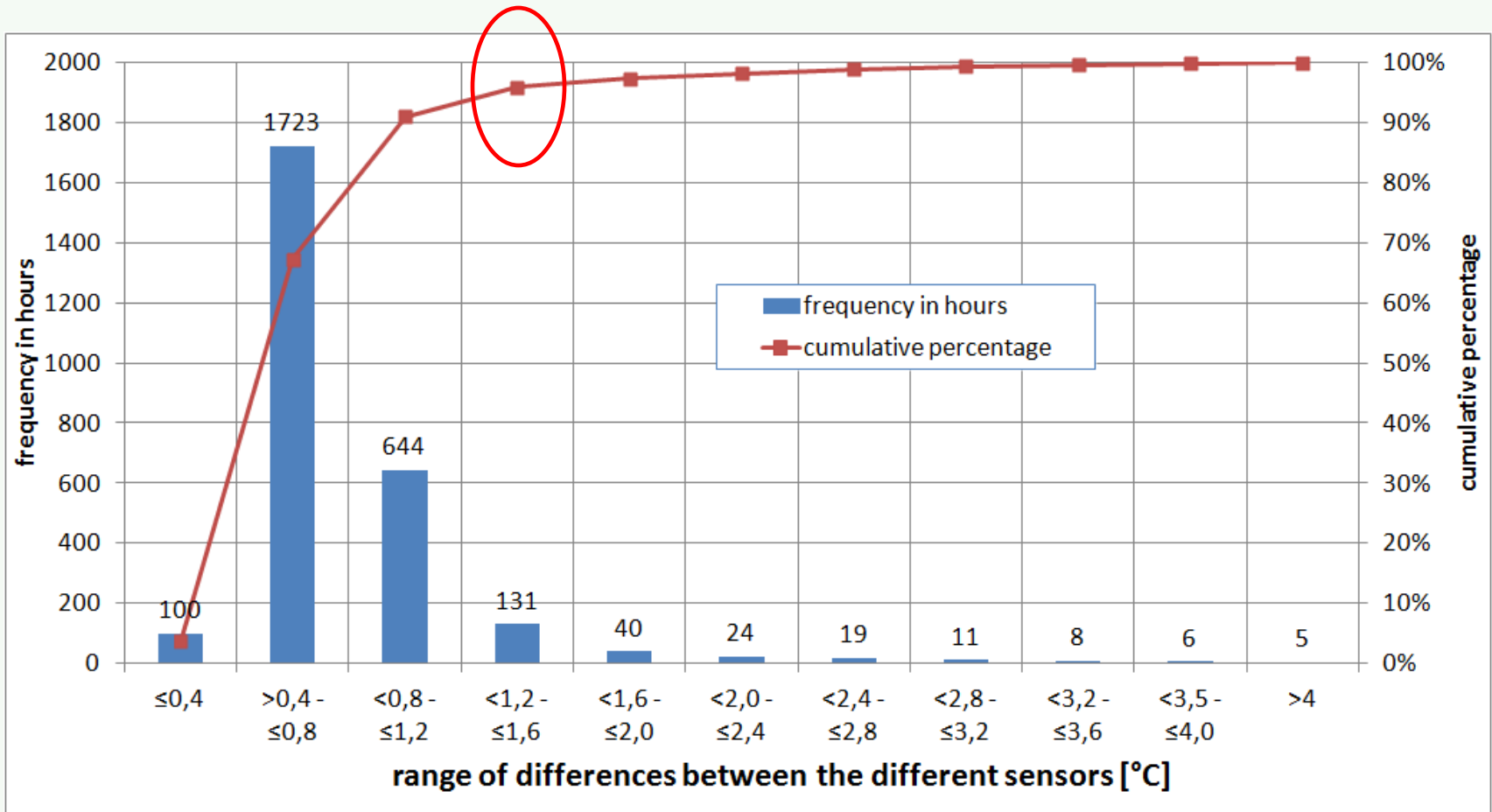


Courses of road surface temperature on 02.01.2017



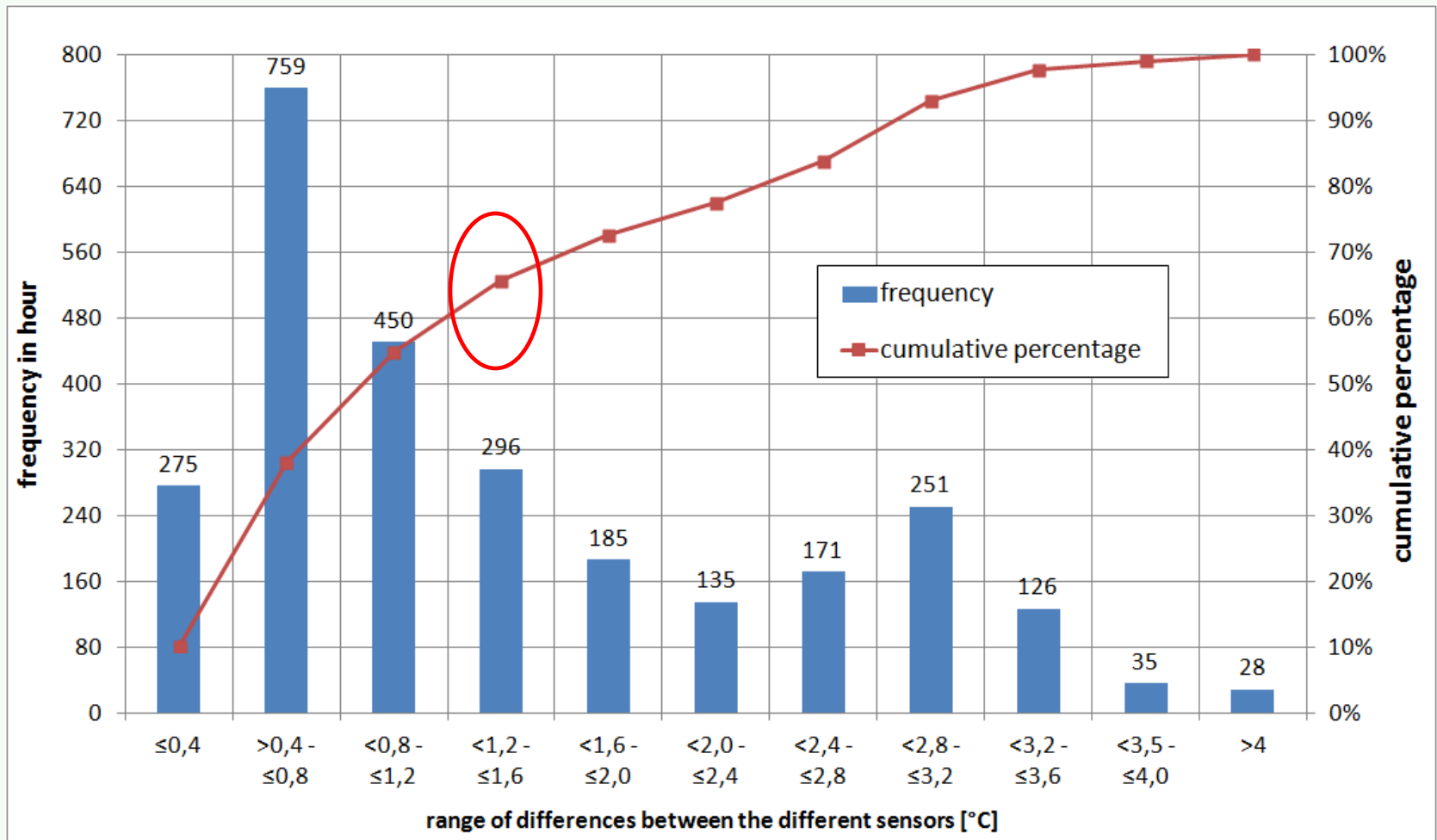


Frequency of ranges of differences between the embedded sensors in left lane in the time 9. December 2017 - 31. March 2018 [in hours]





Frequency of ranges of differences between the infrared thermometers in the right lane in the time 9. December 2017 - 31. March 2018 [in hours]

