

Methodology of time series quality assessment in concrete dam monitoring systems

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Thermal-seepage-stress analysis represent an essential part of dam health monitoring. The average large dam in Europe is about 50 years old, which puts dam operators in urgent need for upgrading and improvement of dam monitoring and decision-support systems. Reliability of the analysis is primarily dependent on quality of measured data, organized and stored in form of time series. In this paper we present a methodology for the assessment of monitored data related to thermal, seepage and deformation processes. The methodology is based on the consensus of several state of the art statistical and AI outlier detection methods, supplemented by hybrid and original methods. A novel Superimposed Multiple Linear Regression model has shown some advantages over traditional regressions, especially in case of time series with frequent and rapid changes of pattern. Due to different nature of dam monitoring time series, variants of the methodology are proposed for time series with strong seasonal behavior and those strongly dependent on other measurements, such as water level. The proposed approach was validated using case study of large arc dam located in southeastern Europe, where time series related to thermal and seepage processes were assessed.