

Leakage detection with the direct current resistivity method: A study of Tha Thung Na dam case

Seepage is one cause of dam failures, particularly on embankment dam. To prevent the threat, dam investigation and monitoring must be conducted for its own safety and public safety. One possible method for dam leakage detection and monitoring is the direct current resistivity (DCR) method which is a geophysical technique used to image the resistivity structure beneath survey profile. Leakage causes resistivity changes on dam making it possible for detection. Since each dam has its own unique characteristic, conducting a general DCR survey along the dam crest cannot efficiently indicate the leakage beneath. We propose dam leakage detection procedure using Tha Thung Na dam as study case. To check resistivity anomaly which might cause by the leakage, 3-D resistivity structure of Tha Thung Na dam must be first constructed. The 2-D DCR profile on the dam crest was conducted and inverted to produce the resistivity structures. These resistivity structures along with the 3-D forward modeling code were used to construct the 3-D resistivity structure. 3-D effects from the water levels and dam geometries are then studies. Numerical simulations of water leakage on the dam core at different depths and different sizes are then conducted with the 2-D DCR profile on the dam crest. The studies reveal that (1) the 3-D resistivity structure of the dam is necessary as a reference, (2) it is possible to detect the water leakage underneath if the leakage is not too deep, and the volume is large, and (3) water level and 3-D geometry plays important roles for the leakage detection.

Keywords : direct current resistivity method, 3-D effects, dam, leakage detection

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