Five Years Report for Functional and Structural Deterioration of Local Road Pavements in TRUE Project

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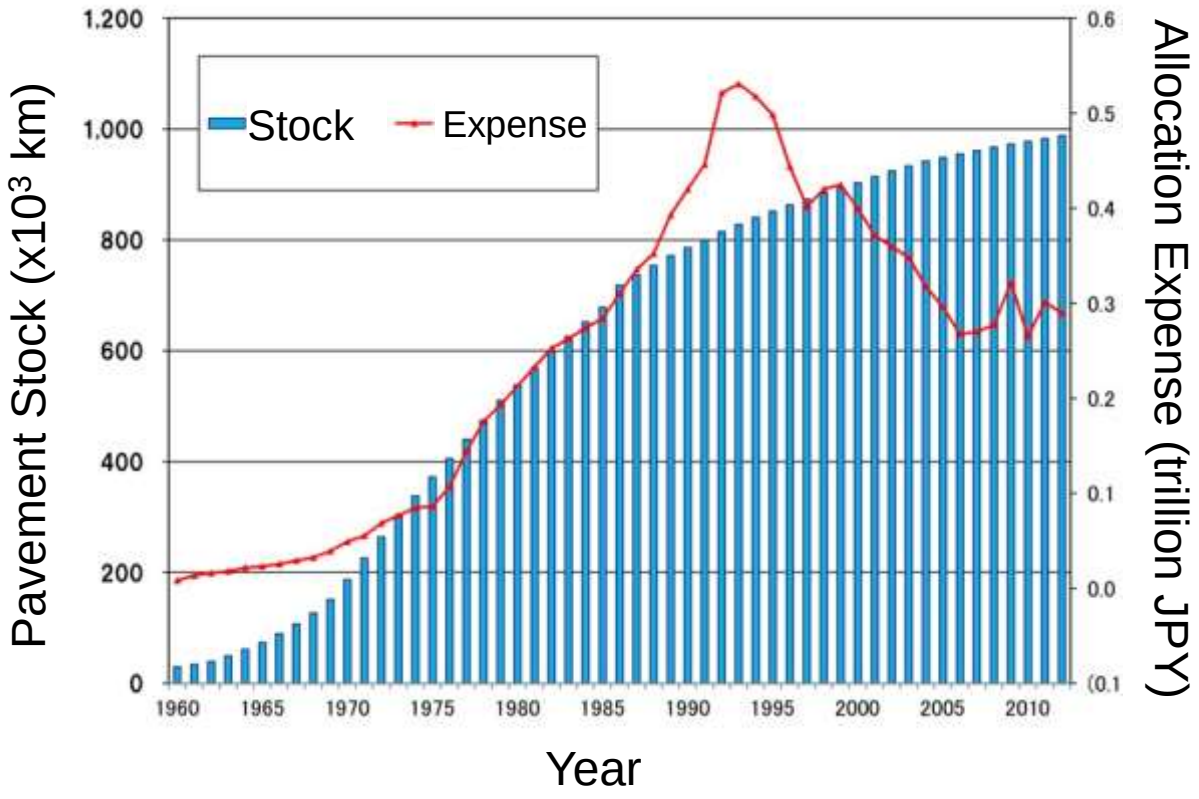
Introduction

Increasing Stocks
in spite of Decreasing Expenses



Transition of Pavement Stocks and Allocation Expenses
(Source: MLIT)

The Bureau of Public Road has issued...
Pavement Inspection Manual (2016)

- introducing ***IRI***
- to improve a ***Maintenance Cycle***

Maintenance Cycle
in Pavement Inspection Manual

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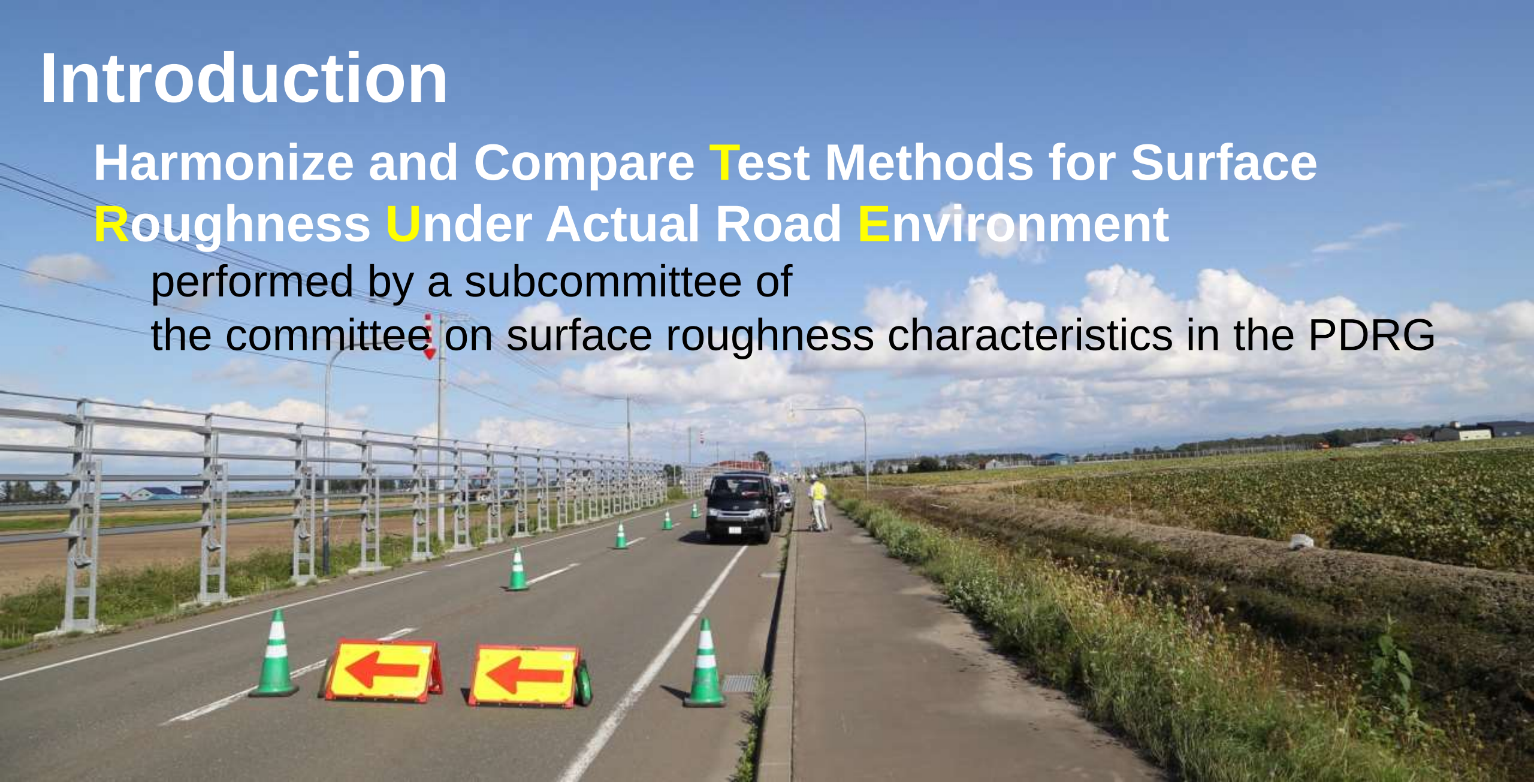
Introduction

Harmonize and Compare Test Methods for Surface Roughness Under Actual Road Environment

performed by a subcommittee of
the committee on surface roughness characteristics in the PDRG



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Brief History of TRUE Project

Pre-experiment

Establish the reference measures (PWRI)

TOPICS:

- Accuracy Overview

TRUE 2014
(1st Exp. Sep. 2014)

FWD and GPR Survey 2014

Draft Guideline for Pavement Inspection (2013)

Pavement Inspection Manual (2016)

- Overseas Participation
- Extra Test Section

TRUE 2016
(2nd Exp. Sep. 2016)

FWD Survey 2016

Publication: Pavement Management Guidebook based on the Pavement Inspection Manual (2018)

- Accuracy Report
- Device Grouping

TRUE 2018
(3rd Exp. Oct. 2018)

FWD Survey 2018

- **High quality reference profiles and open data for intercomparison**
- **Meeting engineers and exchange information**

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Devices Involved in the Project

