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XIII INTERNATIONAL WINTER ROAD CONGRESS

QUÉBEC, FEBRUARY 8 TO 11, 2010

SUSTAINABLE WINTER SERVICE FOR ROAD USERS

A DISCUSSION OF ADVANCEMENTS IN DATA COLLECTION AND PROVISION USING NEXT GENERATION ITS TECHNOROGY IN REGIONS OF COLD AND HEAVY SNOW

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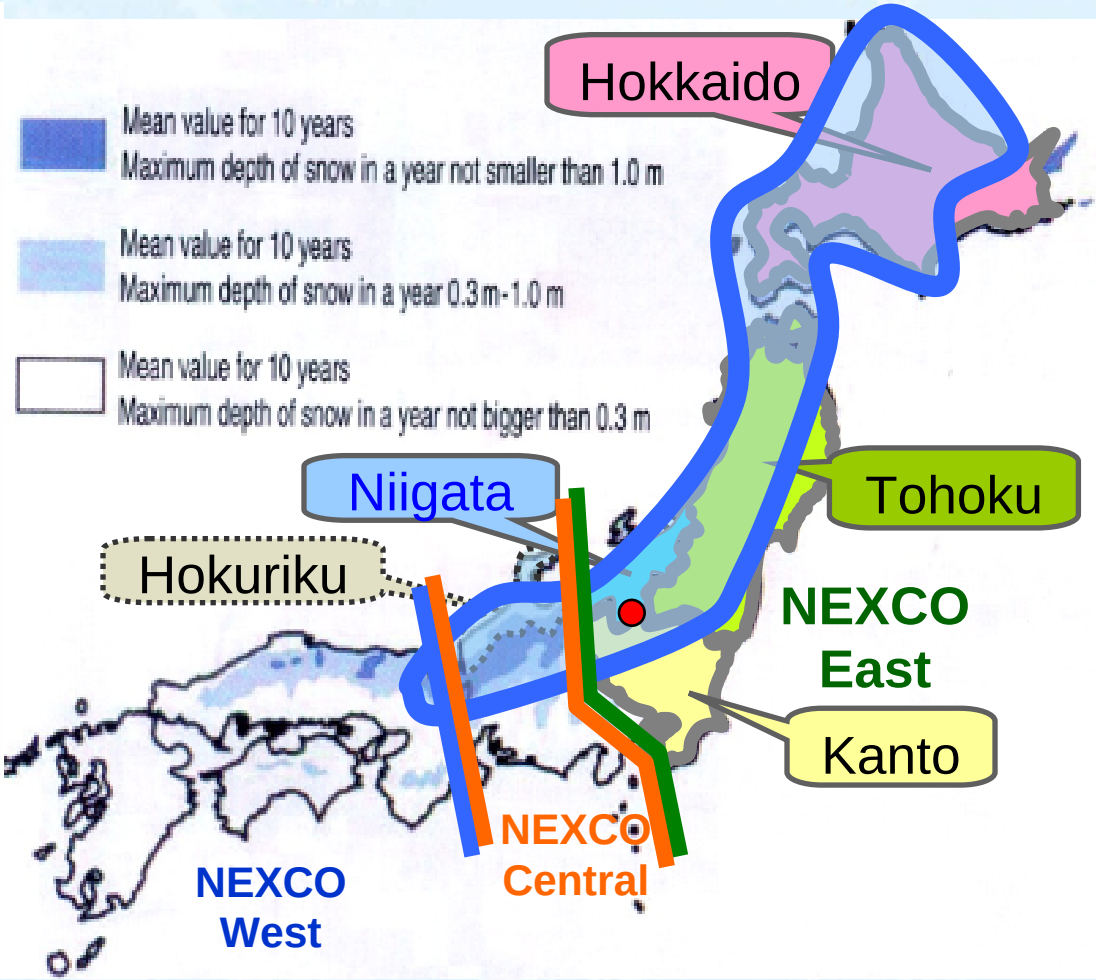
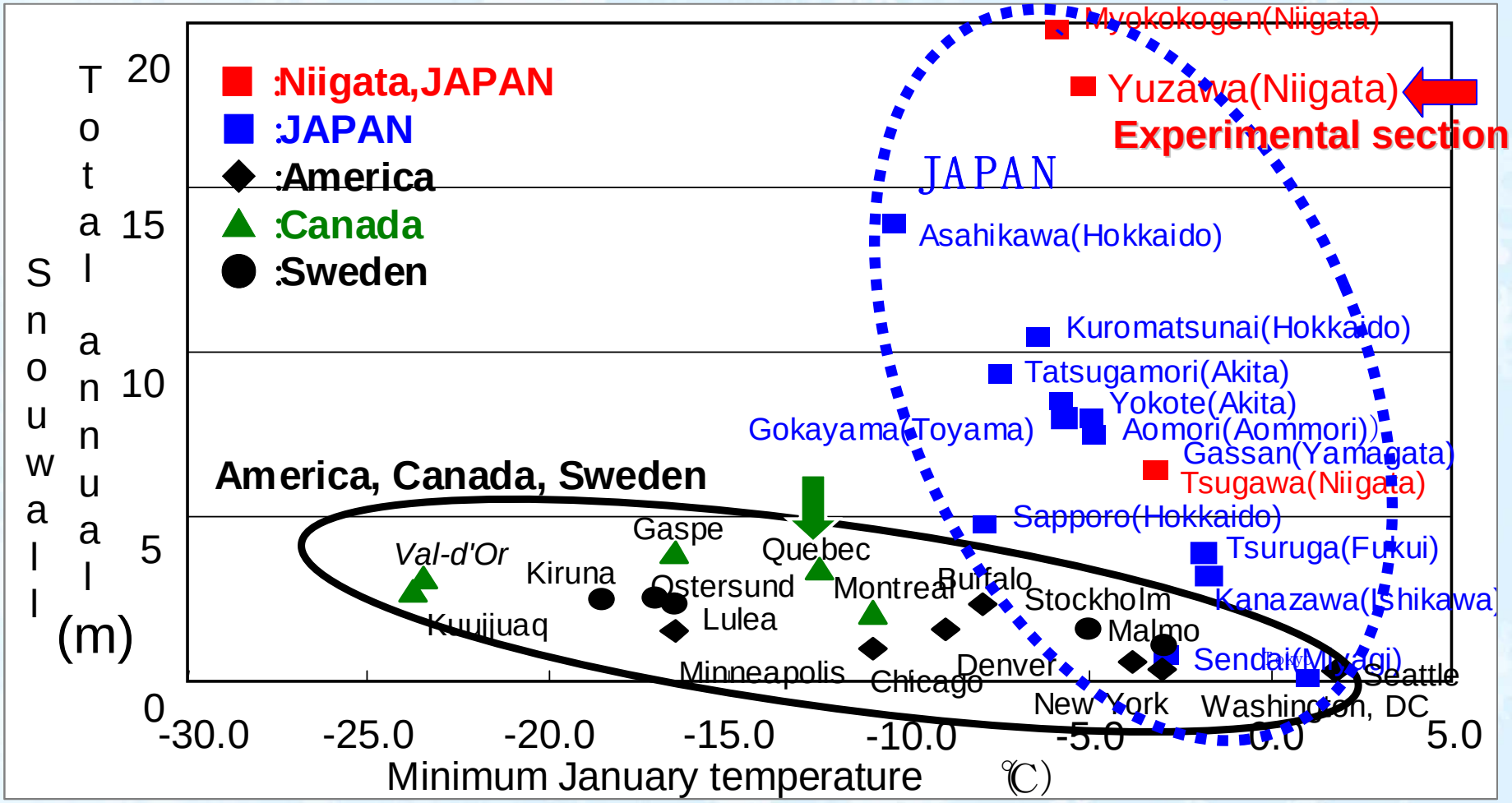
1.Introduction（Background to the experiments）

