■R&D Topics : Inspection, Monitoring, and Diagnostics Technologies
■R&D Theme : R&D of "Electric resistivity monitoring system for the state of water contents in river levee" and "Monitoring system for internal state of river levee utilizing geophysical exploration and ground water observation"
■Principal Investigators : Hideki Saito and Akira Shinsei (Oyo Corporation)

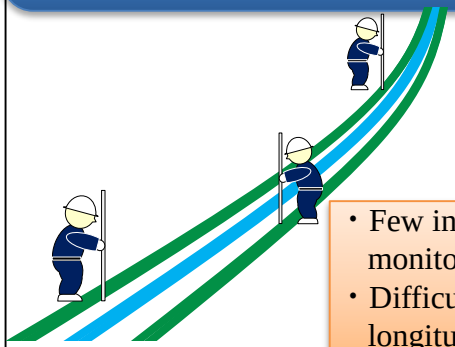

R&D Objectives and Subjects

SIP Cross-ministerial Strategic Innovation Promotion Program

Objectives

・Development of a screening method to determine priority observation location in case of flooding and a monitoring method for status changes in river levee.

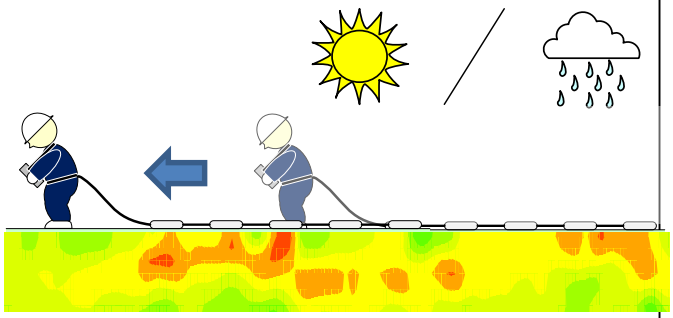
Conventional Method



・Few investigation/ monitoring points
・Difficulty in continuous longitudinal evaluations

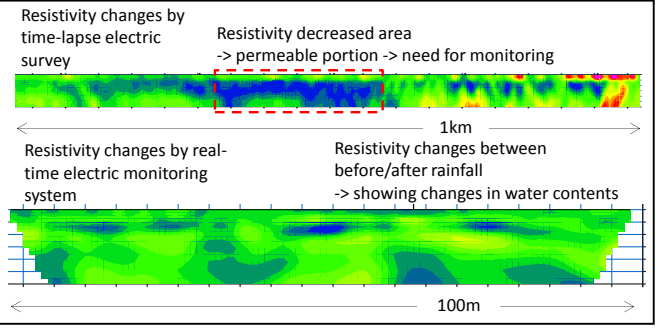
Geophysical Method

• Continuous longitudinal surveys
• Two dimensional sections
• Time-lapse



Subjects (2014-2016)

・Development of an interpretation technique for time-lapse geophysical data..
→ **Concentration on priority areas for observation in case of flooding.**
・Development of an observation method for internal state changes by flooding.
→ **Monitoring changes of water content in the levee in case of flooding.**



Current Accomplishments (1/2) 2014-2016

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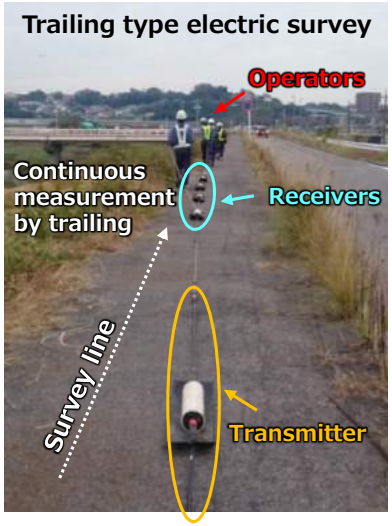
1. Time-lapse electric surveys

Trailing type electric survey is used because of its efficiency for long lines.

Flexibly responding survey can be conducted after rainfall or small flooding.

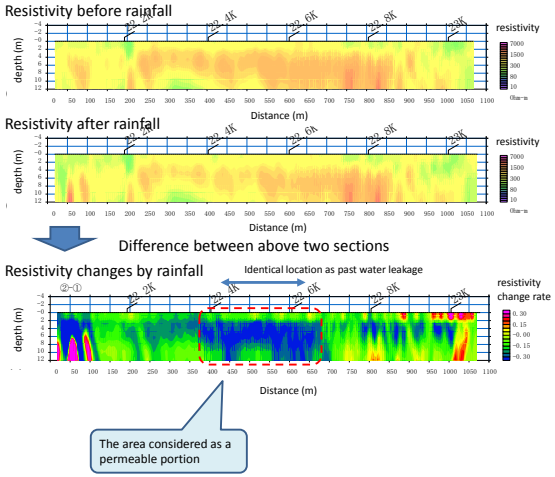


- **quick and low-cost surveys**
- **continuous longitudinal evaluation**

2. Priority observation area

Creating a resistivity change section from before/after electric surveys.

Resistivity decreased area is considered to be a permeable portion.