Number of Devices

	FY 2014	FY 2016	FY2018	Total
High-Speed Devices	20	15	12	47
Low-speed Devices	14	13	16	43
Total	34	28	28	90

Inertial Profiler

MMS

Walking Profiler

Dipstick

Scenes from 2018

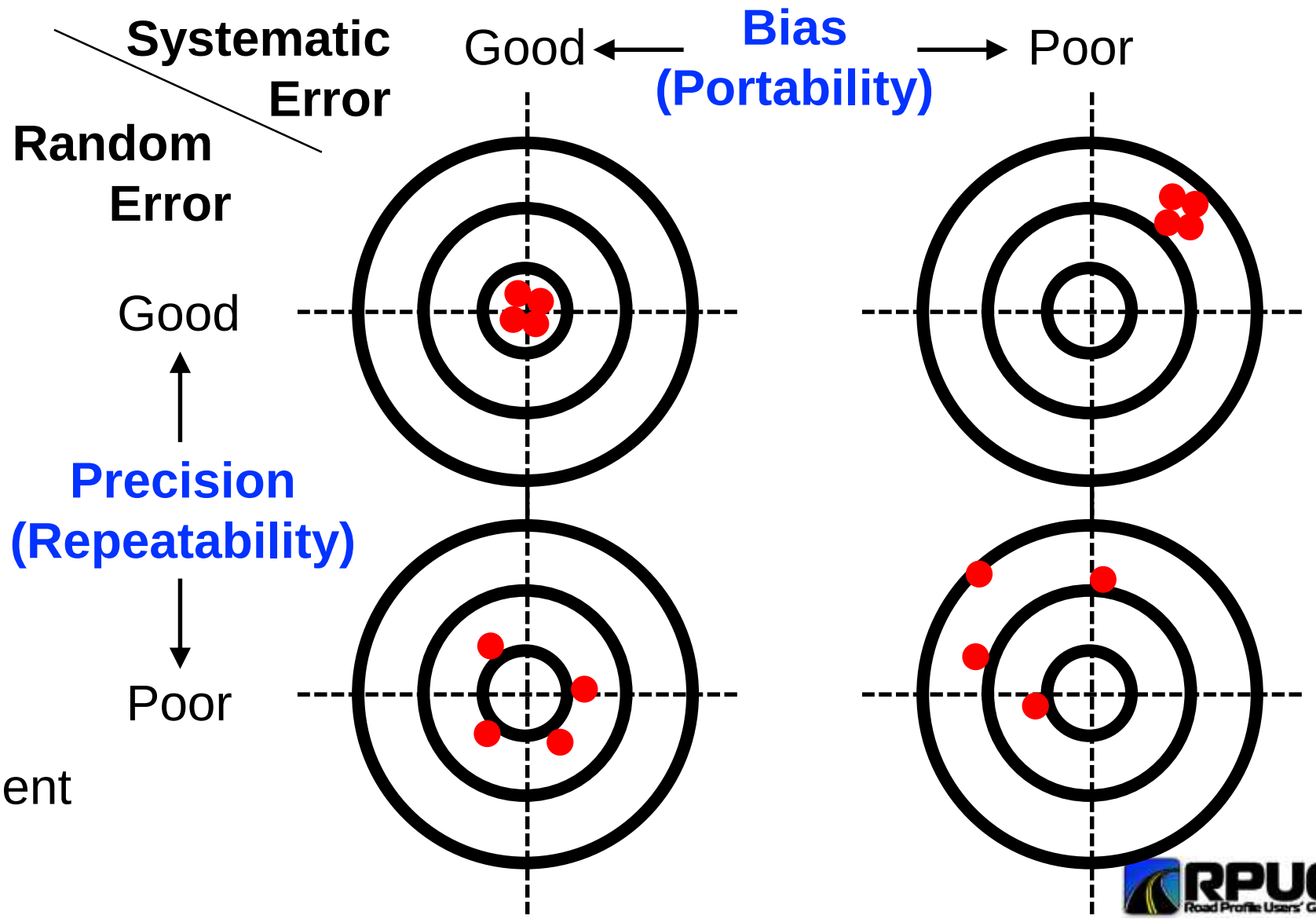
Establishment of Test Sites

Site		1		2	
Road Category		Arterial (High Volume) Road		Residential (Low Volume) Road	
Driving Speed (km/h)		40, 50, and 60 km/h		20, 30, and 40* km/h	
Length (m)		200		200	
Overview					
Section		No. 1	No. 2	No. 1	No. 2
IRI (mm/m)	FY 2014	2.6	1.8	6.3	4.5
	FY 2016	2.6	1.8	6.5	4.5
	FY 2018	2.8	1.9	6.7	4.7

* except for FY2018 due to environmental problem of the test site

Description of Accuracy

Certification of
IRI and Profile Measurement



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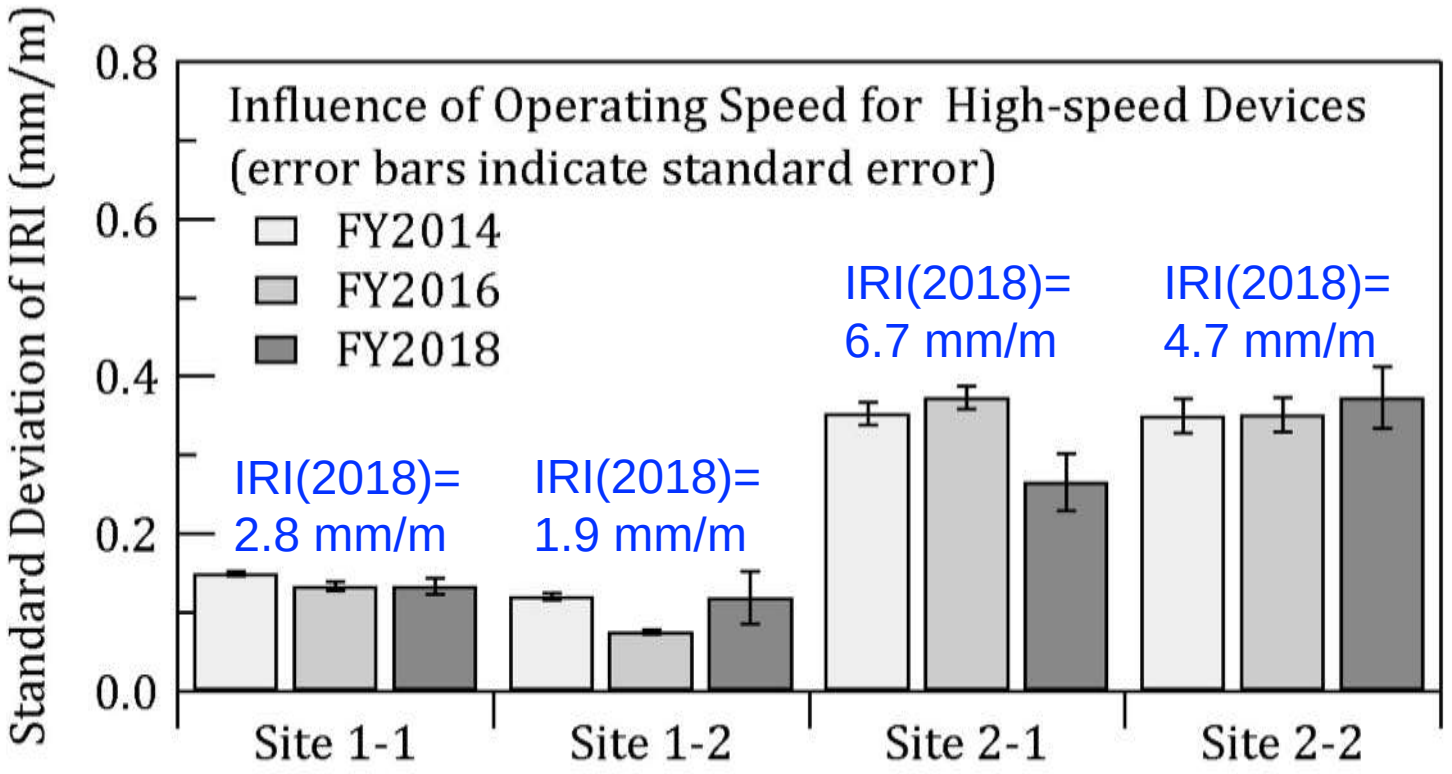
Influence of Operating Speed

- assumed to be a systematic error
- evaluated by the standard deviation for the different speed



The standard deviation increases with increasing IRI values,

within 10% precision of the measured IRIs.