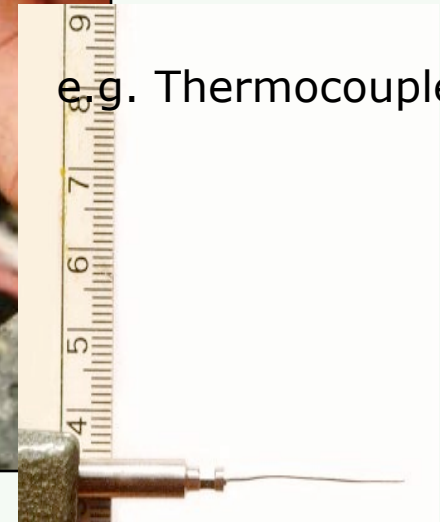




Possibility for reference measurement of the road surface temperature



**Position
of the Sensors**



Inserting of a temperature sensor to the road surface



Road conditions – Waterfilm thickness

Requirements according EN 15518-3:

Road conditions:

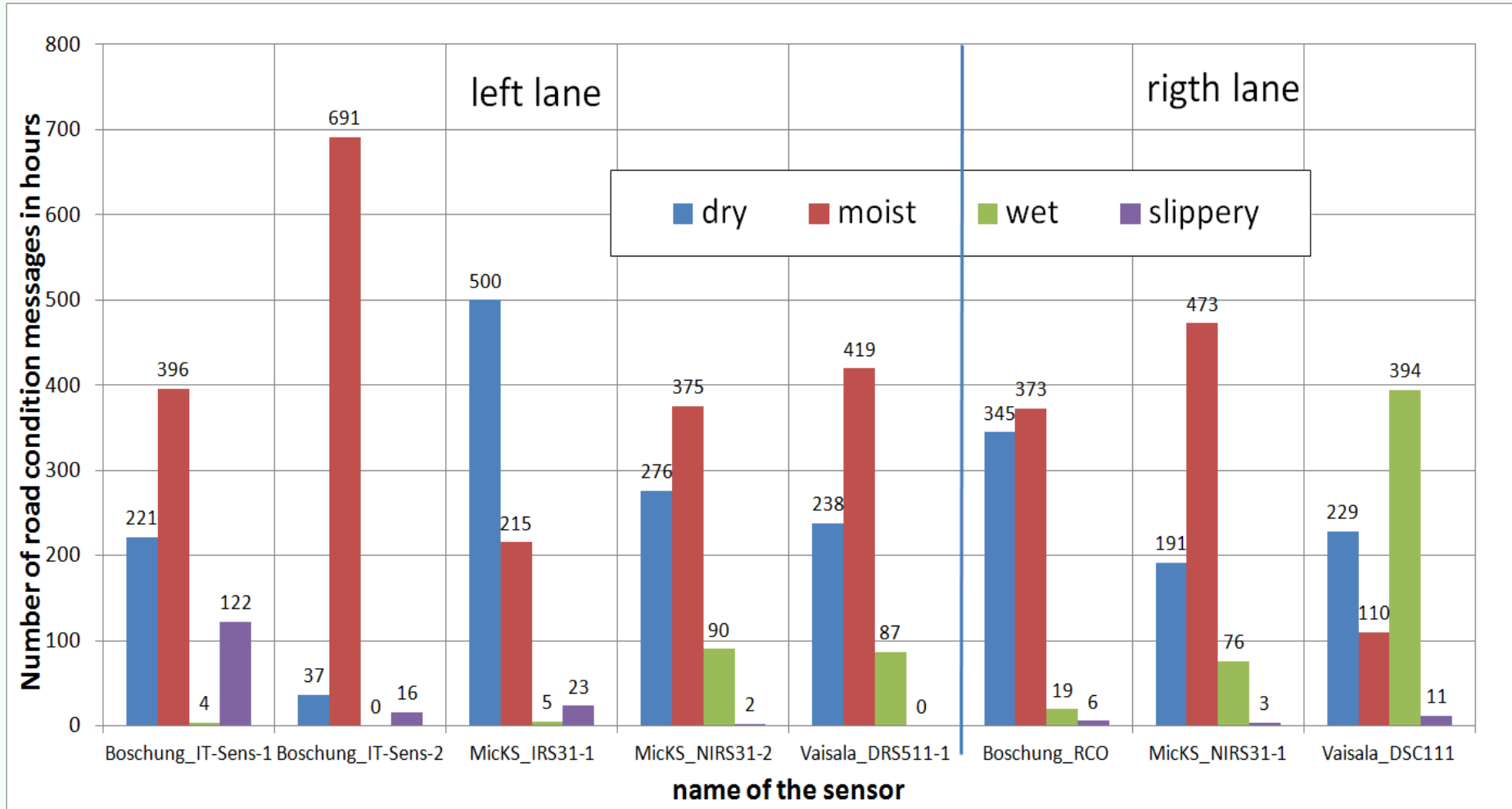
| dry | moist | wet | streaming water | slippery |
|-----------------|---------------------|--------------------|------------------------|---------------------------|
| no water | from 0,01 mm | from 0,2 mm | from 2 mm | ice, snow or slush |

