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## **Numerical modelling of temperature in detection of the increased permeability zones within the levee. ISMOP case study.**

### **Abstract**

The physical condition of earthen levee changes in time. Levee weakening may be caused by leaching of fine grains or animal activity. Weakened areas could be the place of potential destabilization or even levee's destruction. The assessment of the physical condition of the levee using GPR and geodetic measurements not always allows the correct detection of areas of increased permeability.

Thermal anomalies, caused by existing high permeability zone, were observed in the levee during the transition of the flood wave. They were generated by rapid infiltration of the water with different temperature than the temperature inside the levee. Therefore inner thermal measurements may be used to detect places with higher permeability. The research was realized by 2D numerical modelling. Geometry and geomechanical properties of the earthen levee were taken from ISMOP project.

Results of numerical modelling shows, that detection of high permeability zones using thermal sensors can be accomplished. There are however some necessary conditions that must be met sufficient thermal contrast between water and soil, a huge permeability difference between levee and weak area, and dense thermal sensors grid.

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