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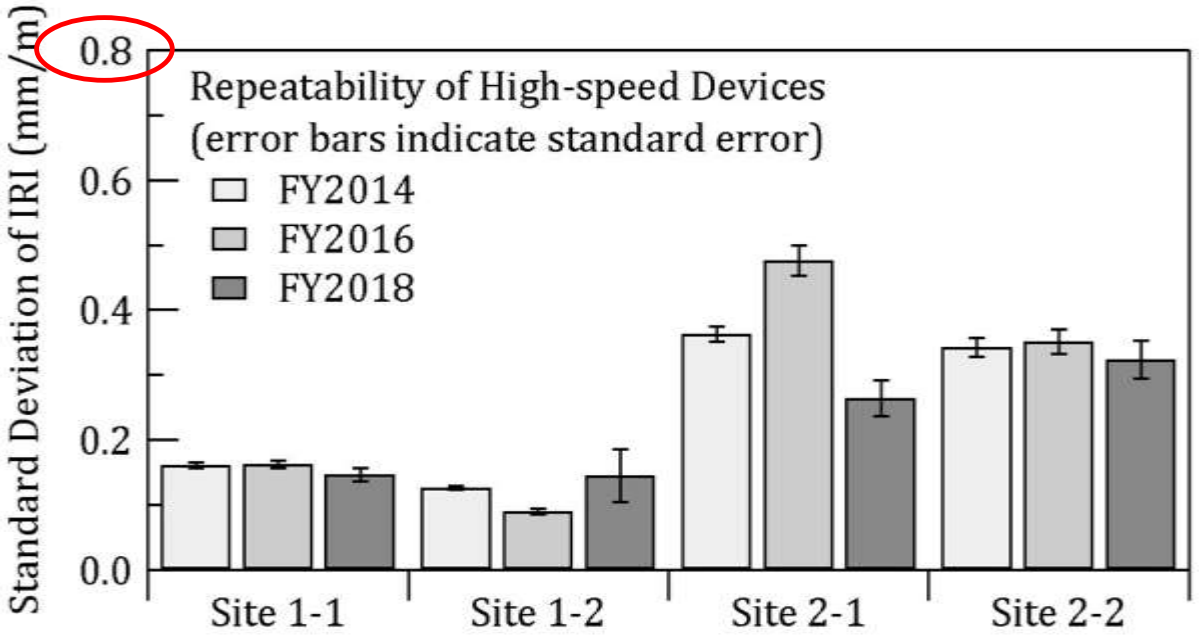
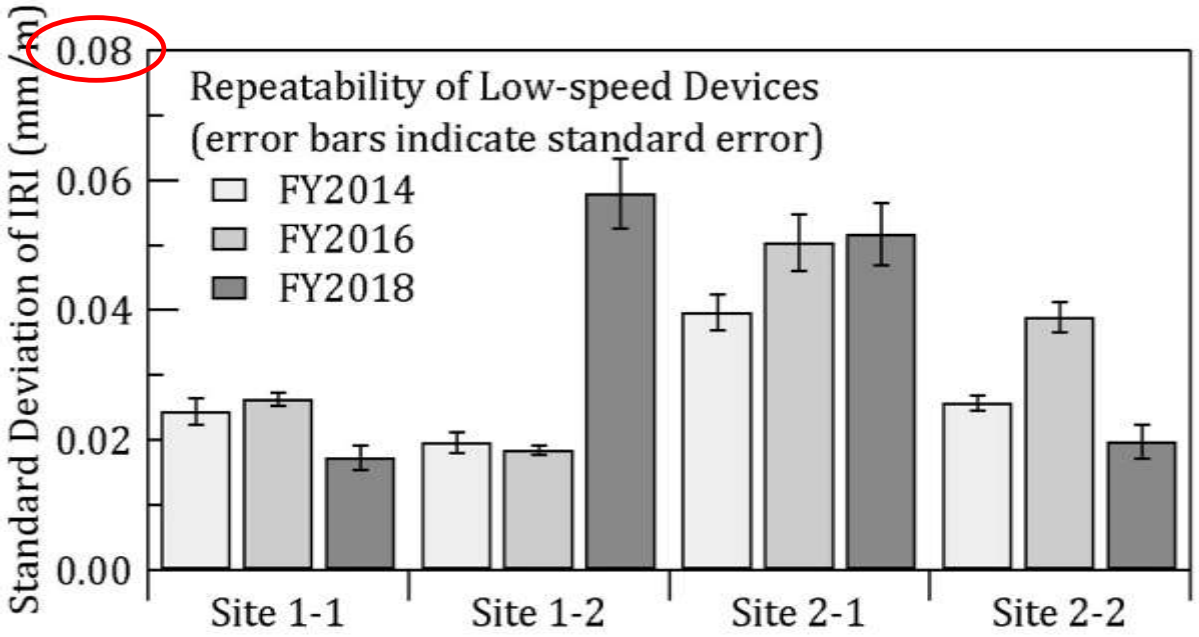
Repeatability of IRI Measures

- the ability to obtain repeat measures with the same device at the same time
- evaluated by the standard deviation obtained by repeated runs





The standard deviation increases with increasing IRI values,

within 10% precision for High-speed devices

whereas 1% precision for Low-speed devices.

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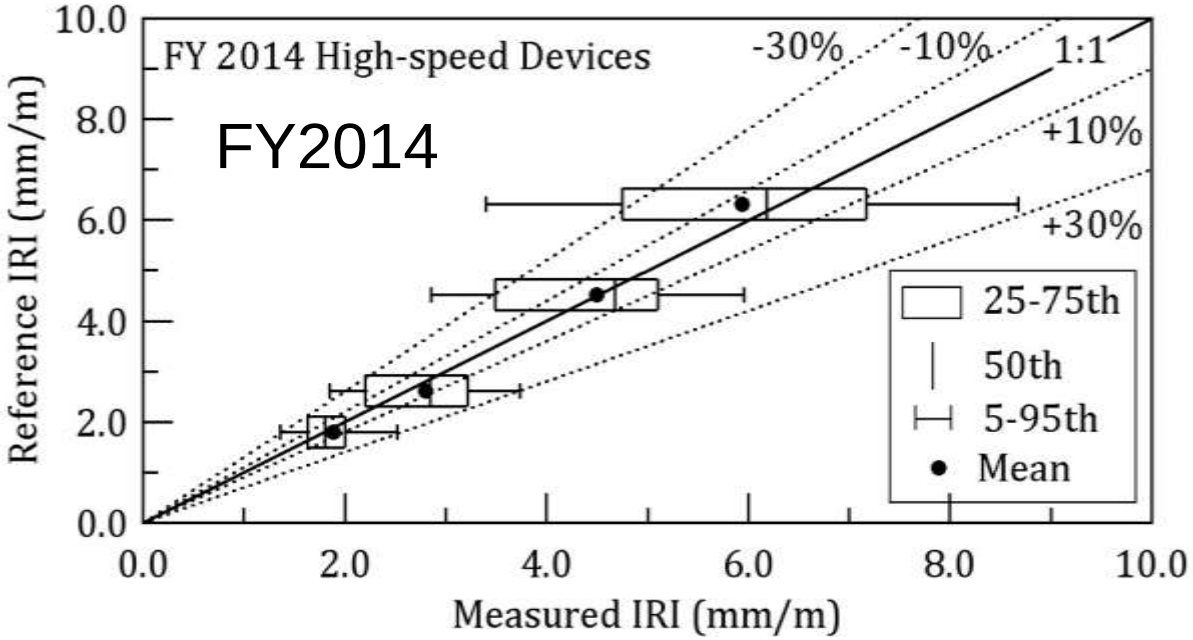
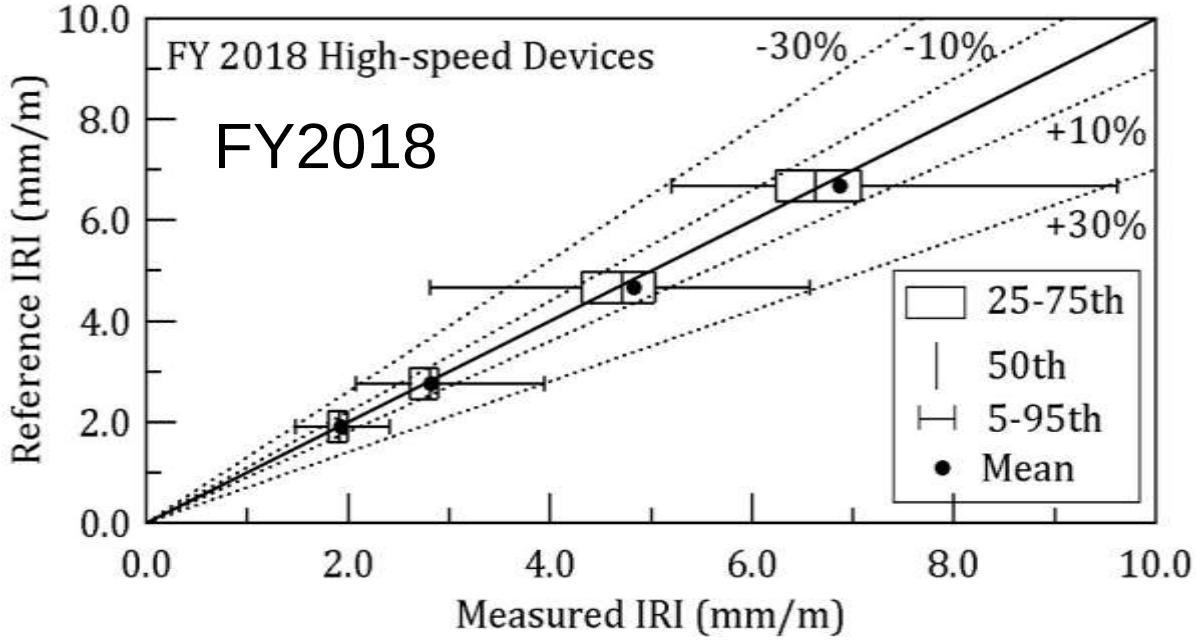
Reproducibility of High-speed Devices