Water film thickness:

Measuring range between 0,2 mm and 3 mm
accuracy: +/- 30%

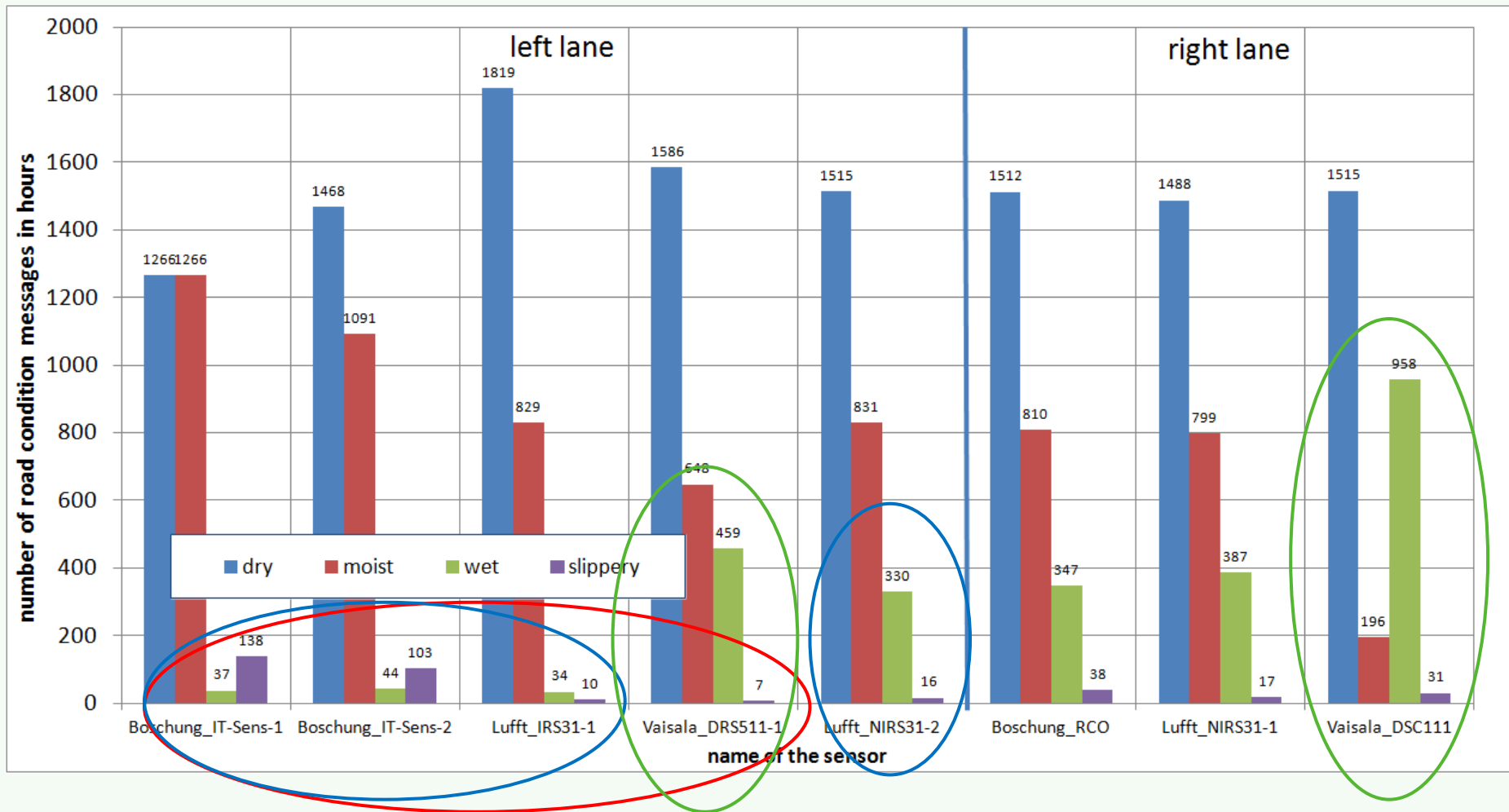


Frequency of road conditions in the January 2017 [in hours]

