

Bachelor-Thesis 2011

Geodetic monitoring network in the Mont Terri rock laboratory



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The Mont Terri Project is an international research project for the hydrogeological, geochemical and geotechnical characterisation of opalinus clay. In this context, a deformation network is measured. This network concerns spatial deformations in the rock laboratory. This Bachelor Thesis evaluates the modified geodetic network. The analysis is calculated with Leica Geo Office and LTOP.

Keywords: Mont Terri rock laboratory, precise trigonometric measurements, precise levelling, gyroscope, LTOP, Leica Geo Office, multi-epochal approach, displacement analysis

1. Introduction

The geodetic network was designed in 2007 by the Federal Office of Topography swisstopo. In 2011 the network was modified by Institute of Geomatics Engineering of the University of Applied Sciences Northwestern Switzerland. The network was measured with GNSS, precise trigonometric measurements, a gyroscope and precise levelling. The aims of the analysis were to calculate the final 2011 coordinates and the 2007 to 2011 multi-epochal approach. Furthermore, the measurements were examined for systemic influences.

2. Analysis

The GNSS observables were analyzed with Leica Geo Office 8.0 and least square adjustments with LTOP 99.6.1. The detailed process is shown in the following figure.

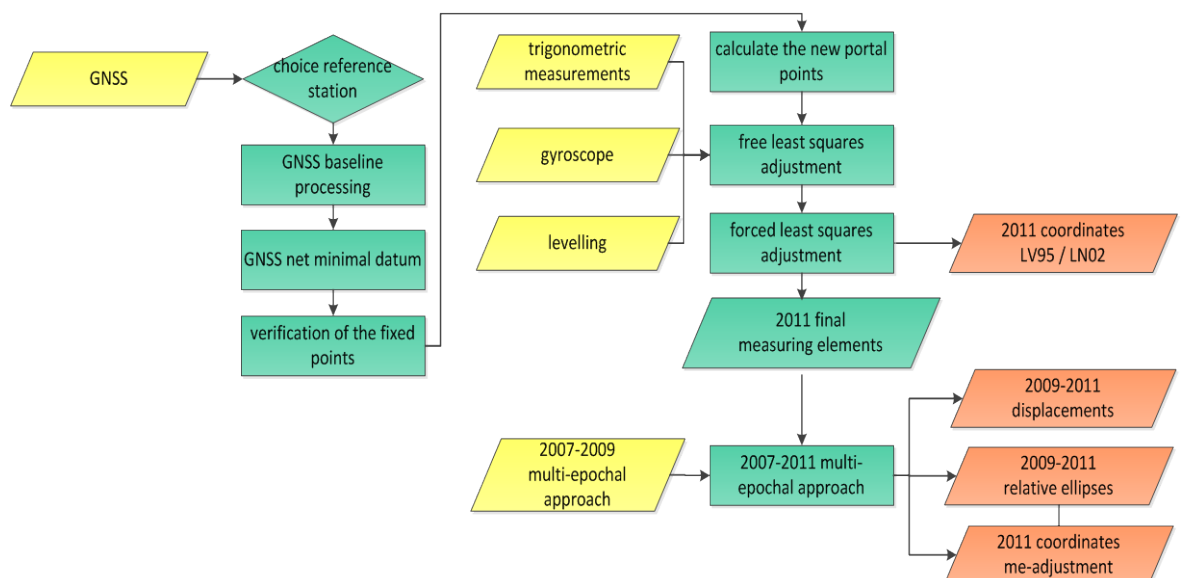


Figure 1: Data Processing

3. Result

The new network design improves the horizontal position accuracy in the rock laboratory considerably. The absolute precision of the horizontal position is now 7 mm (95% level of significance), previously 25 mm. The precision of the altitude is 1 mm (95% level of significance) as before.

Systemic influences could be detected in the trigonometric elevation angles. Otherwise, the altitudes were measured by levelling; the elevation angles in this case are not so necessary. Other systemic influences such as horizontal refraction could not be detected, although some observations were done near the tunnel wall.

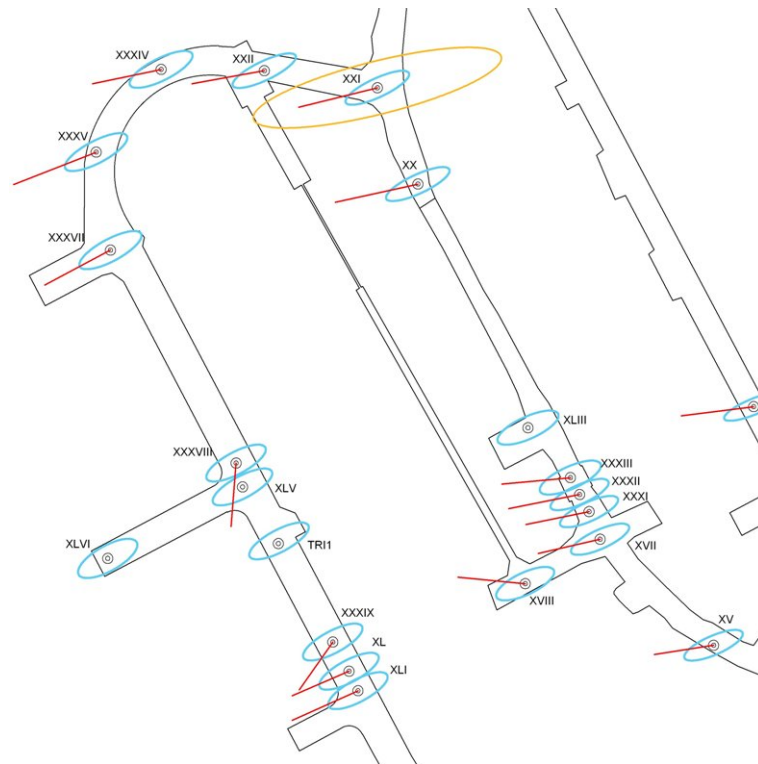


Figure 2: Confidence ellipses and displacements in the rock laboratory (absolute ellipses in blue, 2009-2011 relative ellipse in brown and displacement vectors in red)

4. Contact

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