



Regional quantification of rock glacier movement in Austria using governmental GIS data

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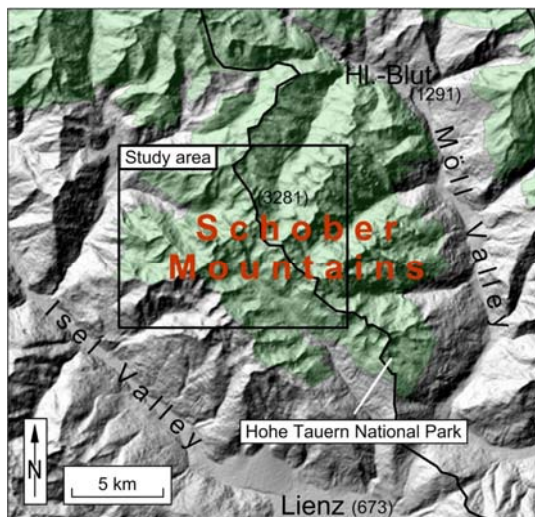
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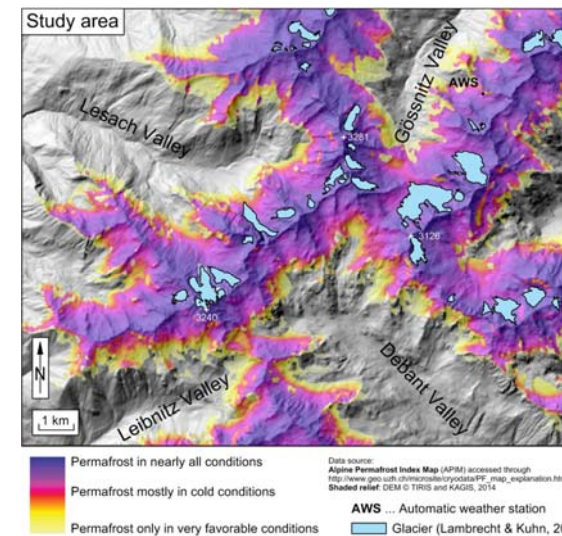


