

# **Automatic Geodetic Deformation Analysis for Large Dams**

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**KEY WORDS:** Interdisciplinary Approaches for the Design and Analysis of Deformation Measurements, Warning and Alert Systems, Monitoring Concepts for Static and Dynamic Deformations of Engineering and Geotechnical Structures, Multi-Sensor Systems and Sensor-Networks, Automation of Monitoring Measurements and Interpretation

## **ABSTRACT:**

The theory of deformation analysis has become popular during the last decades while the demand for deformation analysis is much older. First applications date back to the early twenties of the previous century. Geodetic methods for the determination of displacements and deformations of large dams were first applied in Switzerland. Extensive literature exists on measuring methods and equipment. A rigorous analysis of the measurements became feasible only with the advent of computers. These permit data processing using sophisticated mathematical models and were able of dealing simultaneously with large numbers of observational data. The development of new and improved instruments of significantly higher accuracy has also opened new fields of application. Nowadays the use of GNSS technology and Automatic Total Station collocated with precise dual axis inclinometers deployed on large dams require the deformation analysis to be processed automatically on regular period of time. Such automatic deformation monitoring solution is seen today as a must from the large dams authorities to be integrated in risk and disaster management program. The responsibility of geodetic deformation analysis is therefore gaining of interest and the so called classical campaign based method is clearly outdated. Processing geodetic mixed observations using rigorous Least Squares Adjustment method in different steps and deriving highly reliable analysis of the deformations is a key element in a complete deformation permanent monitoring project. The authors will review the processing strategy and will illustrate the state of the art using existing worldwide projects where a such automatic deformation analysis is fully operational.