- the ability to repeat the measures with a different device of the same basic design
- the width of box-plot and deviation of a mean from a line of identity





The 50th-75th percentile devices were within the error of 10%, while some devices exceeded the error of 30%.

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Accuracy has increased over the year.

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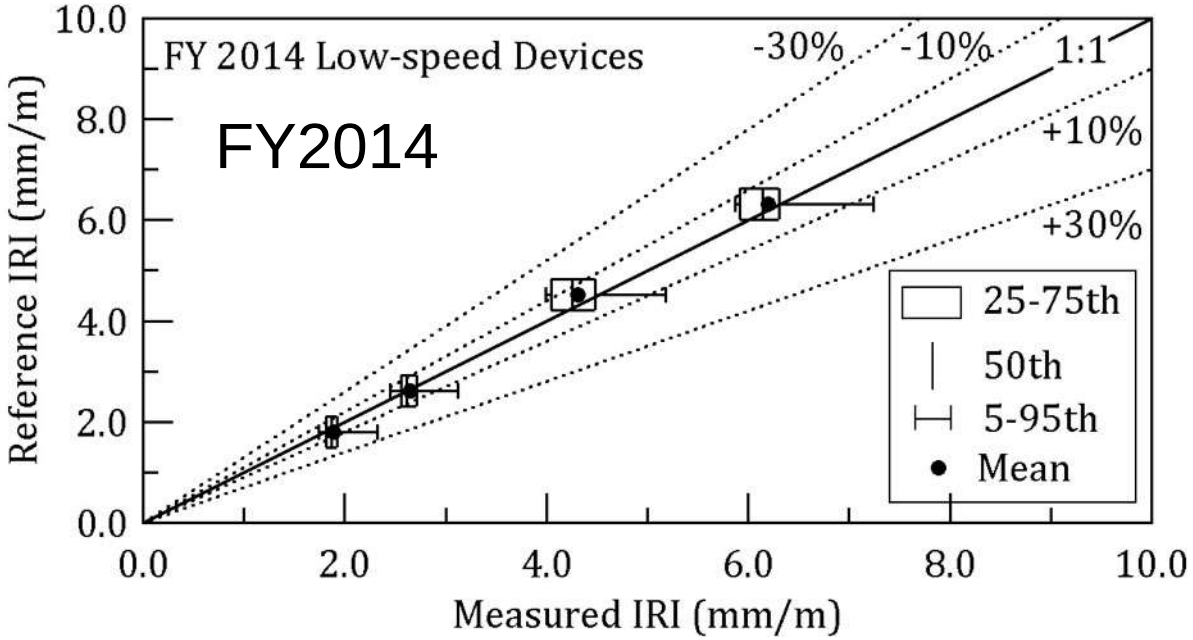
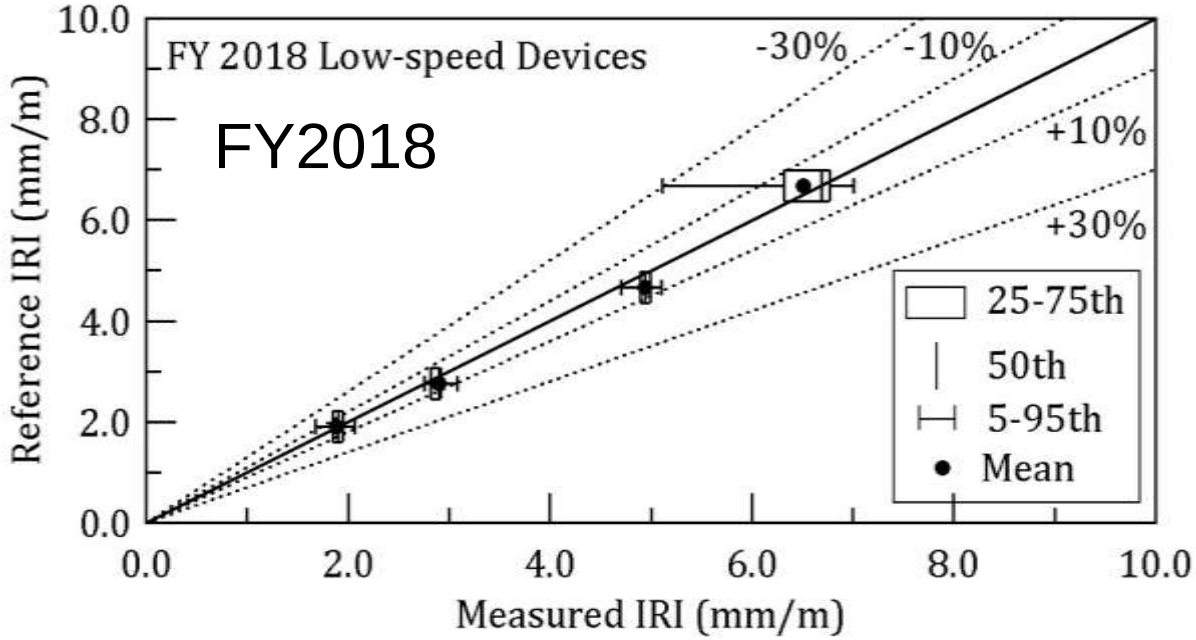
Reproducibility of Low-speed Devices

- the ability to repeat the measures with a different device of the same basic design
- the width of box-plot and deviation of a mean from a line of identity





The 50th-75th percentile devices were within the error of 10%, while some devices exceeded the error of 30%.

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Accuracy has increased over the year.