Map of the area administered by NEXCO East, and the Experimental site in our experiment

NEXCO East
Administrative Area



An Area of Snowfall compared with other parts of the world （Snowfall and Temperature ）



Heavy Snowfall

Unable to Climb Uphill

Strategies to support smooth, safe driving in snowy regions

①Snow Removal by Snow-Remover Vehicles

②Spreading of Agents to prevent freezing of the road surface

③Patrol

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Strategies to support smooth, safe driving in snowy regions

⑦Snow and Ice Information Boards

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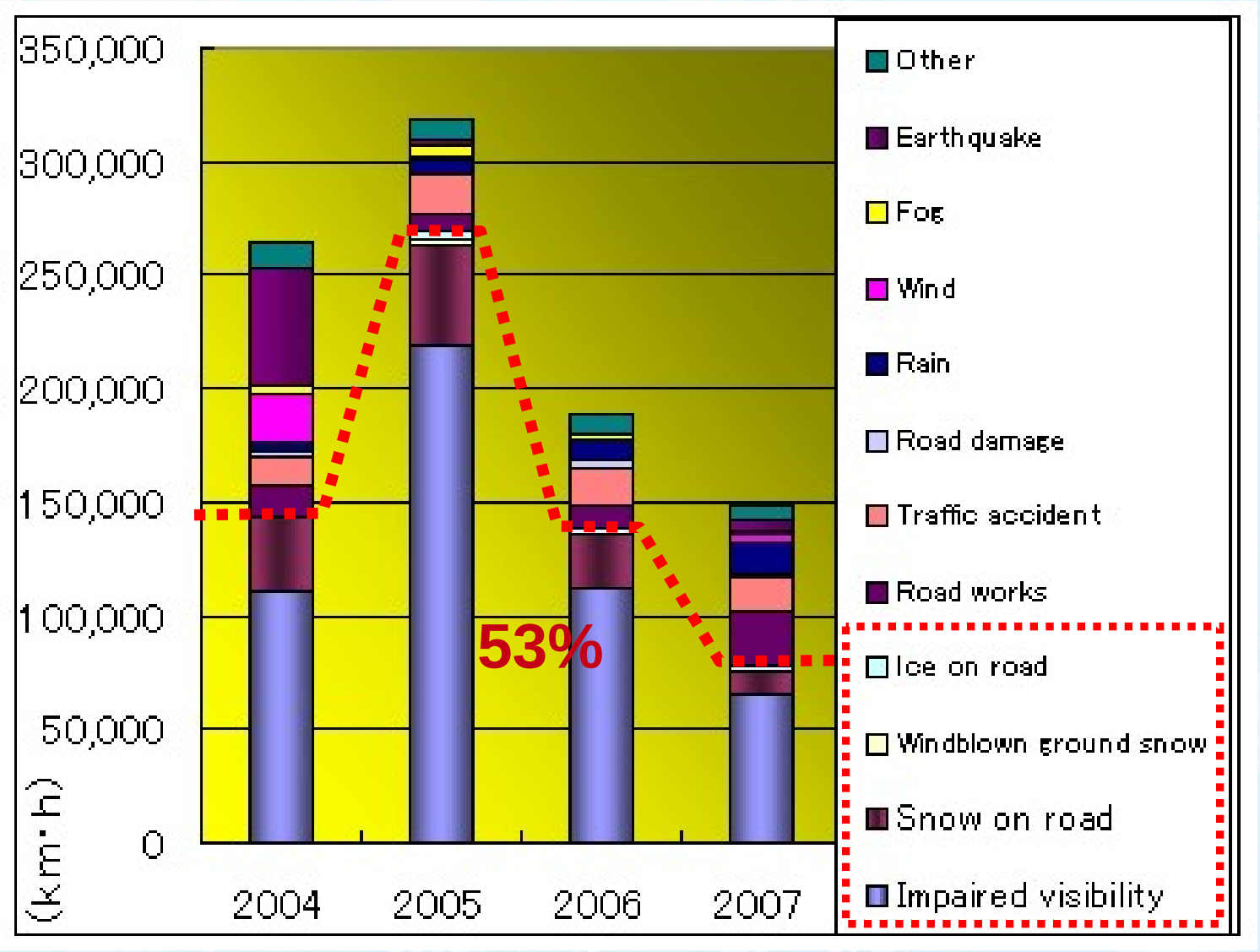
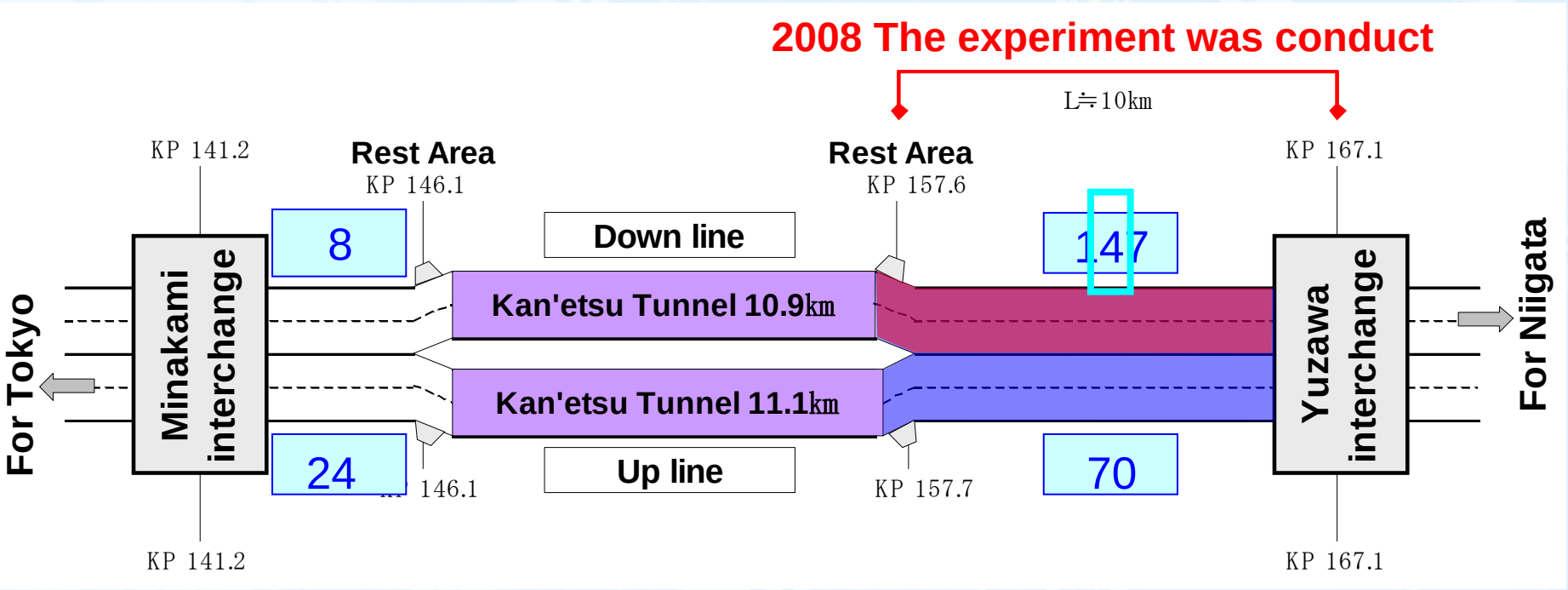
Road closure km-hrs by cause



