

39

Adopting 4D resistivity survey to Geocentrifuge for efficient monitoring the inside of the physical model

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In the field of geotechnical engineering, reduced-scale physical modeling is often conducted within a large centrifuge in order to provide correct scaling of the self-weight stresses. The application area of centrifuge modeling has expanded from traditional geotechnical engineering problems to more complex geotechnical systems. Long term electrical resistivity monitoring technique has also been developed for solving various geotechnical and geoenvironmental problems. Because it is easier to make a model than to conduct full-scale tests while the centrifuge also provides more accurate and realistic stress conditions in the model system than a 1-g experiment and resistivity survey can provide additional information for monitoring the inside condition of the model which conventional measurement equipment such as camera and point based sensors cannot easily show, adopting resistivity survey system to the geocentrifuge can be a powerful tool for efficient monitoring study. Additionally, using geocentrifuge can be a good alternative to verify the applicability of 4D resistivity survey as it is difficult to find adequate full-scale verification site. Acrylic plates where many nails are planted by equal interval are used for electrode system. Electrodes are connected to the AGI Supersting 8P installed at the center of centrifuge. Remote interface box is employed to control Supersting 8P from the outside. As the basic step of the study, we performed two cases of geocentrifuge physical modeling combining time lapse resistivity survey. One is for underground saline water intrusion from the ground surface and another is for water intrusion into a levee body during filling with water. Results show the feasibility of the resistivity survey in detecting the change of model condition during geocentrifuge physical modeling.