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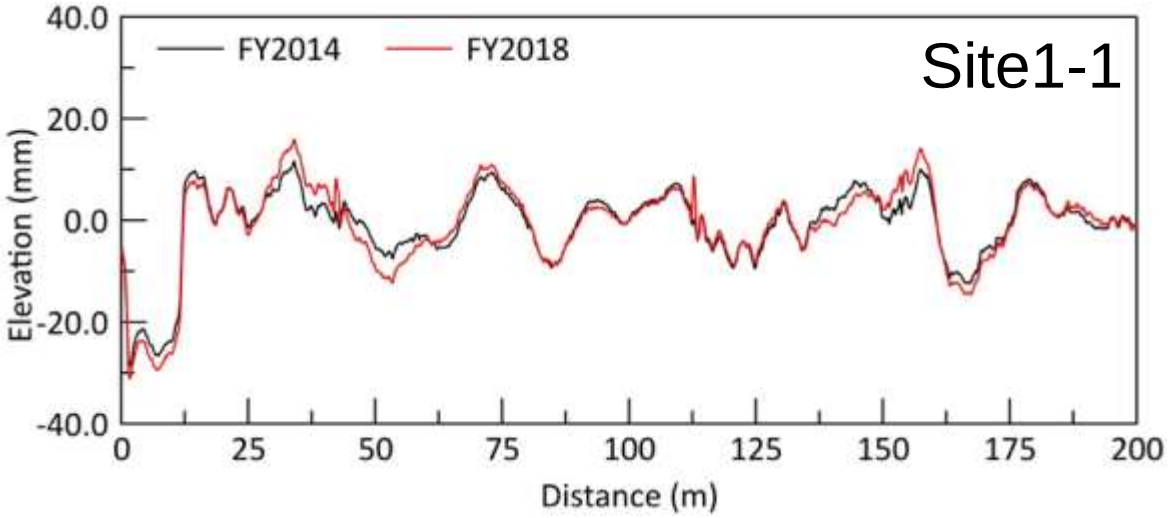
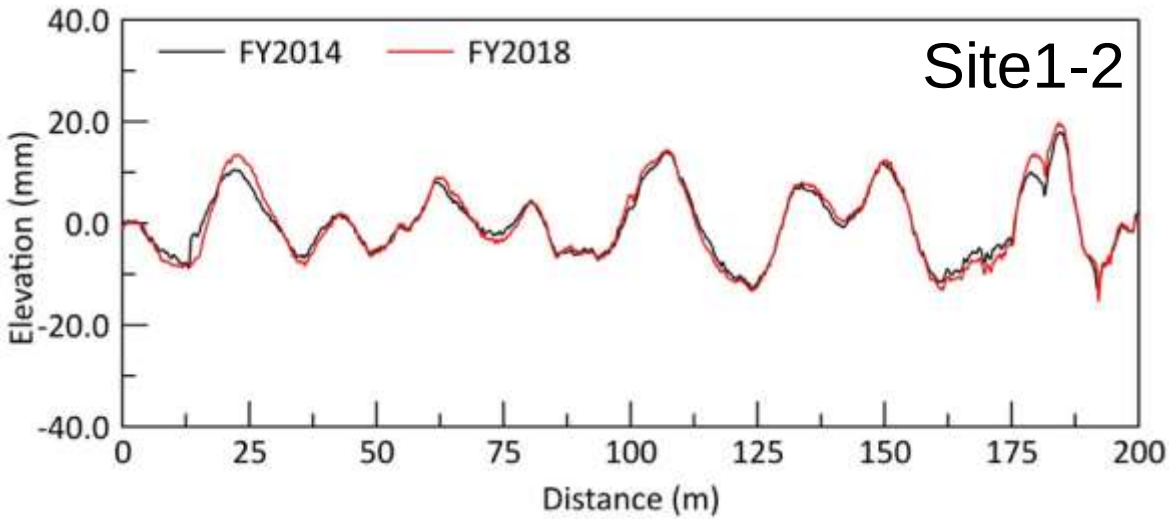
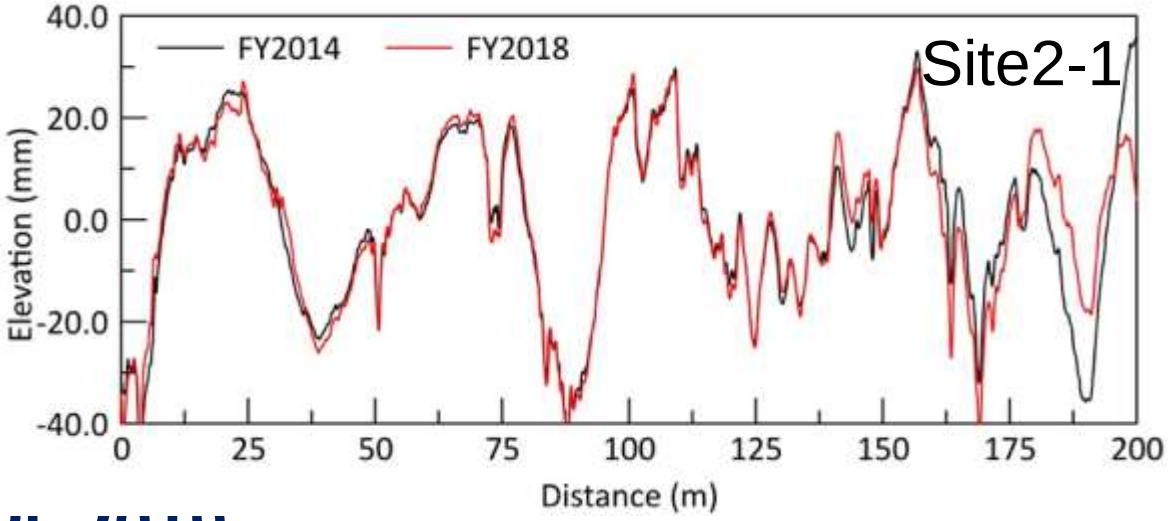
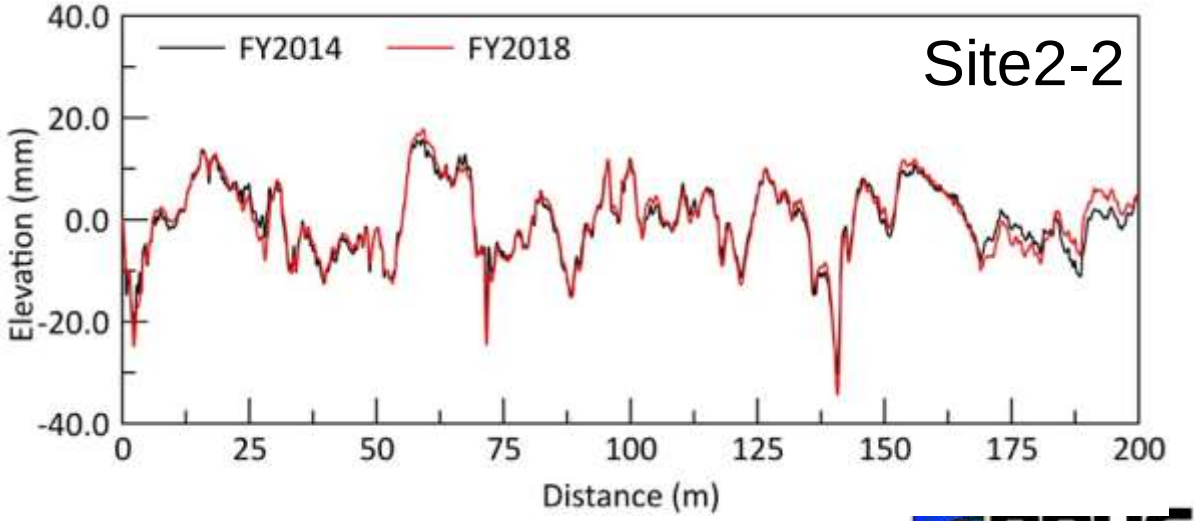
Elevation Change in Measured Profiles

