

# **Fusion of Inhomogeneous Geodetic Data for Rock Cliff Monitoring: a Case Study of the Lianziya Cliff in Three Gorges National Geological Park in China**

**Aiham Hassan, Li Zhang, Gabriel Kerekes and Volker Schwieger (Germany)**

**Key words:** Deformation measurement; Engineering survey; GNSS/GPS; Laser scanning

## **SUMMARY**

Rock cliff monitoring on the Yangtze riverside is of crucial importance for the inhabitant's life, waterborne transportation and the Three Gorges Dam. The Lianziya Cliff is in a high-risk area and requires geodetic monitoring for collapse predictions. This is achieved with different measurements techniques that co-work with the purpose of determining cliff movements. This publication shows the fusion of tachymeter, GNSS (Global Navigation Satellite System), GB-SAR (Ground based Synthetic Aperture Radar) and TLS (terrestrial laser scanner) data and reaffirms the stability of the cliff within a period of one year. One challenge is to combine data represented in different dimensions, for e.g. GB-SAR data which gives line-of-sight displacements and area-wise TLS point clouds that are directly in 3D, as well as point-wise Total Station (TS) and GNSS. Another challenge was to define a common geodetic reference for the two epochs and to detect movements or deformations between two epochs. In principle, this should not be so difficult, but often, as in this case, the measurements are inhomogeneous or even not complete in each epoch. In this contribution the authors focus on solving these issues e.g. by TS measurements and the Iterative Closest Point (ICP) algorithm. The two epochs took place in 2018 and 2019; time interval that is too small to detect deformations. Therefore, statements regarding the required temporal distance to detect deformations are also made.

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