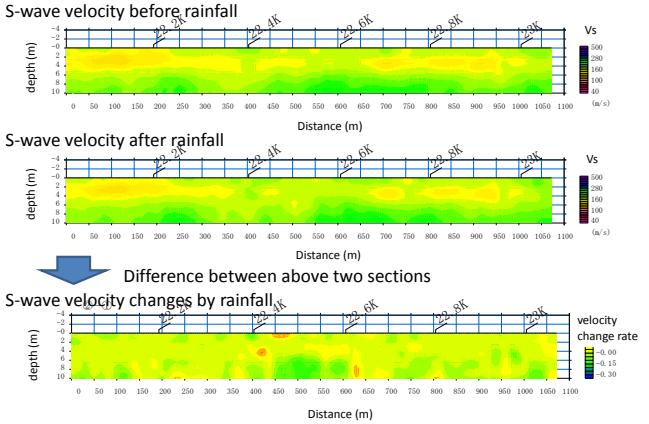


- **resistivity decreased area detected**
- **the area should be monitored in case of flooding**

3. Time-lapse MASW

Land-streamer type system is used because of its efficiency for long lines.

Decreased S-wave velocity area is considered to be a loosened portion.



- **2D section of Vs changes by rainfall**
- **Vs must be decreased by loosening of levee body suffered from flooding**

Utilization example

350m area out of 1 km was pointed out as the location to be monitored during flooding

It is possible to point out the area that should be monitored in case of flooding by time-lapse electric survey

Current Accomplishments (2/2) 2014-2016

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4. Clarify the internal state of levee

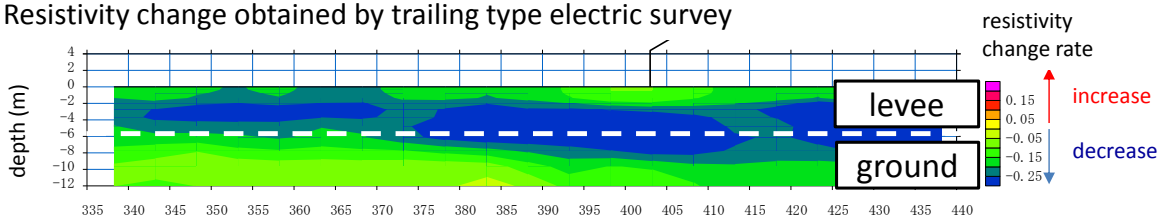
Resistivity changes show water contents inside the levee body

* Trailing system was confirmed to be useful compared with monitoring system

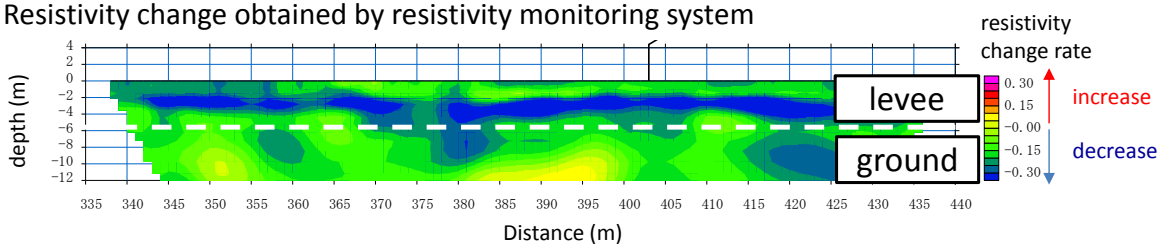
S-wave velocity changes show the existence of loosening portion in the levee

*The loosening of levee was not observed during this R&D period.

Resistivity change obtained by trailing type electric survey



Resistivity change obtained by resistivity monitoring system



Applicability of trailing type electric survey was confirmed by comparison with high resolution resistivity monitoring system

- **Change of water content in a levee body due to flooding can be clarified.**
- **Loosening of a river levee due to flooding can be clarified.**

Flow of utilization

1. Time-lapse electric survey
2. Priority observation area

Priority observation during flooding

3. Geophysical survey after flooding
4. Clarify the internal states

Efficiency in flood prevention and maintenance

Goals

Numerical target

Efficiency in monitoring locations determined by the method.

Goal to reduce costs for patrol by 10%.

Users

River administrators

How to use/Places for use

Conducting geophysical surveys in the same line of river levee before and after rainfall or small flooding.

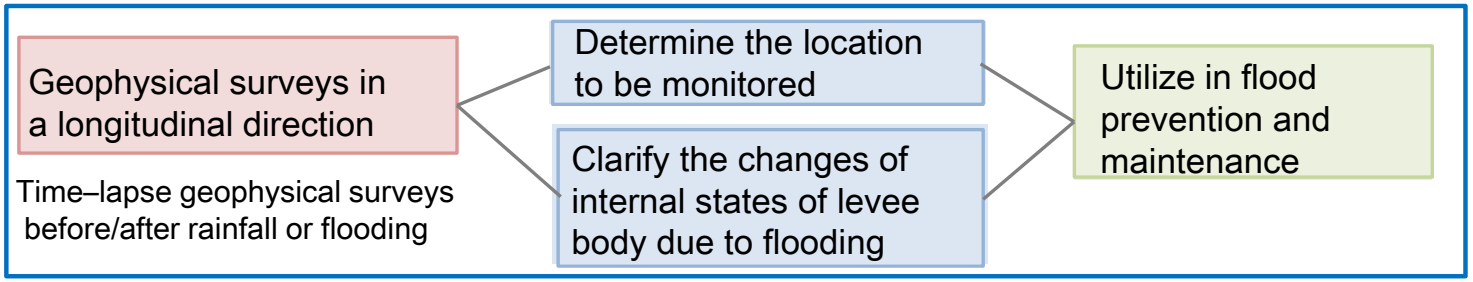
Land streamer type surface wave survey

Trailing type electric survey

Sales method

Electric and seismic surface wave surveys conducted by geophysicists. → Interpretation and consultation by river engineers → Flood prevention and maintenance by river administrators

Services to offer



Determining the monitoring location in case of flooding and providing changes in the states of levee after flooding

→ It can be applicable to other fields, including slopes, reclaimed land, etc.