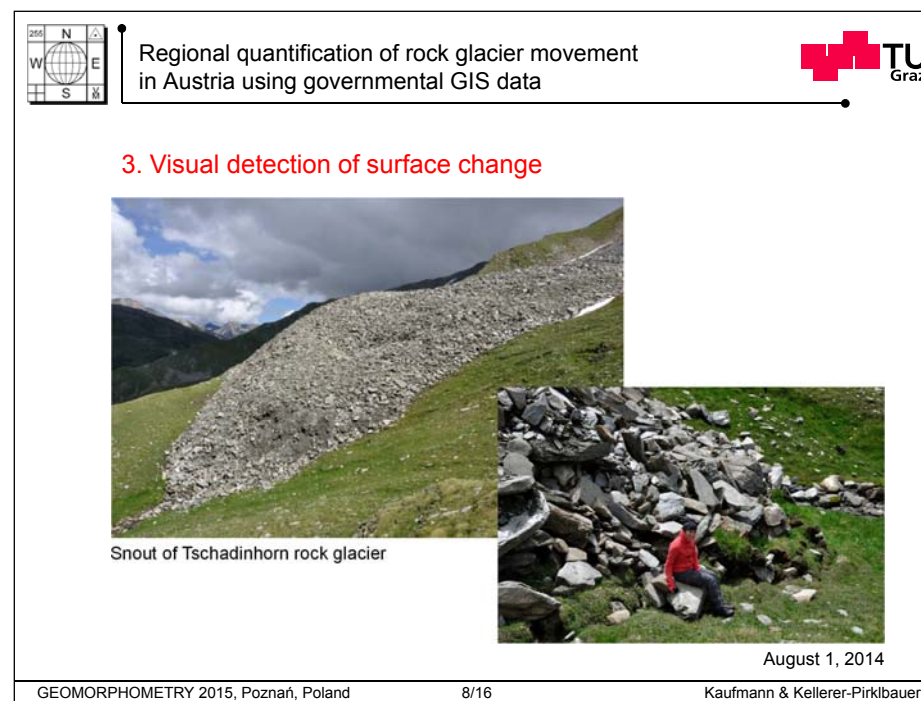
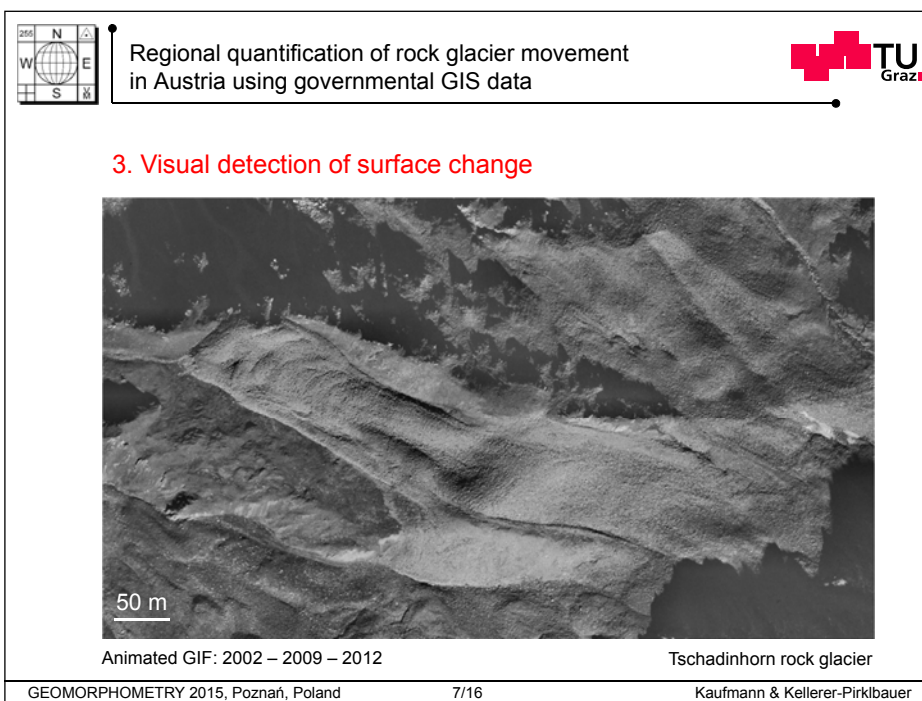
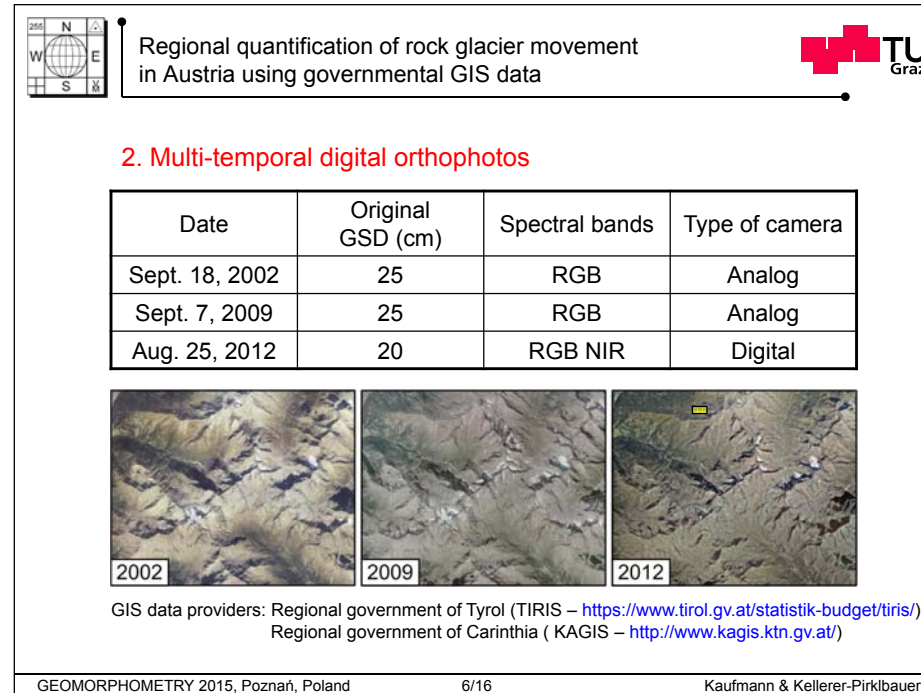
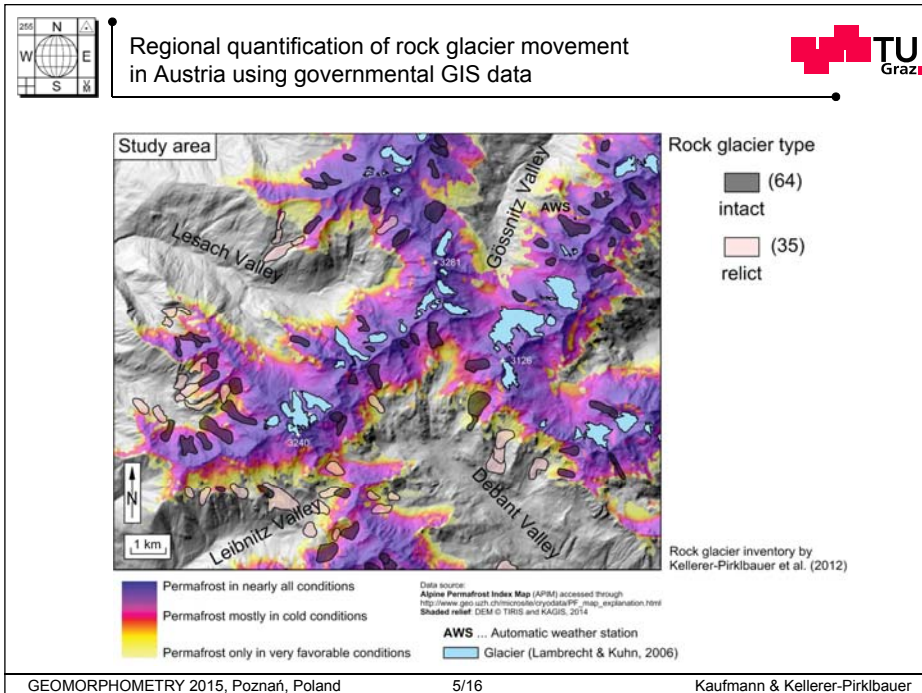
1. Introduction