3.2 The Site of Experiment

< Collision diagram >



00 ・・・ Number of Accidents on snow-covered

(2003-2007)

Situation of experiment site

- Kan’Etsu Expressway Minakami-Yuzawa -

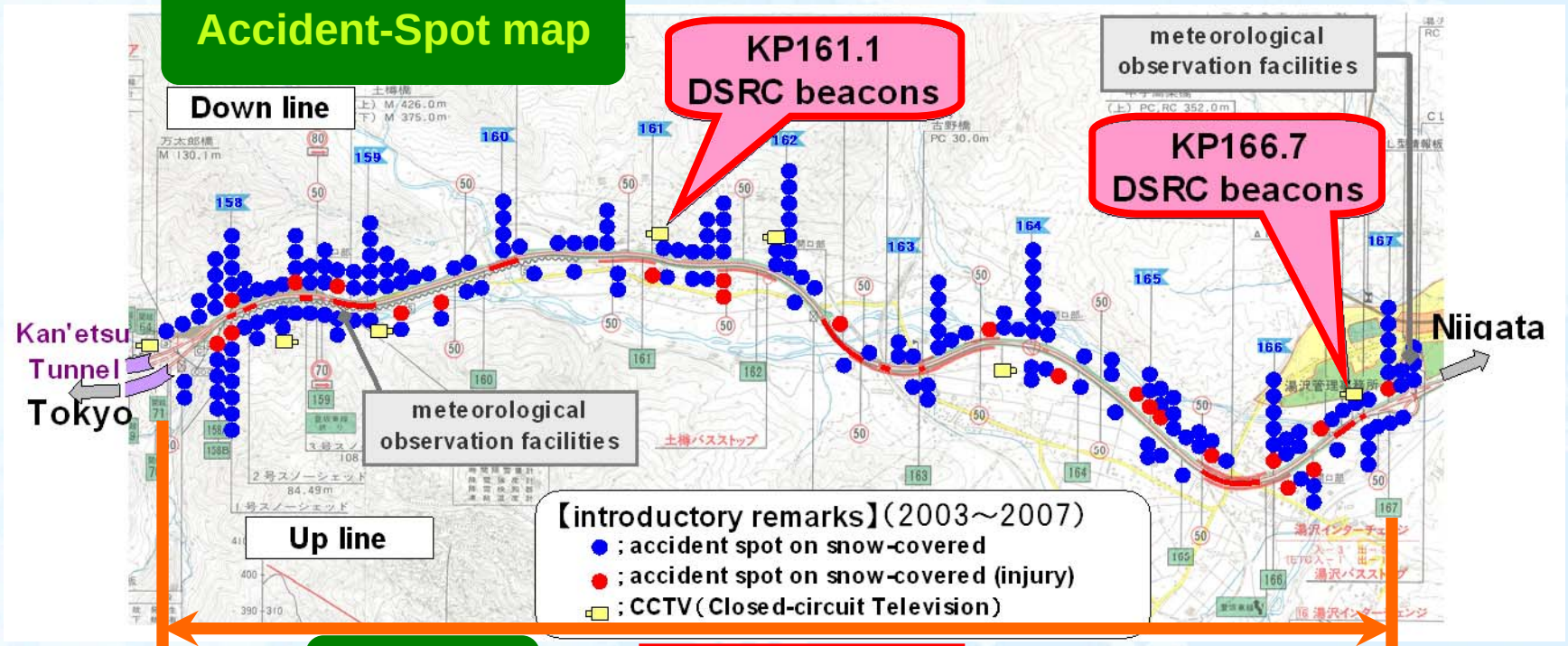


Table 1 List of Standard Threshold Values

Collected Data		Standard Threshold Values (Current specifications)	Minimum Unit (off-line)	
Run History	Running Speed	Interval of data storage 100m	0.1 sec cycle	← Report item
Behaviour History	Longitudinal Acceleration	−0.25G	0.01G	
	Lateral Acceleration	±0.25G	0.01G	← Report item
	Angular Velocity	±8.5deg/s	0.1deg/s	