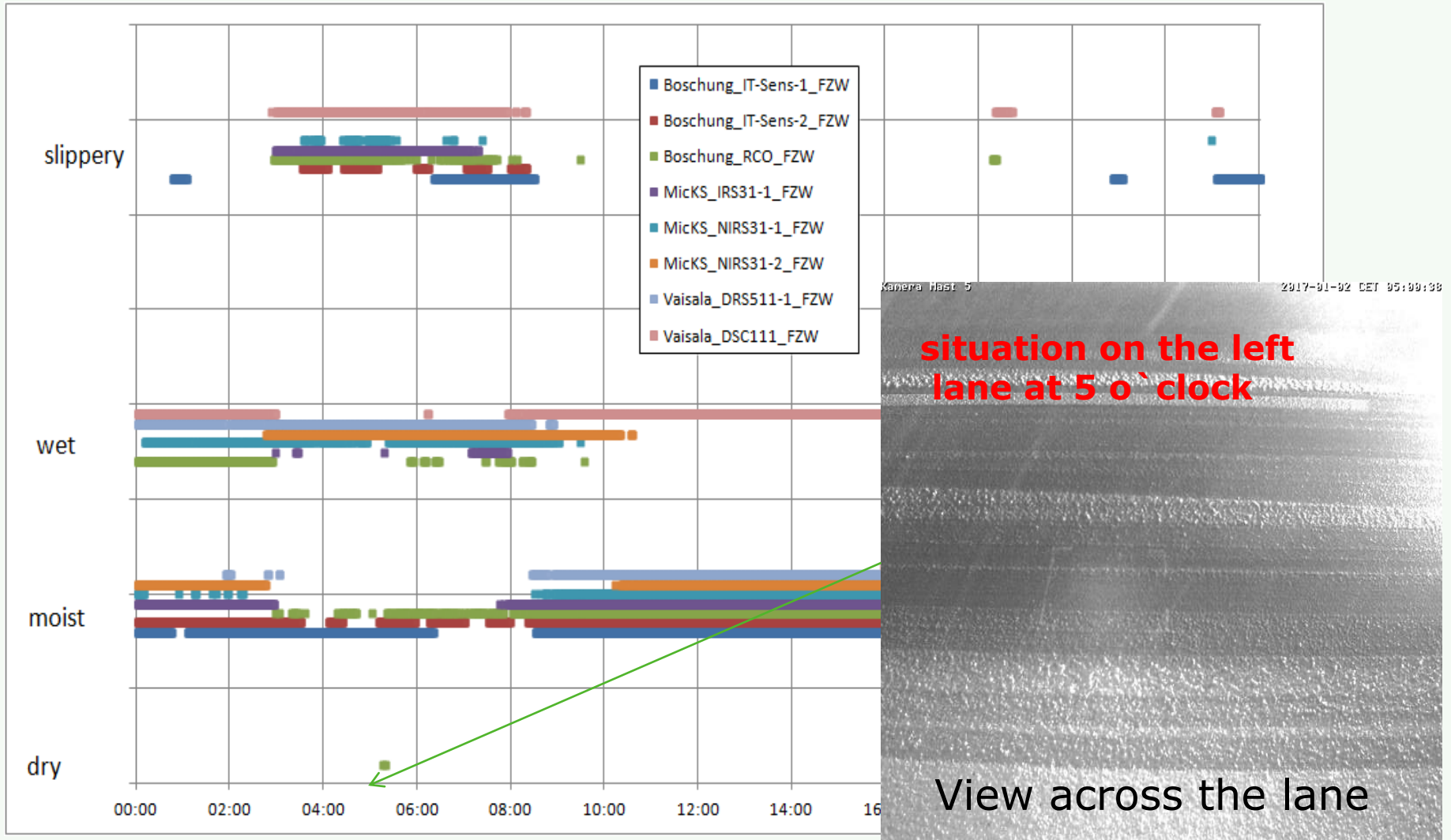




Frequency of road conditions in the time 9. December 2017 - 31. March 2018 [in hours]