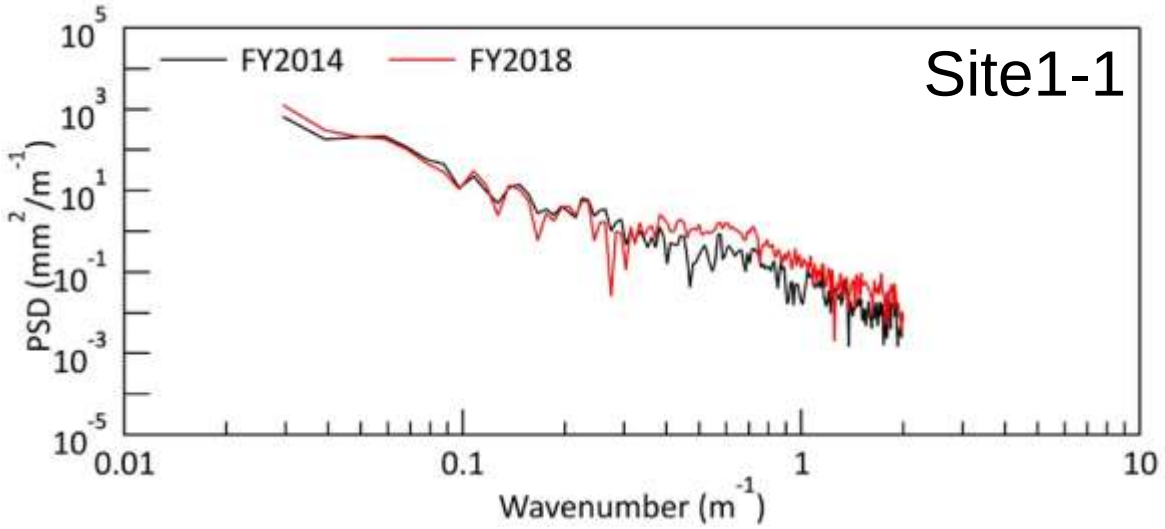


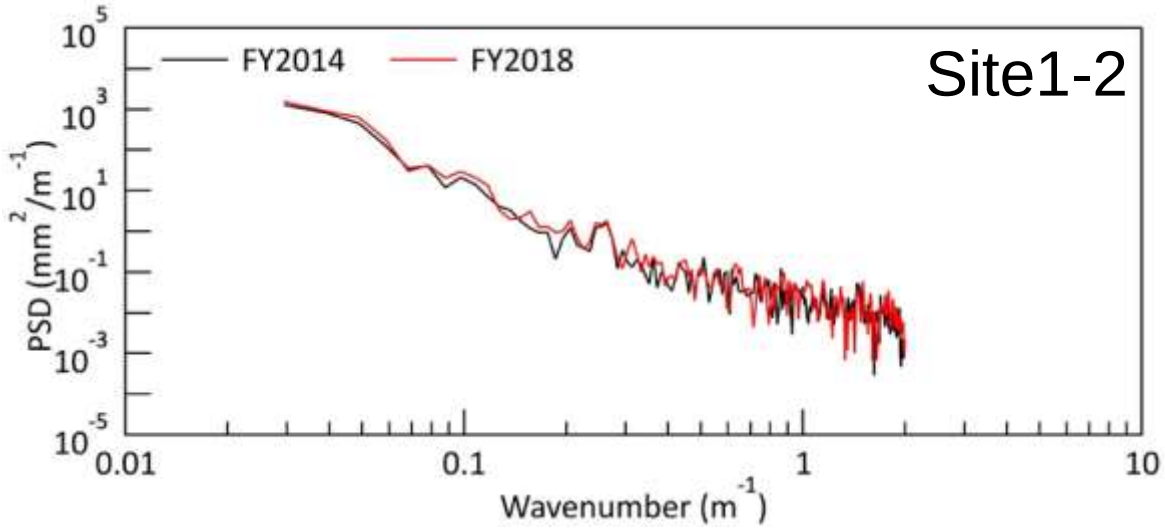


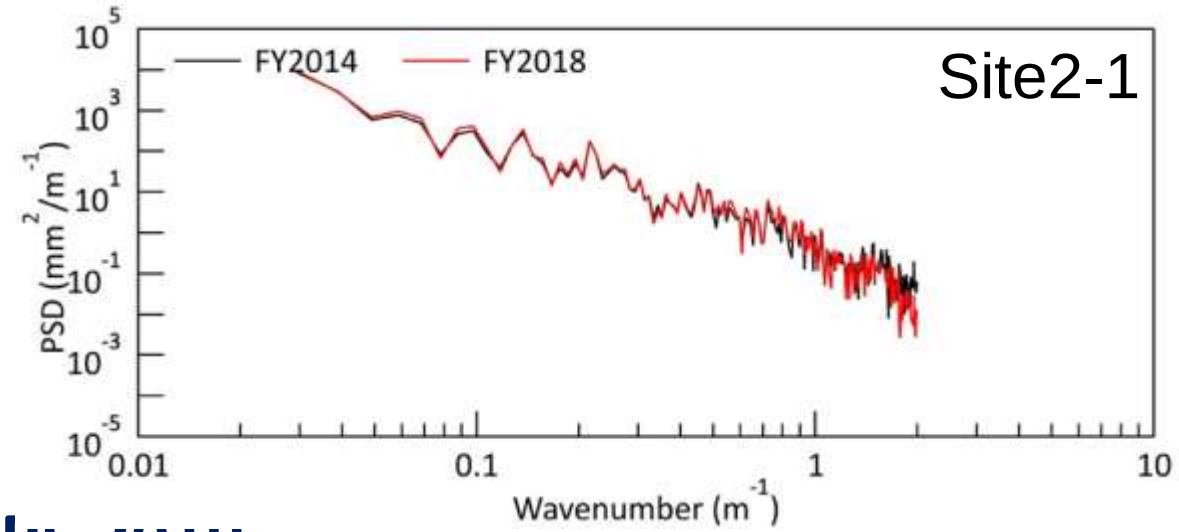


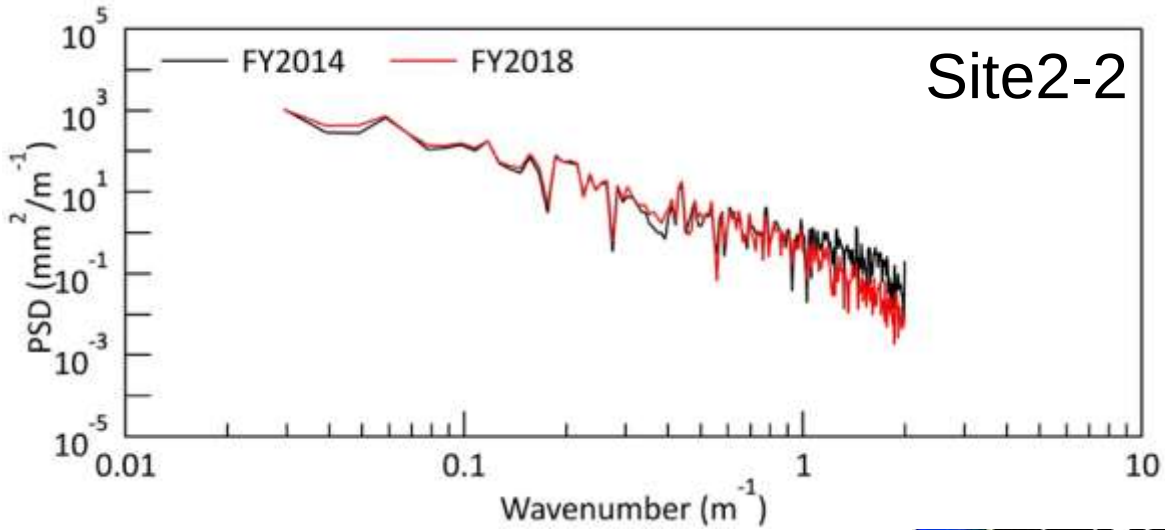


PSD Change in Measured Profiles









Deflection Measurement by FWD

Deflection measurement for every 10 m