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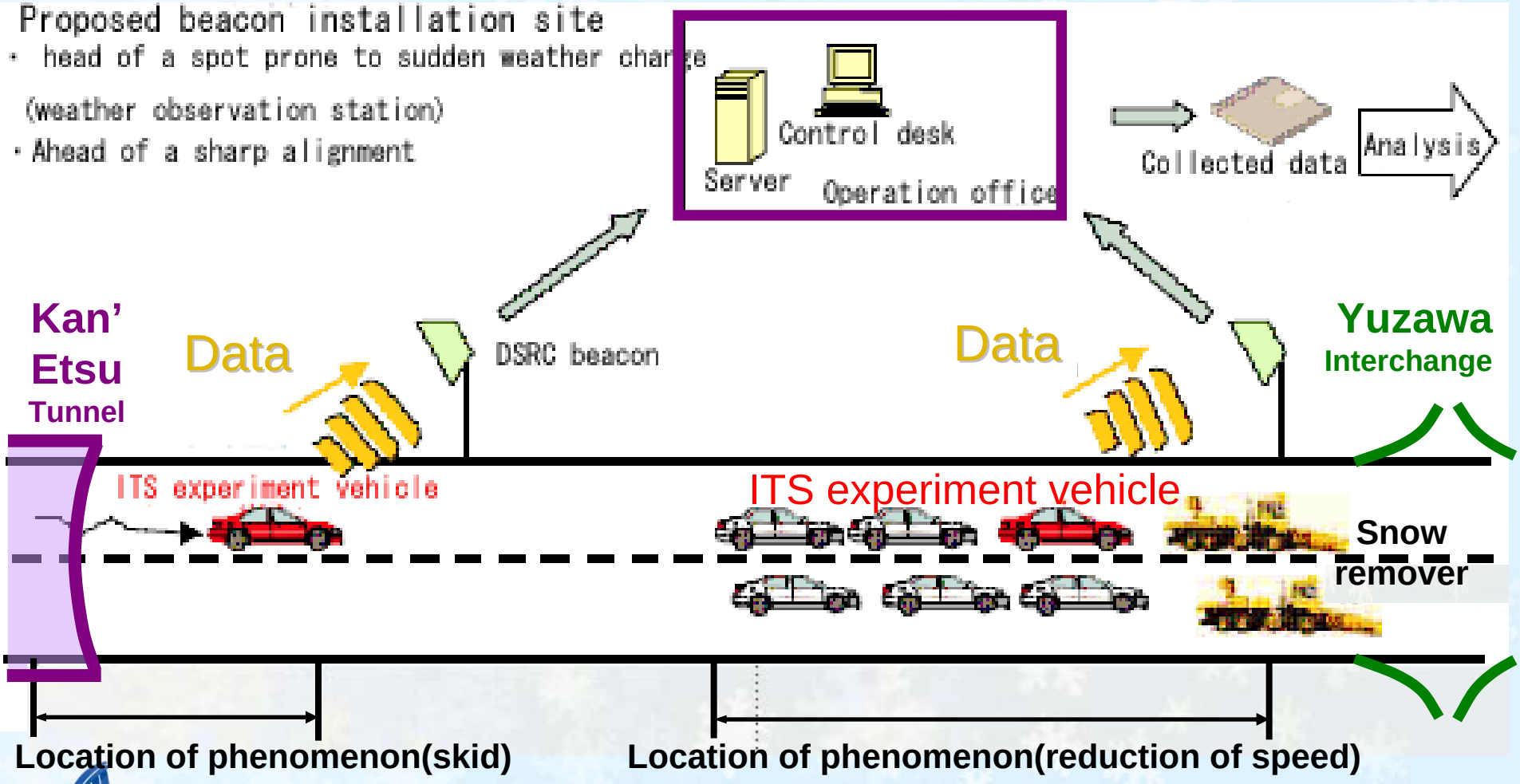
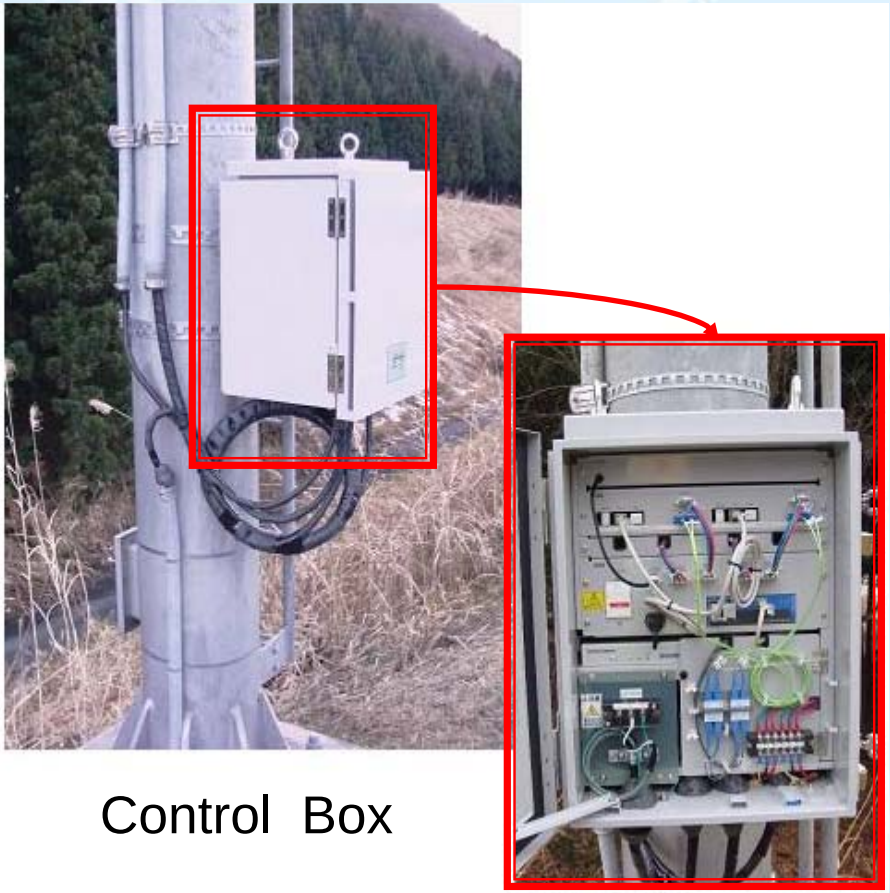
3. Outline of Experiment