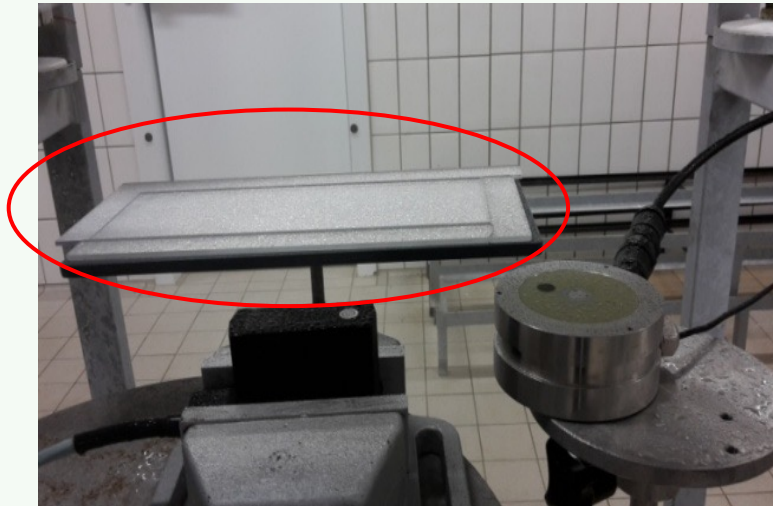


Courses of the road conditions on 02. January 2017



Tests of sensors for Road conditions and Waterfilm thickness

Test of embedded sensors



Test of a remote sensor



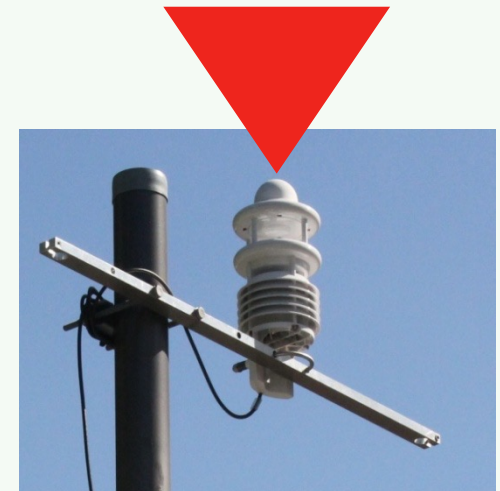
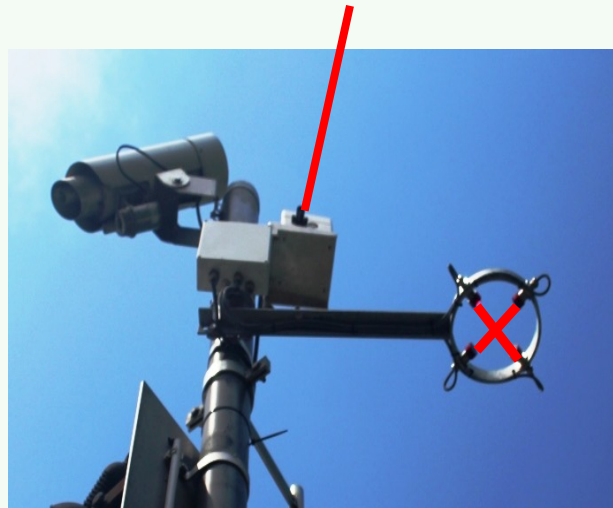
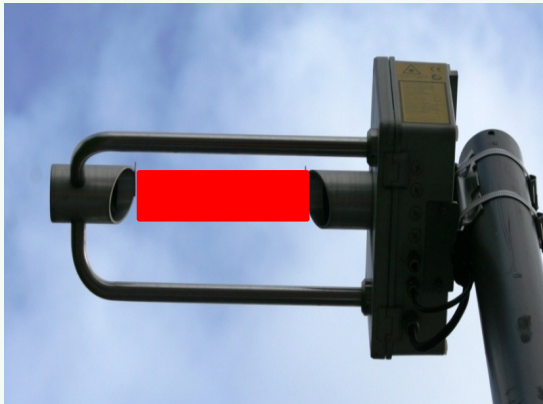
Pictures for evaluation