- Kinematics of rock glaciers
- Application of geobrowsers (Google Maps, Microsoft Bing) for detection and quantification of fast moving rock glaciers
- Study area: Schober Mountains (Hohe Tauern Range, Austria)



Study area: 125 km²







4. Computation of displacement vectors and flow velocity

- Matlab-based program
- Change detection (multi-temporal orthophotos and DEMs)
- Image matching (NCC, back-matching)
- Sub-pixel accuracy
- Automatic detection of outliers
- Stable areas: detection of small systematic offsets, accuracy assessment

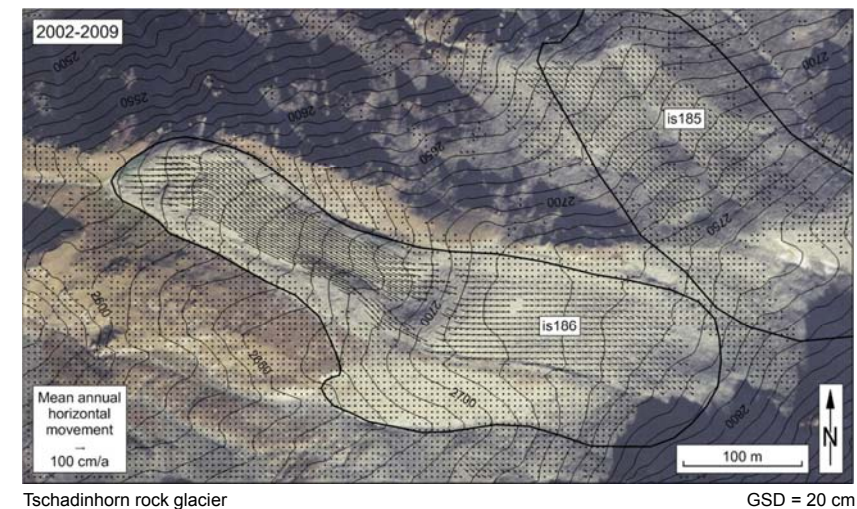
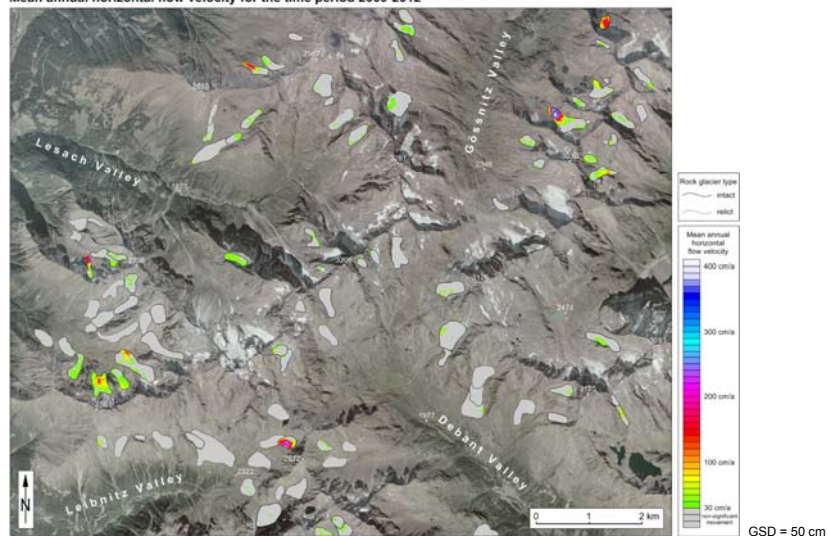