3.1 Experimental Equipment

Wireless Antenna

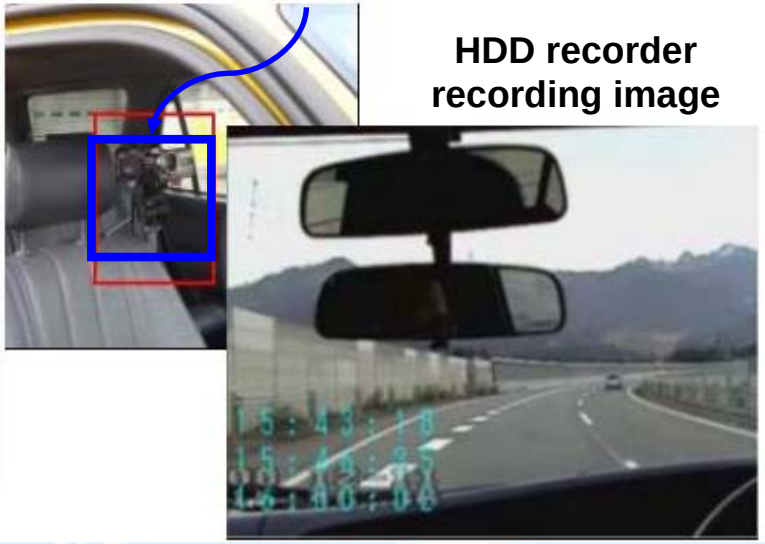


Control Box

The inside

Inside-Vehicles

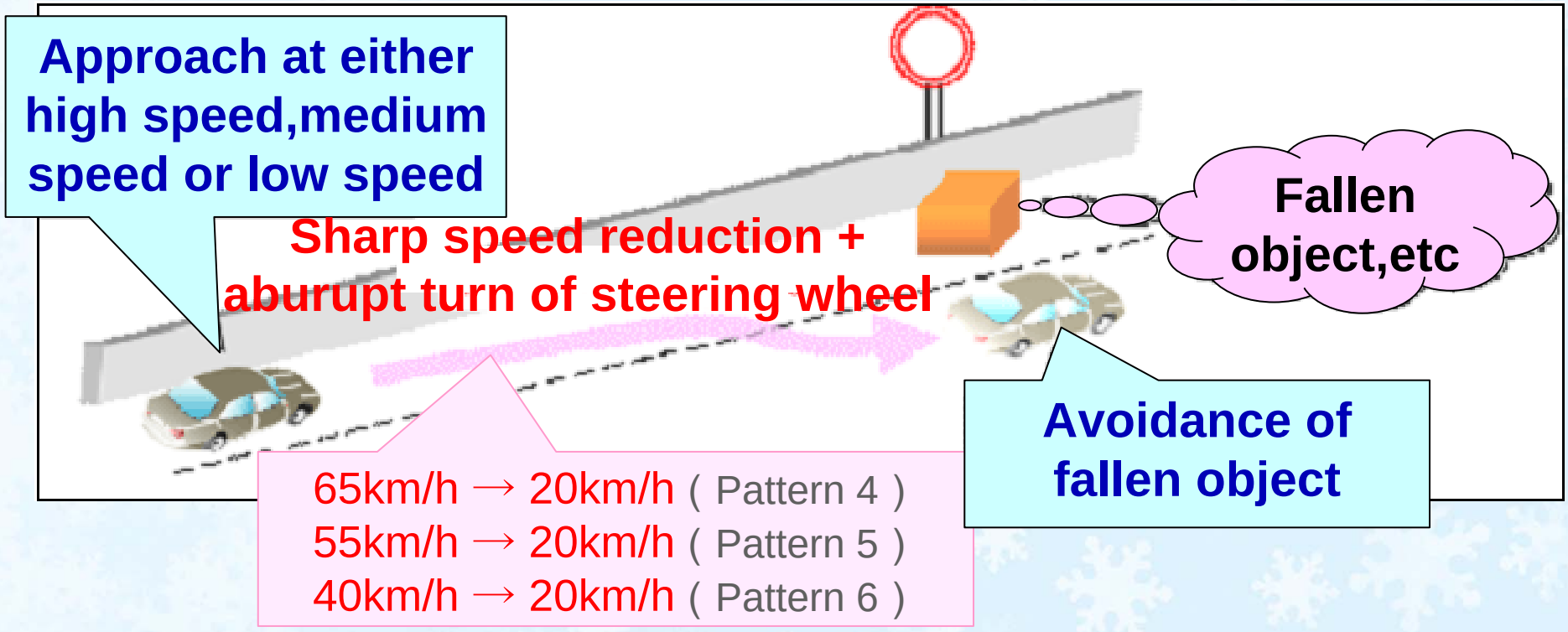
Video camera installation situation



HDD recorder recording image

3.3 Experimental method

Fig.6 — Simulation running Patterns



Test Patterns on snow road

Outline of experimental method

on a snow-covered road

■Simulation runs

Sharp speed reduction

- Pattern 1 speed reduction 65km/h→ 20km/h ・・・・・・ ①
- Pattern 2 speed reduction 55km/h→ 20km/h ・・・・・・ ②
- Pattern 3 speed reduction 40km/h→ 20km/h ・・・・・・ ③

Sharp speed reduction ＋ abrupt turn of steering

- Pattern 4 speed reduction 65km/h→ 20km/h + lane-change ④
- Pattern 5 speed reduction 55km/h→ 20km/h + lane-change ⑤
- Pattern 6 speed reduction 40km/h→ 20km/h + lane-change ⑥

■Normal running(Lane-Changing) ・・・・・・ ⑦

■Set-speed run(Driving at a set speed of 60 km/h) ・・・ ⑧

①～⑥、⑧;2 runs per each pattern(1 run performed 3 times,total sample size 18)

⑦ ;2 runs (all data,total sample size 10480)

4. Results of assessment and verification

4.1 Speed

0.1 sec cycle
（Minimum unit）

50 m cycle

80 m cycle

100 m cycle
（Standard）

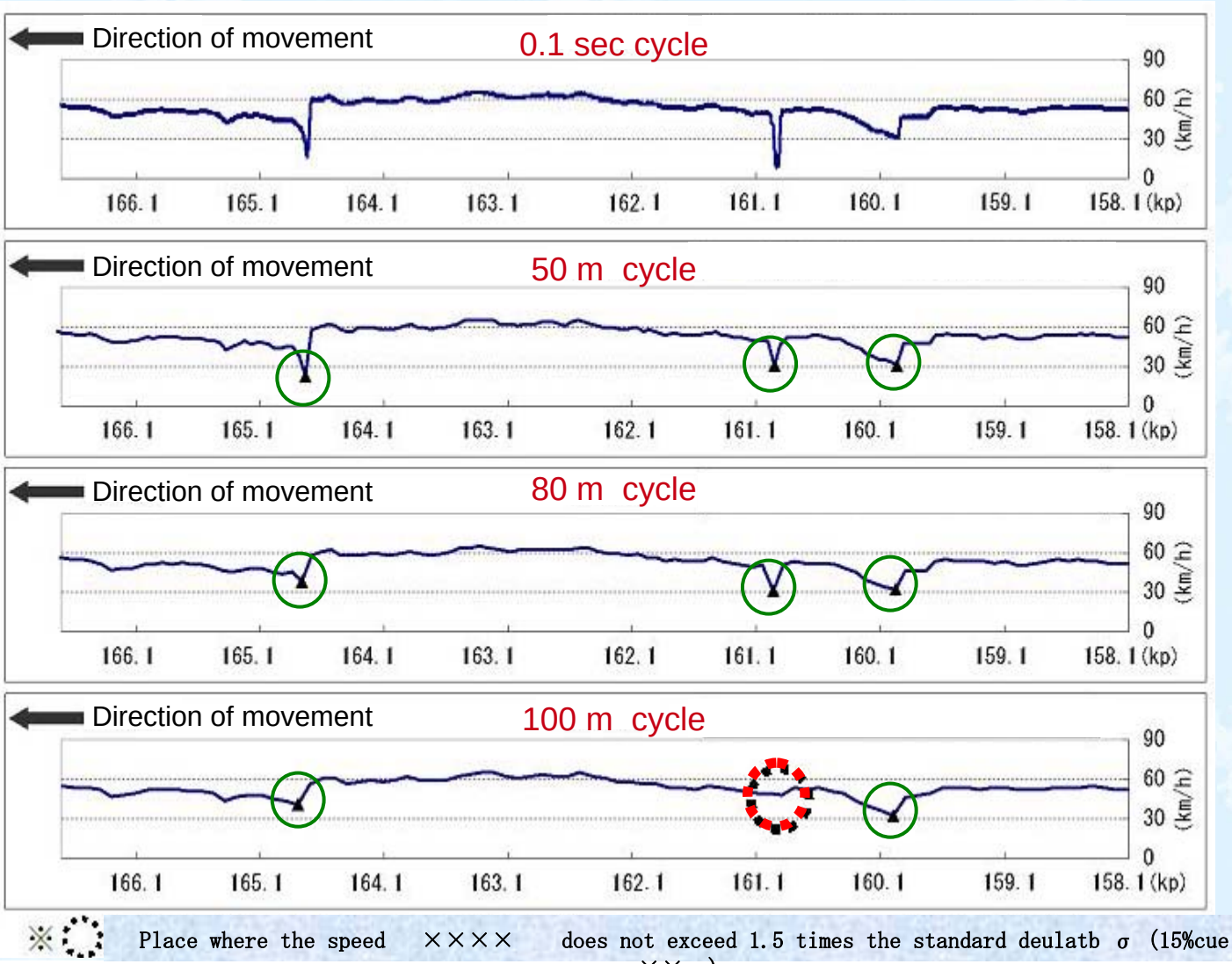
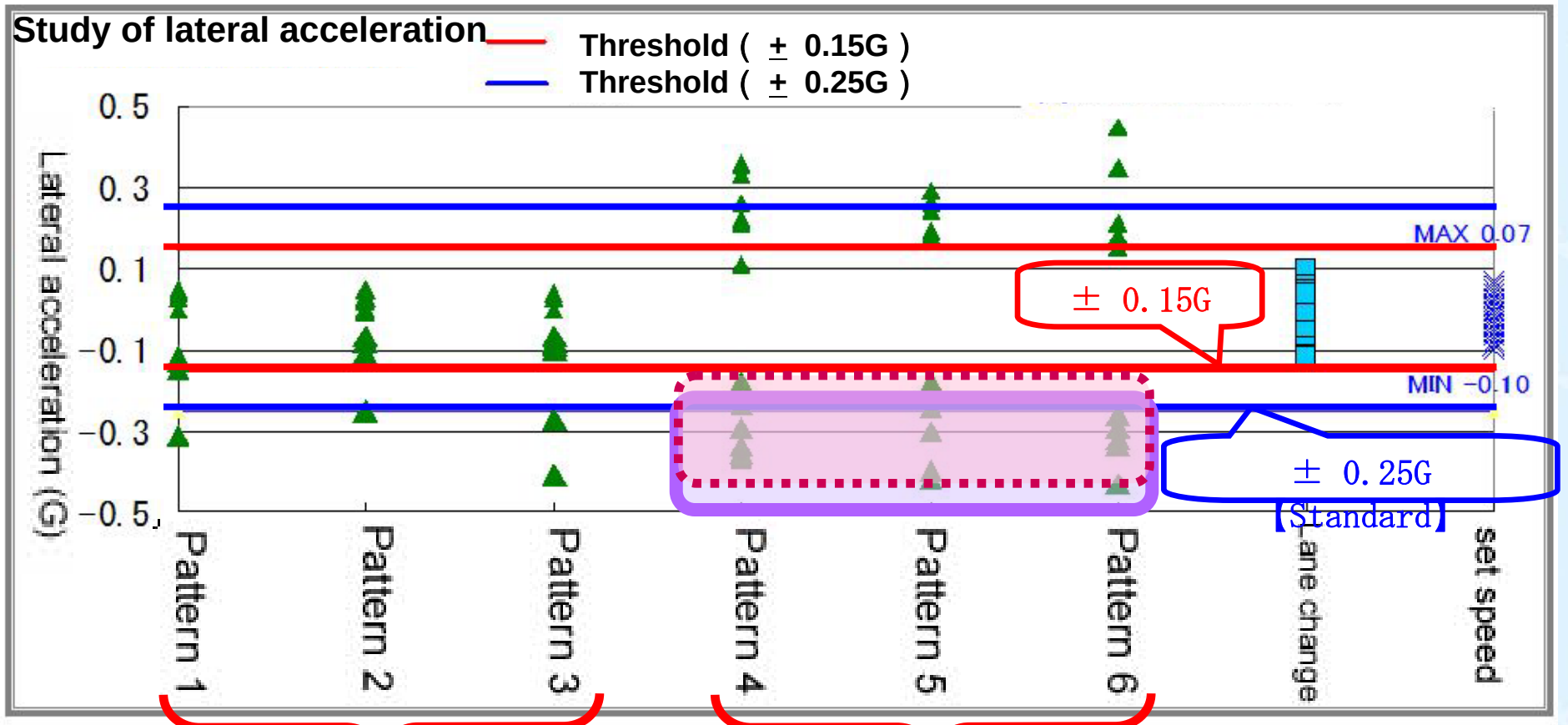