Kind of precipitation – precipitation intensity

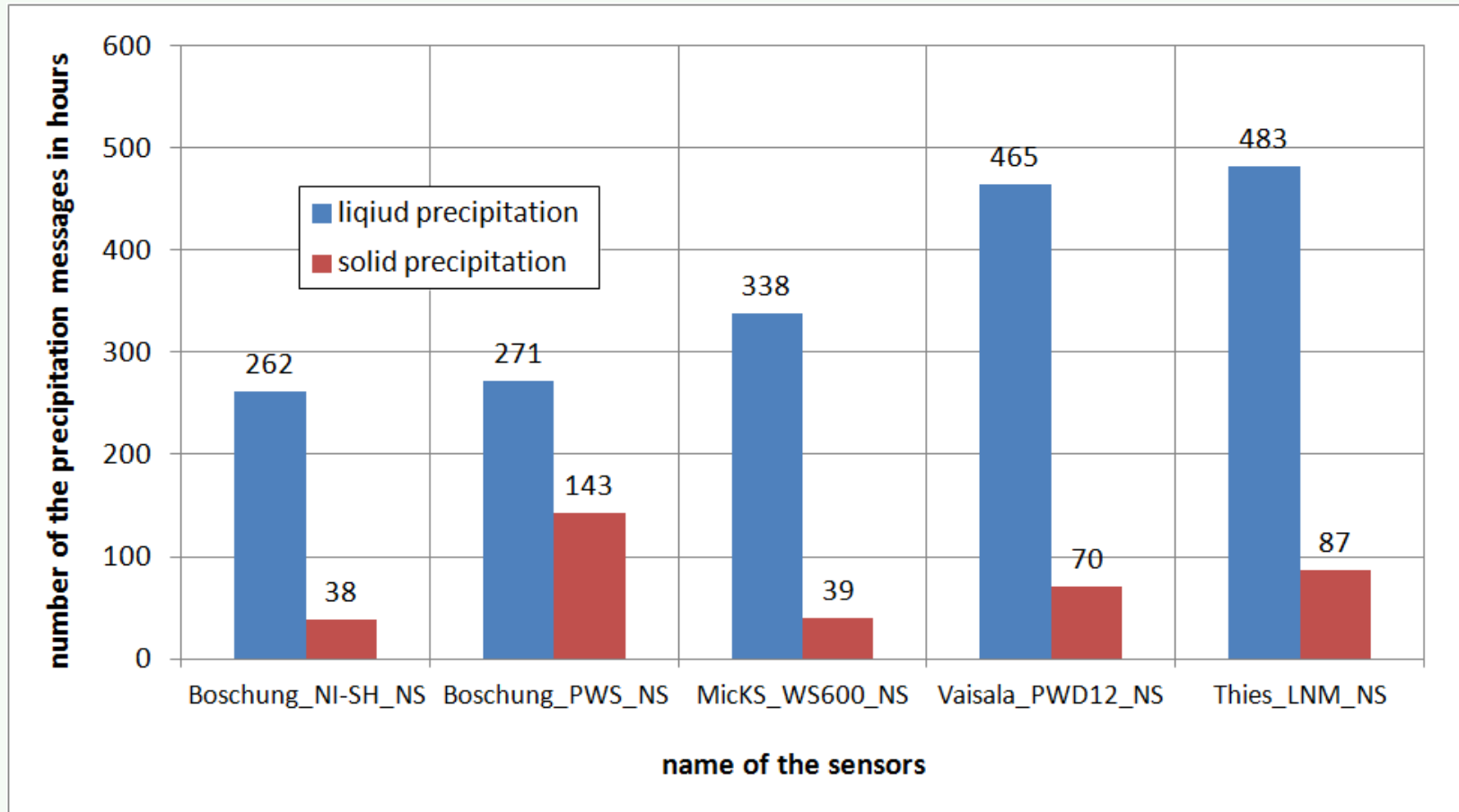
Requirements according EN 15518-3:

- Precipitation must be given at an intensity of ≥ 0.1 mm/h after 10 min
- The sensors must differentiate between liquid and solid precipitation
- Accuracy of precipitation intensity: between $\pm 20\%$ and $\pm 40\%$ depending on the intensity range
- Measured value resolution of 0.1 mm/h





Frequency of the kind of precipitation in the time 9. December 2017 - 31. March 2018 [in hours]



only in 174 hours the same message of all sensors



Evaluation based on photos (here rain)



Planned works

- **Further analysis of existing data**
- **Discuss the results with the suppliers**
- **Development of new test methods for remote sensors (Introduction of test methods to CEN standardization)**



Thank you for your attention!

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