

Combining luminescence dating and sedimentary analysis to derive the landscape dynamics of the Velická Valley in the High Tatra Mountains, Slovakia

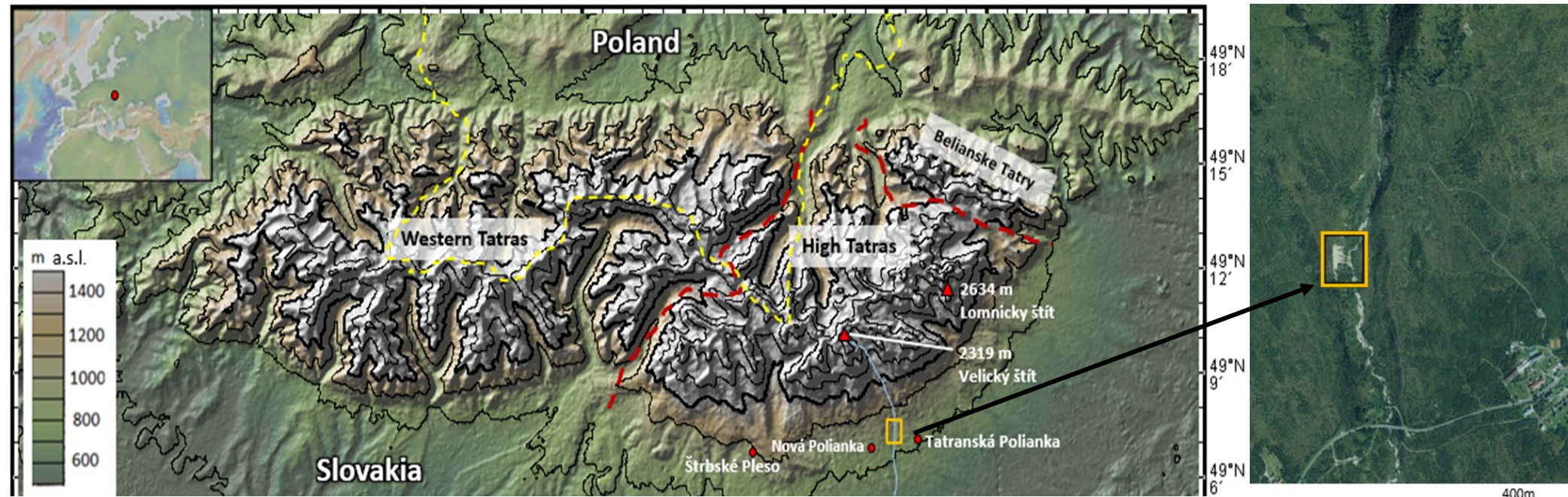
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Motivation & Research questions

Luminescence dating is widely used in combination with sedimentological analysis to reconstruct the landscape development of the Quaternary period. Here, quartz and K-feldspar measurements are used to date and evaluate the luminescence characteristics of sediments from seven sites of the lower part of the Velická valley (995-1250 m a.s.l.) in the High Tatra Mountains, Slovakia. The following research questions are answered:

- What are the characteristics of the quartz and K-feldspar samples?
- How are the sediments deposited?
- When were the sediments of the sites deposited?
- How does the formation of the deposits relate to glaciations in the Tatra Mountains?
- How are the dates and the landscape dynamics correlated?



Results & Discussion

The measured doses were higher than expected and the older sediments dated back to the Middle Pleistocene. However, the dated material was incompletely bleached, and the older samples were saturated. High fading rates were measured. The sediments were interpreted as different kinds of subaerial flows. In addition, the oldest samples were deposited in a proglacial environment, most likely on an outwash plain.

Conclusions

- Quartz measurements were rejected, due to unreliable results
- The ages with a low g-value and the ages corrected for a high g-value (for temperature 225°C) are combined together as the best age estimates per site.
- A summary of the landscape dynamics (see below): The deposition of site 4, 2, 1 followed normal superstition (219 ka, 209 ka and 171 ka). A relatively strong vertical incision followed (171-142 ka) and site 5 was afterwards deposited in a calm energy environment (142 ka).

Methods

In the field the luminescence samples are collected together with a sedimentological description, a log, clast shape analysis and maximum particle sizes. To eventually date the sediments in the laboratory, K-feldspar is used with the use of infrared stimulated luminescence (IRSL). Before the signal is measured via a specific protocol, quality tests are executed on small discs (aliquot: see photo).