Fig.7-Chart of the speed history on an accumulated cycle in a Pattern 2 simulation run

4.3 Lateral acceleration



legend

- ▲ ・・・ **Minimum / maximum values during each pattern run**
- ■ ・・・ **Minimum / maximum values during lane change**
- × ・・・ **Total data during run at set speed**

following threshold values

- **The following threshold values were obtained for the items measured.**

✧**Speed (Sampling interval)**

within 80m （Altered from 100m intervals）

✧**Angular velocity (threshold value)**

± 8.5deg/s or higher

✧**Longitudinal acceleration (Threshold value)**

— 0.25G or higher

✧**Lateral acceleration (Threshold value)**

± 0.15G or higher(Altered from ± 0.25G)

5. Conclusion

- Possibility of the abnormal traffic flow detection.
- Possibility that the accident can be prevented and be reduced beforehand if information obtained from the vehicle is used well.

- Hereafter the accumulation of further data, and effectiveness and accuracy improvement of the collection data.

- **The upgrade of the dissemination of the safe driving support .**
- **The actual experiment data becomes reference.**

Thank you for your kind attention.

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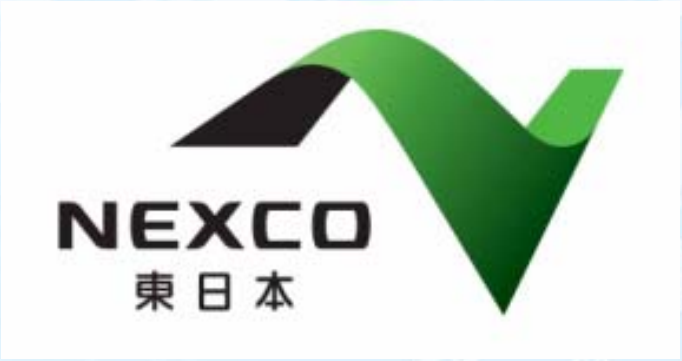

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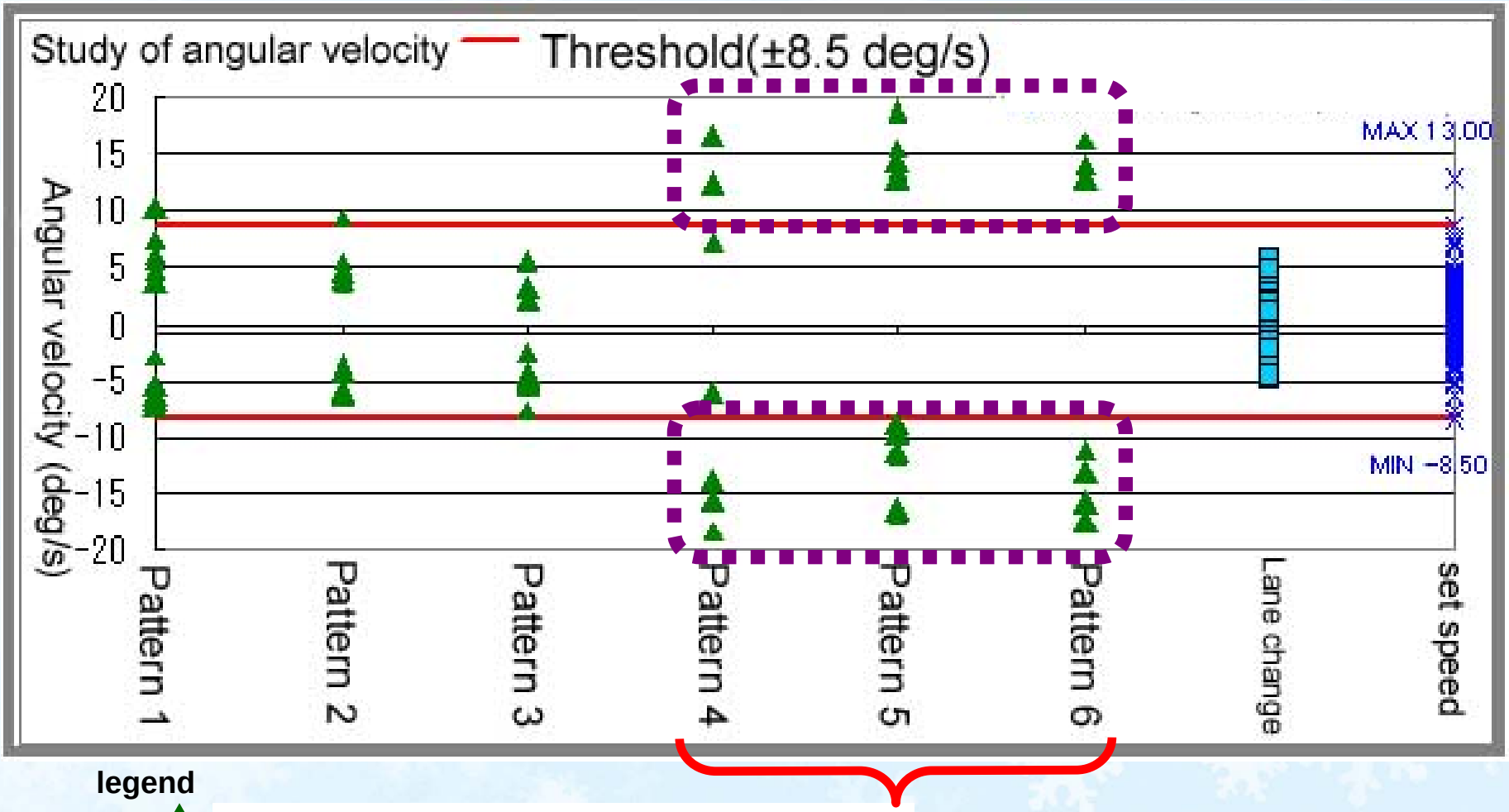
4.2 Angular Velocity