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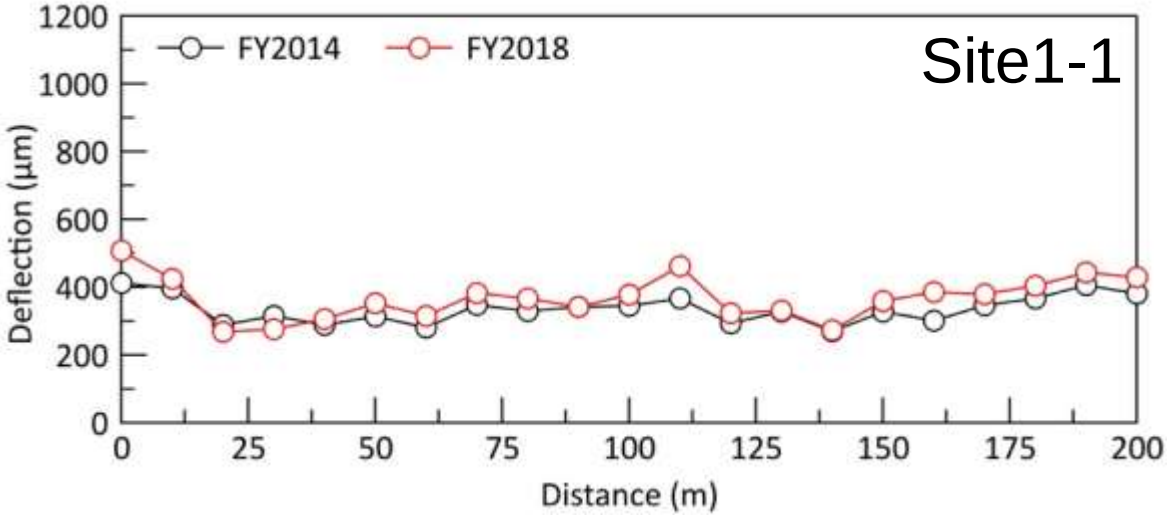
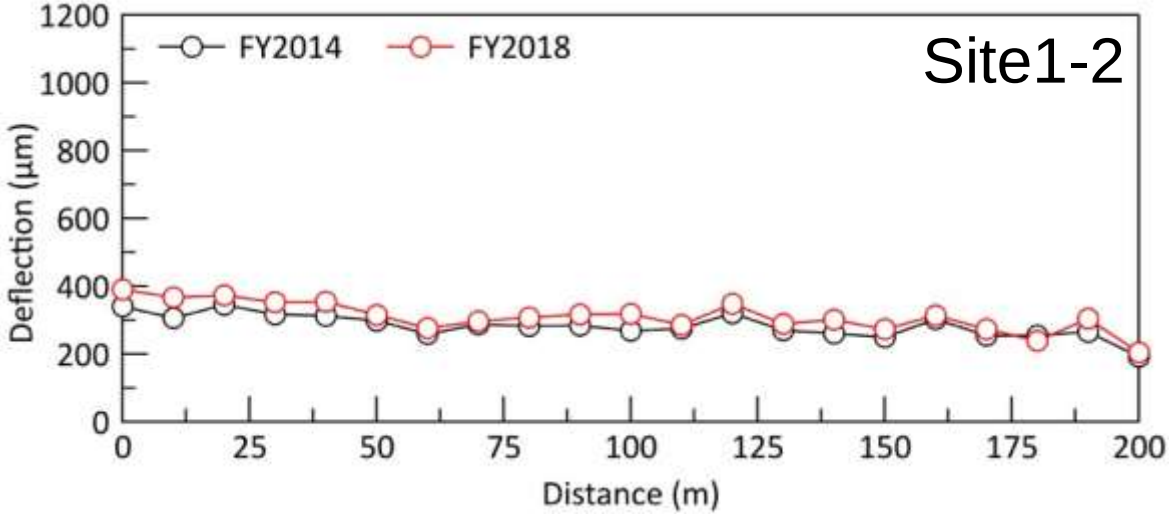
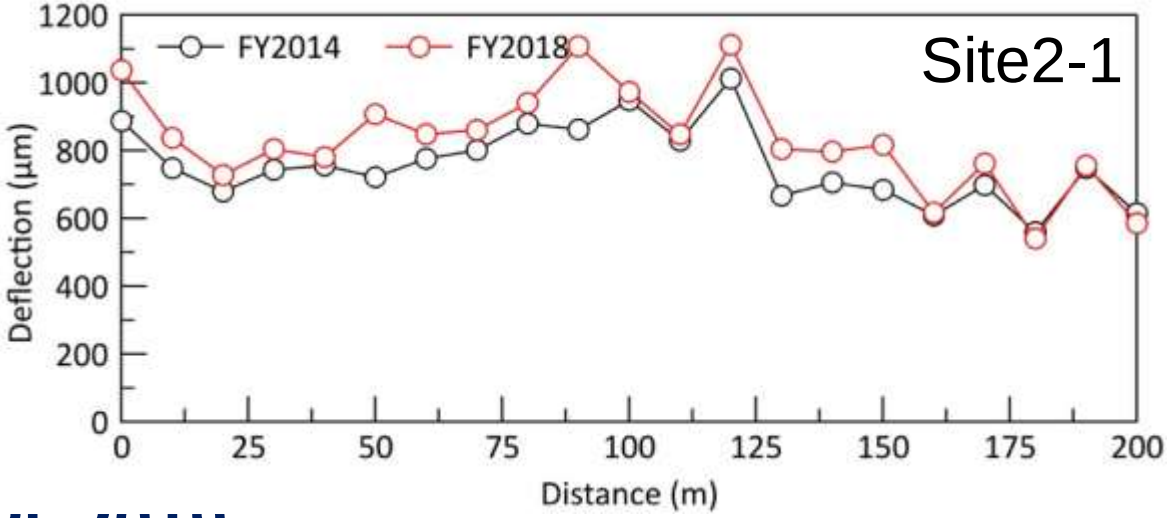
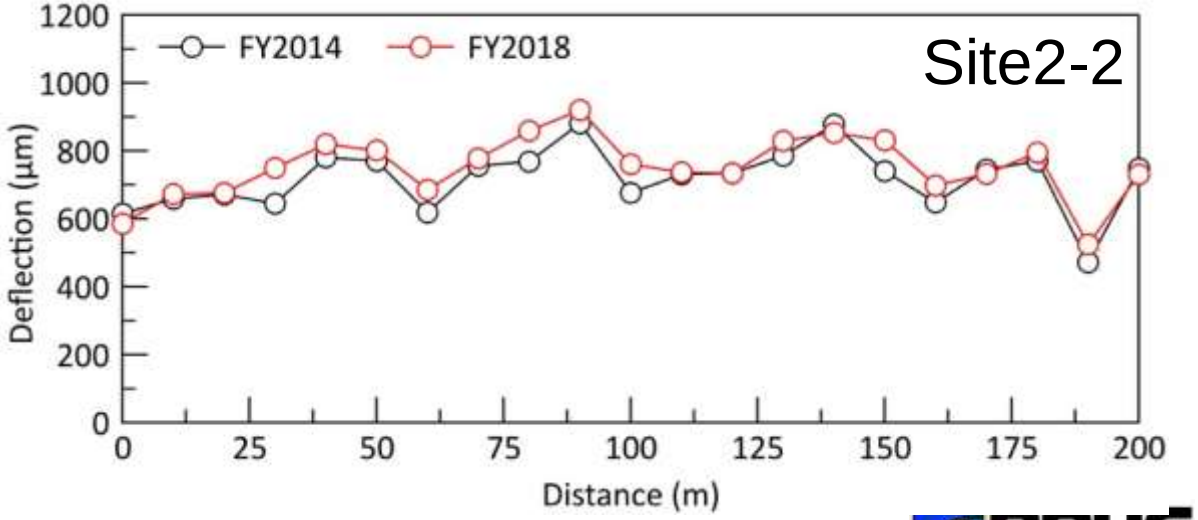
D_0 Change in Measured Deflection

