Chair of Engineering Geodesy
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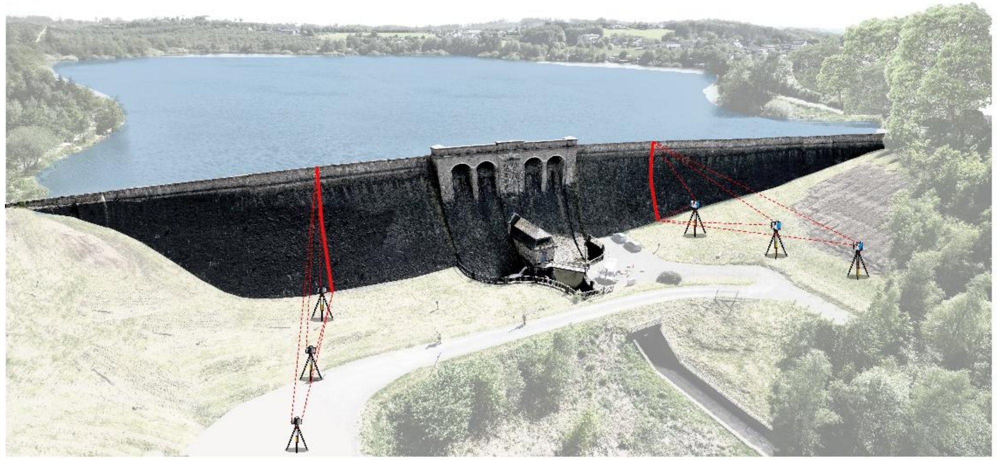
Deriving a generalized stochastic model for terrestrial laser scanner measurements

Background and state-of-the-art

- TLS uncertainty quantification is key to assessing the significance of geometric deformations measured by laser scanners
- A realistic variance-covariance matrix (VCM) Σ_{pp} represents all the error sources effecting the polar measurements at each point



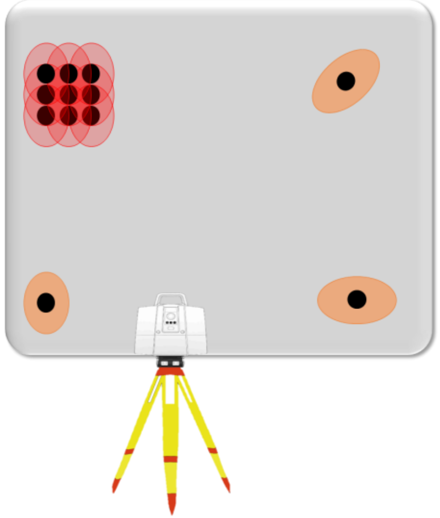
Brucher Water Dam

Research questions

- How can fully-populated VCMs be built to incorporate all relevant TLS error sources?
- How can VCMs be generalized using forward models that link error sources to uncertainty?
- How to adapt the derivation of VCMs to different spatial scales?

Research methods

- Measurement procedures for empirical derivation of realistic Σ_{pp}
- Processing strategies for parameterizing uncertainty
- Scale-adaptive approach for adapting VCM to varying spatial scales



$$\Sigma_{pp} = \begin{bmatrix} \Sigma_{1,1} & \Sigma_{1,2} & \cdots & \Sigma_{1,n-1} & \Sigma_{1,n} \\ \Sigma_{2,1} & \Sigma_{2,2} & \cdots & \Sigma_{2,n-1} & \Sigma_{2,n} \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ \Sigma_{n-1,1} & \Sigma_{n-1,2} & \cdots & \Sigma_{n-1,n-1} & \Sigma_{n-1,n} \\ \Sigma_{n,1} & \Sigma_{n,2} & \cdots & \Sigma_{n,n-1} & \Sigma_{n,n} \end{bmatrix}$$

Left:Short-scale effect (red), Long-scale effect (orange), Right: Fully propagated VCM

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