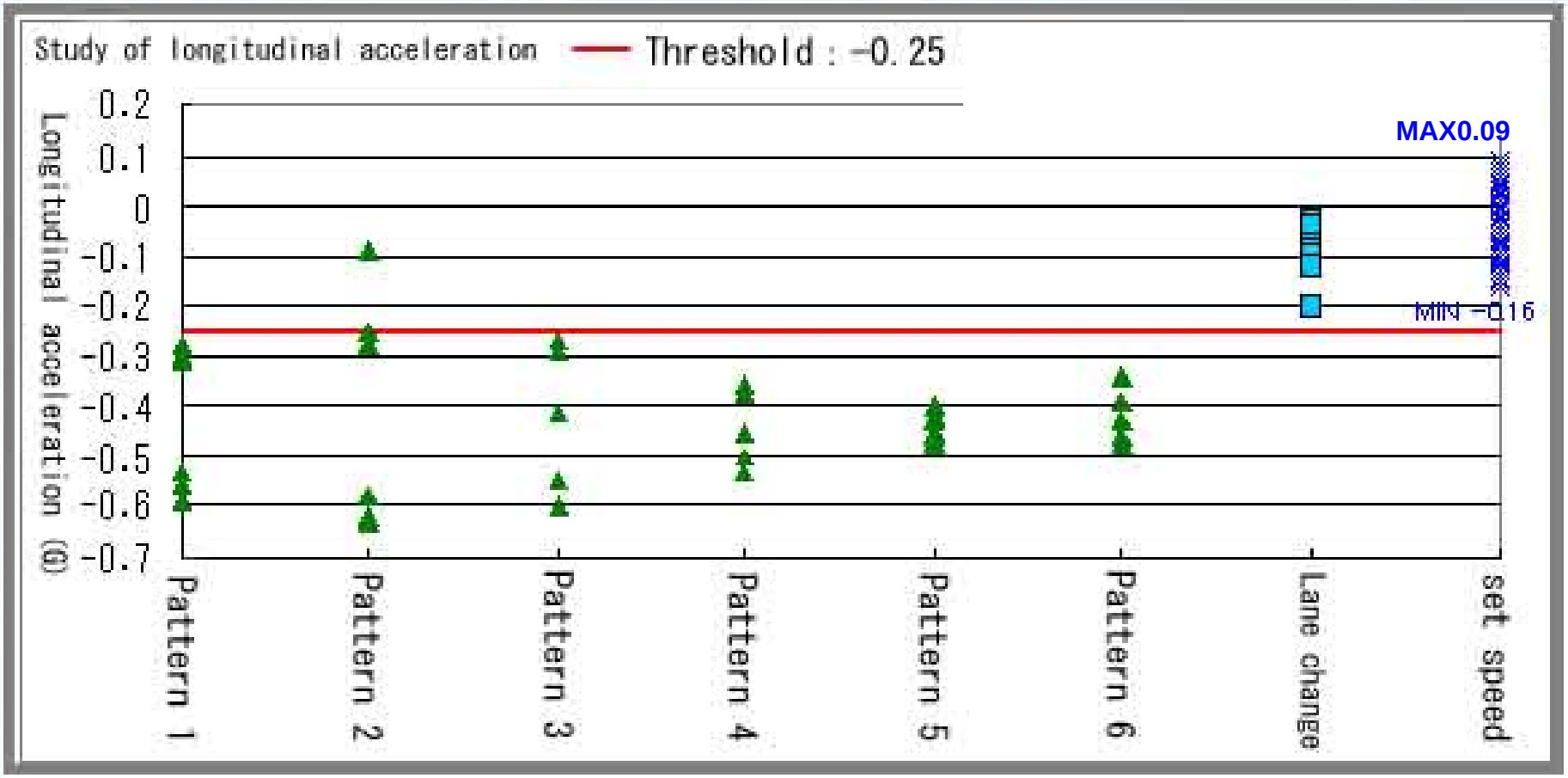


legend

- **Minimum / maximum values during each pattern run**
- **Minimum / maximum values during lane change**
- **Total data during run at set speed**