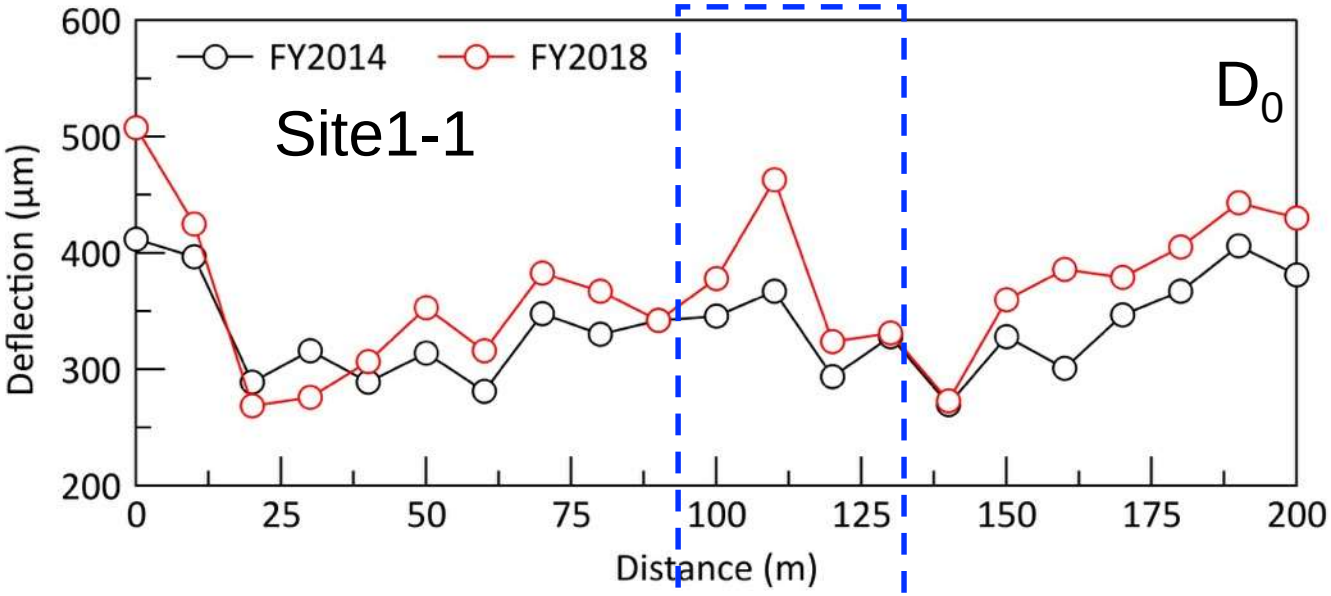


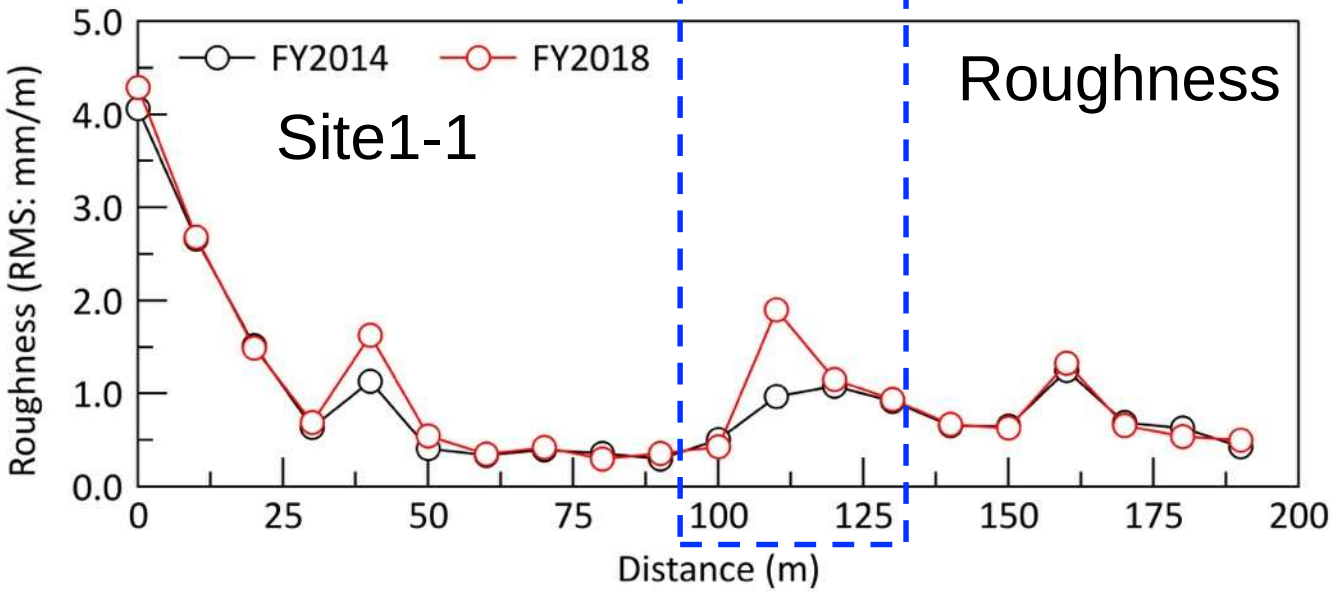






Functional and Structural Deterioration





A slight trend has been observed over five years

Correlations between roughness and deflection has been still unclear…

The data obtained in this project contribute to analyzing the relationship between functional and structural properties

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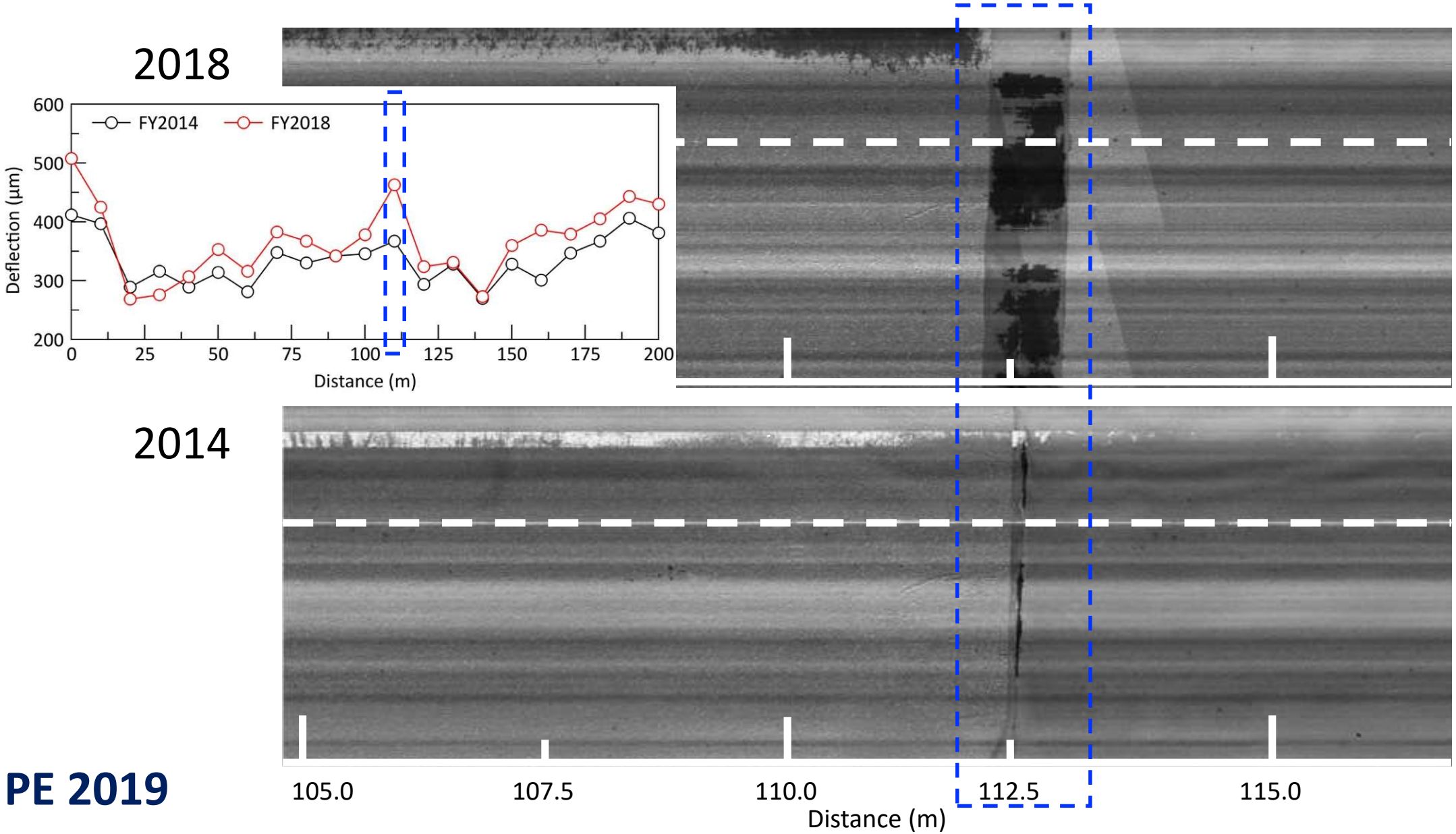
Functional and Structural Deterioration



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Summary and Conclusion

TRUE Project

- Harmonize and Compare Test Methods for Surface Roughness Under Actual Road Environment
- Experiments were conducted at Hokkaido, Japan in 2014, 2016 and 2018
- Not all of the devices used in Japan, but a number of them have been involved in this Project.

Analysis of Experiment Results

- Influence of operating speed for high-speed devices
- Repeatability
- Reproducibility and Portability

Summary and Conclusion

Not only functional but structural points of view

- Structural Properties were measured immediately after the experiments.
  - FWD (Falling Weight Deflectometer)
  - GPR (Ground Penetrating Radar)

Relationship between functional and structural properties?

JRPUG / RPUG-PDRG 1st Joint Meeting

Thank you

Questions??

RPUG-PDRG 2nd Joint Meeting
Oct. 22-23, 2020 @ Fukuoka, Japan

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