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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”

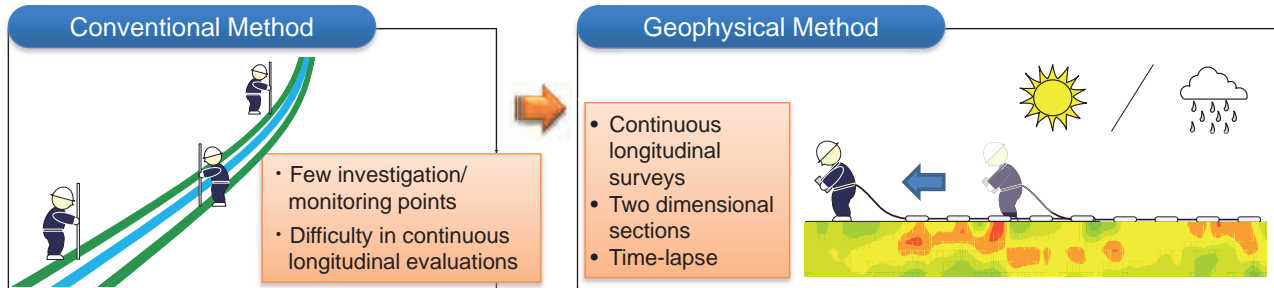


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R&D Objectives and Subjects

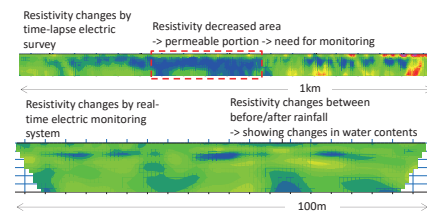
Objectives

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



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)

**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

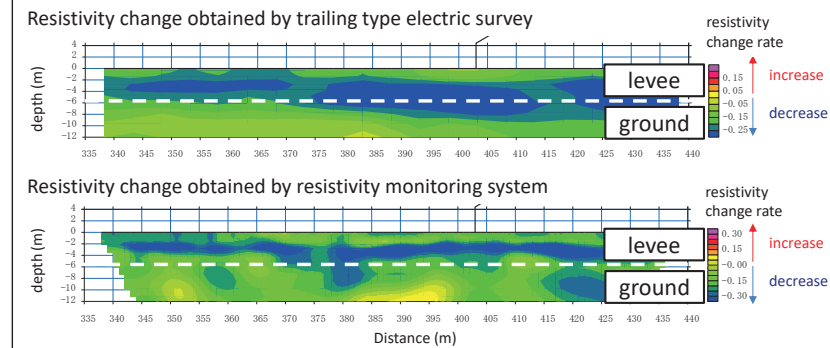
It is possible to point out the area that should be monitored in case of flooding by time-lapse electric survey

Current Accomplishments (2/2)

(2014-2016)

4. Clarify the internal state of levee

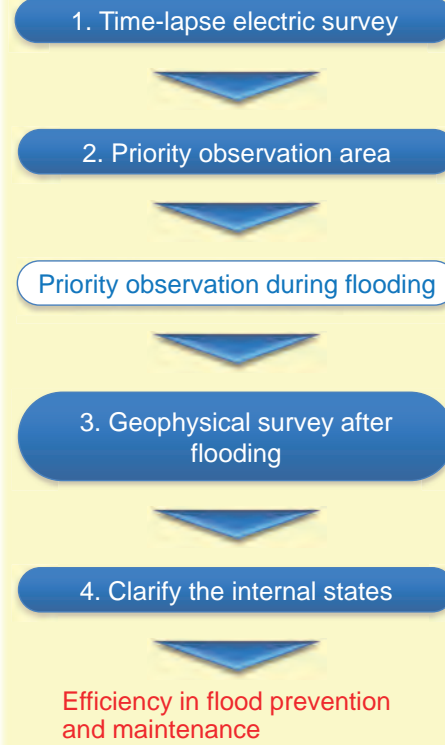
- Resistivity changes show water contents inside the levee body
- \* Trailing system was confirmed to be useful compared with monitoring system
- S-wave velocity changes show the existence of loosening portion in the levee
- \* The loosening of levee was not observed during this R&D period.



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



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.
- 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**:
  - Geophysical surveys in a longitudinal direction
  - Determine the location to be monitored
  - Time-lapse geophysical surveys before/after rainfall or flooding
  - Clarify the changes of internal states of levee body due to flooding
  - Utilize in flood prevention and maintenance



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.