Fig.8-Distribution of Angular Velocity

4.4 Longitudinal acceleration

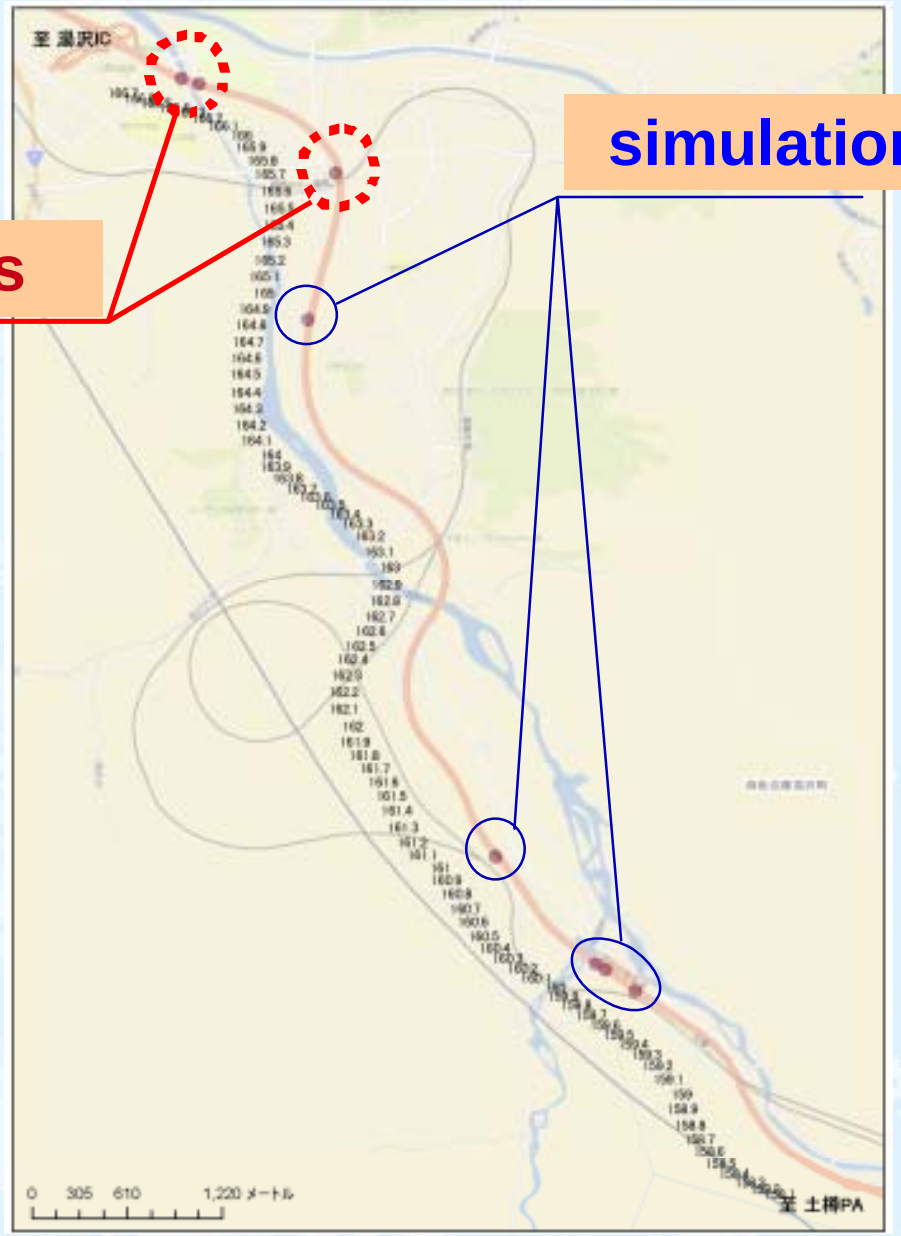


legend

- ▲ **Minimum / maximum values during each pattern run**
- ■ **Minimum / maximum values during lane change**
- × **Total data during run at set speed**

Fig.10-Distribution of longitudinal acceleration

4.6 Detection of Hazard Spots



Hazard Spots

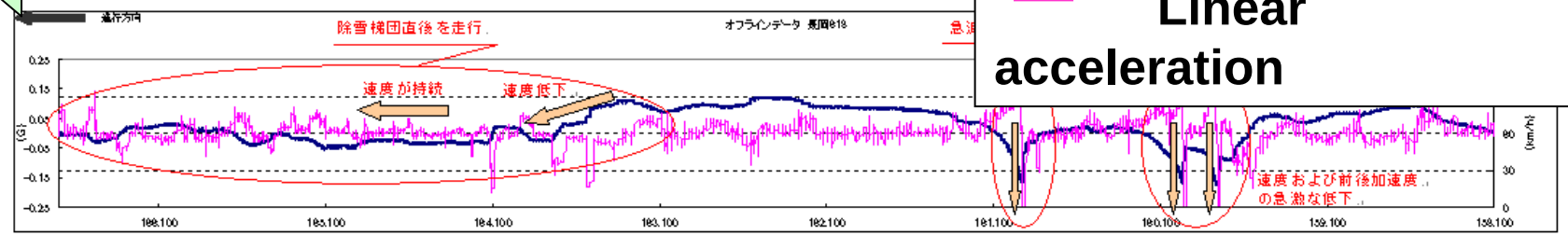
simulation run

Example of Probe Car Information (Vehicle Behavior Data)

Direction of Travel

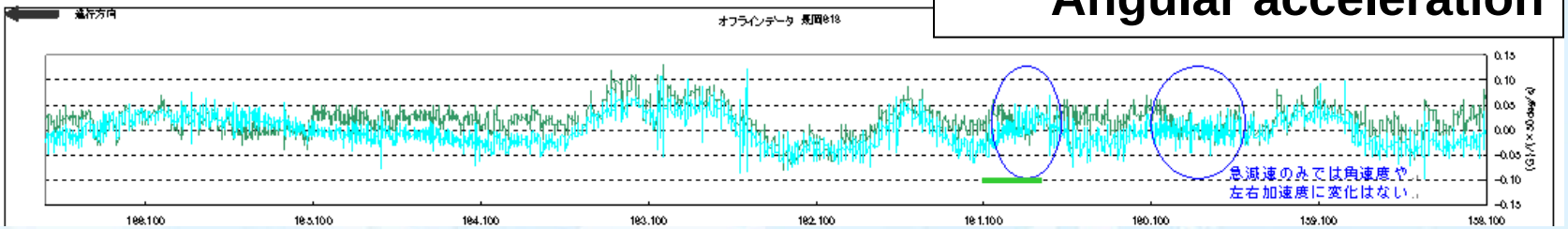
Speed

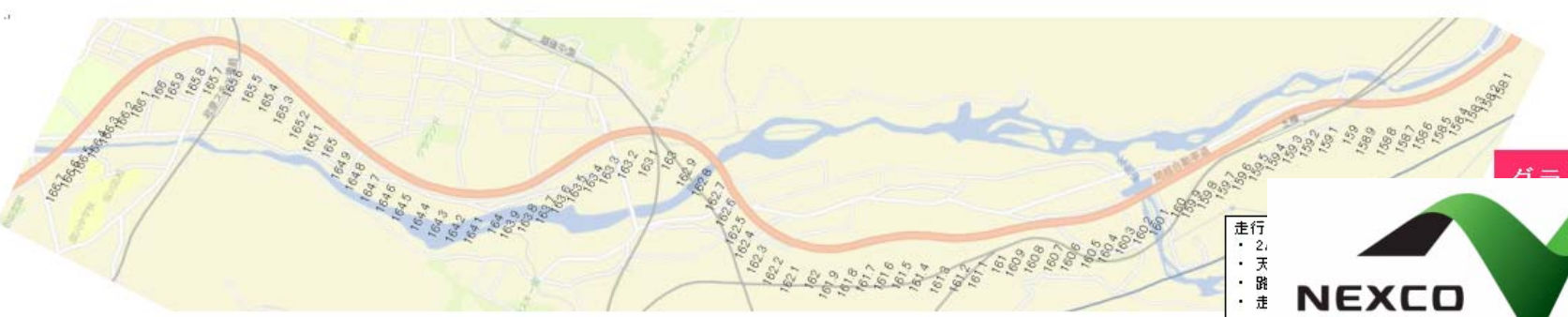
Linear acceleration



Lateral acceleration

Angular acceleration





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