Analysis of annual temperature distribution inside the experimental embankment

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INTRODUCTION

The aim of this work is analysis of temperatures distribution inside experimental embankment In the period from August 2015 to September 2016. The experimental embankment was built for monitoring inner processes using sensors system developed during ISMOP project [1].

System of reference sensors is installed in three cross-sections, each built from different type of soil [5]. Figure 1 shows a sensor location in those cross-sections. Temperature sensors are within different distances from the surface, which enables the analysis of temperature variation with that distance.

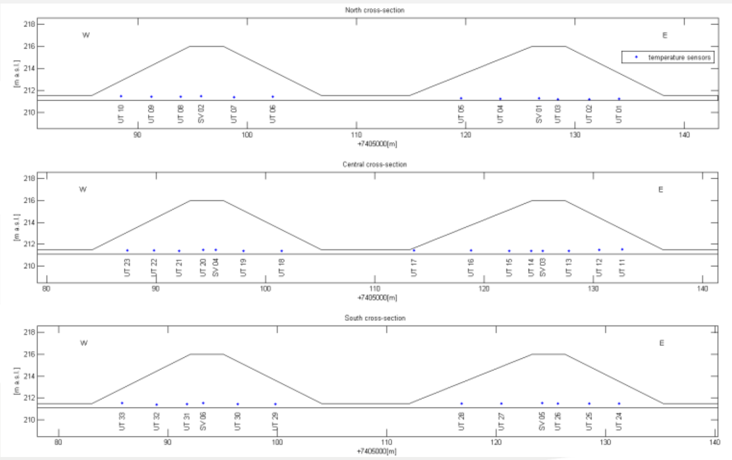

Fig. 1. Location of reference sensors in central cross-section of experimental embankment

TEMPERATURE ANALYSIS

Figure 2 shows the temperature variation in all reference point sensors and air temperature (TZ) during the last year (August 2015 - September 2016). Figure 3 and 4 presents temperatures in CW and CE cross section's sensors to obtain a more clear charts. The sensor UT 17 , which is located about 20cm below the surface, is most sensitive to changes in air temperature. The highest variation of the temperature is observed by the sensor located closely to the surface. It also can be observed that the temperature decreases with a distance from surface.

The temperatures curves are shifted in phase due to the ambient temperature. Minimum and maximum temperatures for each sensor are achieved in different moments of time and they differ from each other even by several months. In September and April temperatures observed by sensors were similar. For each period of time, a simplified model of the initial parameters based on historical and current temperature can be prepared for a numerical modelling purposes.

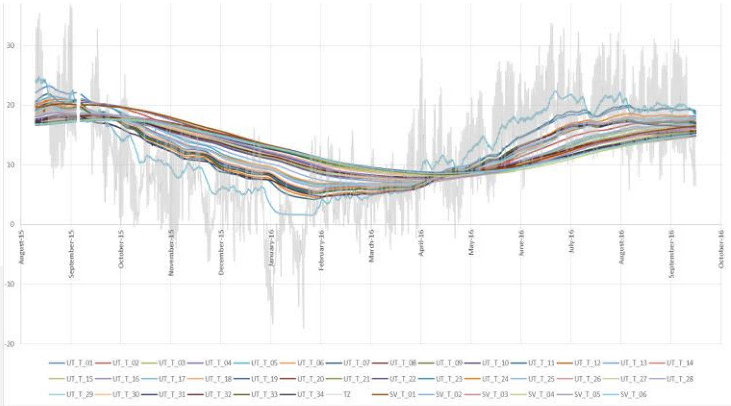

Fig. 2. Temperatures in all reference point sensors

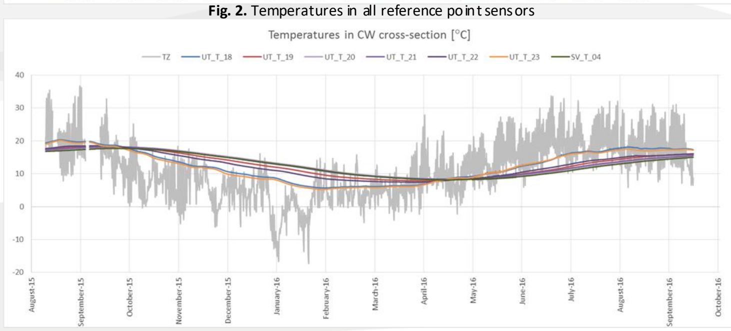

Fig. 3. Temperatures in CW cross-section

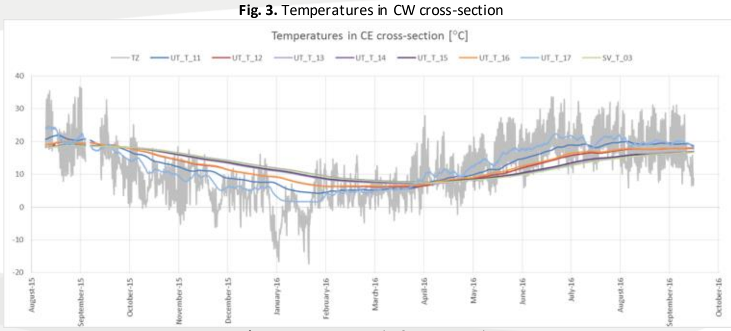

Fig. 4. Temperatures in CE cross-section

CONCLUSIONS

Using the presented analysis, it will be possible to prepare the numerical model for the initial temperature of the experiment performed in a given period of the year. Preparation of flooding experiments on embankment during the hot spring when a high temperature differences occurring can lead to increased heat flow inside the embankment. It will be registered by the temperature sensors. In the case of anomalous temperature distribution it will be able to detect deviations from the models, which will lead to the detection of leakage and the associated risk of embankment's damage.

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