The Importance of Laboratory Experiments for Finite Element Calculations in Landslide Investigation

Barbara Schneider-Muntau
alpS - GmbH, Innsbruck, Austria
Laboratory Experiments in Landslide Investigation

Casestudy

Gepatsch
Kauner Valley

Site

Tyrol

AUSTRIA
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Site
Laboratory Experiments in Landslide Investigation
40 years of geodetic measurements

- Primary scarps
- Secondary scarps
- Geodetic displacement vectors
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Displacement, creep trend

- Waterlevel (mASL)
  - Extensometer elongation
    - Max (1767 mASL)
    - Mid (1715 mASL)
    - Min (1665 mASL)

- Geodetic points

Graph showing displacement (m) over time (years) with waterlevels at different elevations.
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Geological section

Bedrock
Sliding mass 1
Sliding mass 2
Sliding mass 3
Sliding mass 4
Moraine
Sliding zones
Water table

0 250 500 m
Driving forces

\[ \dot{\varepsilon} = \frac{1}{\eta} \left( \bar{q} - q_y \right)^n \]
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Shear test

\[ F \] and \[ S \] applying force on the sample

\[ \sigma \] and \[ \tau \] showing stress and shear stress

Supported by

Kplus
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Triaxial Test
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Laboratory Experiments

\[ \sigma_1 = 420 \text{ kN/m}^2 \]
\[ \sigma_2 = 100 \text{ kN/m}^2 \]
\[ \sigma_3 = 100 \text{ kN/m}^2 \]
\[ \bar{q} = 320 \text{ kN/m}^2 \]
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Laboratory Experiments

\[ \dot{\varepsilon} = \frac{1}{\eta} (\bar{q} - q_y)^n \]

\[ \dot{\varepsilon} = 2 \cdot 10^{-12} (\bar{q} - 177)^{2.2} \]

- creep test in shear box
- triaxial creep test 1
- triaxial creep test 2

Graph showing equivalent stress (kN/m²) on the x-axis and equivalent strain rate (1/s) on the y-axis. Points indicate different creep tests.
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### Results

<table>
<thead>
<tr>
<th></th>
<th>Total/year</th>
<th>Ratio (Spring/Autumn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equivalent Stress</td>
<td>-</td>
<td>1.65</td>
</tr>
<tr>
<td>Calculated displacement</td>
<td>2.5 cm</td>
<td>4.6</td>
</tr>
<tr>
<td>Measured displacement</td>
<td>2 – 4 cm</td>
<td>3.0 – 7.2</td>
</tr>
</tbody>
</table>

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\dot{\varepsilon} = 2 \cdot 10^{-12} (\bar{q} - 177)^{2.2}
\]