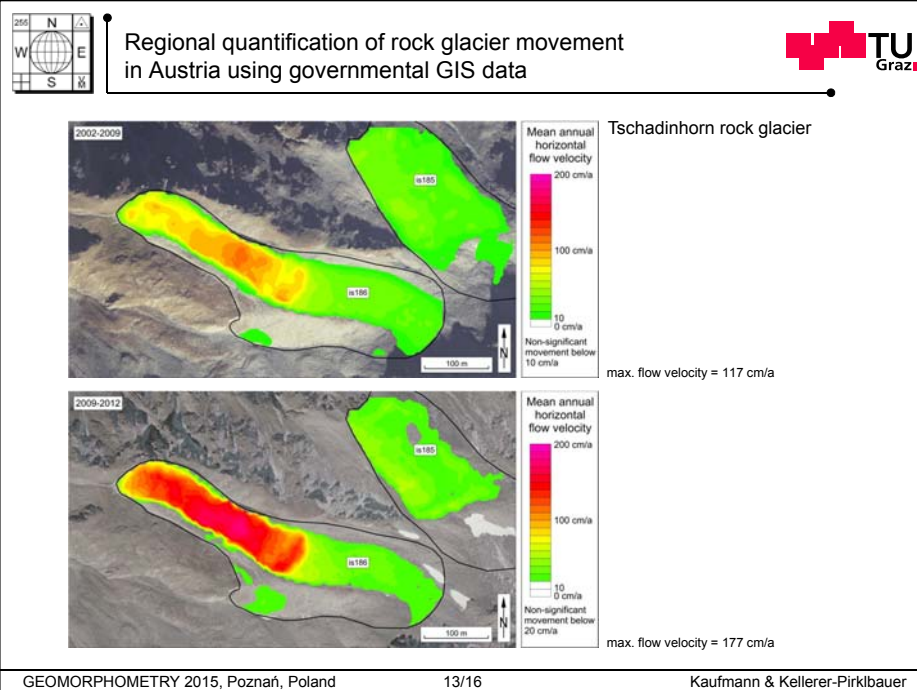
5. Results

- Two thematic maps (2002-2009, 2009-2012) showing the mean annual horizontal flow velocity of all rock glaciers of the study area
- 12 intact rock glaciers revealed significant movements in both periods.
- $V_{\max} = 440 \text{ cm/a}$
- Velocity increase by a factor of 1.4 to 1.8



Mean annual horizontal flow velocity for the time period 2009-2012





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6. Conclusions

- Data availability and accuracy
 - Multi-temporal orthophotos (3-year interval) are available.
 - Geometric quality of orthophotos is generally high.
 - Relative registration error of ± 60 cm for any two orthophotos, thus
 - 3-year interval: accuracy is approx. ± 20 cm/a;
 - The detection of slow moving rock glaciers is not possible.
 - Ortho-rectification quality is mainly influenced by DEM.
 - The current availability of multi-temporal governmental DEMs is limited.
 - DEMs offer great potential in change detection.

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6. Conclusions

- Rock glacier speed-up and climate relationship
 - Almost all fast moving rock glaciers in the study area have increased their mean annual flow velocities.
 - This regional signal is also confirmed on an Alpine-wide scale.
 - Warmer temperatures favor higher velocities.

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