

Supplement S2 - Method comparison and significance tests

to Sperlich et al. 'Standardised determination and normalisation of
saturation plateaus of luminescence rock surface dating depth profiles'
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To test if there is a significant difference in NF and fitting results between the different methods of determining the plateau region, we applied the most widely used approach (five deepest data points) and SatPlat on all test datasets. The NF were tested for statistical significance with a two-tailed, paired t-test (Student, 1908). Then, LDPs with known ages were fitted to the bleaching with depth model (Sohbati et al., 2011, 2012a) using the Python Time Machine (pyTM; Meyer et al. (2023, 2026)) to calibrate for $\overline{\sigma\phi_0}$ and μ . 28 out of 36 LDPs of dataset RG-2 have independent age control (^{10}Be CRN by Munroe et al. 2024) and passed SatPlat and fitting with pyTM. 31 out of 35 LDPs of dataset Cavity (Andričević et al., 2023) passed SatPlat and fitting with pyTM.

The following equations compare if the 95% confidence intervals CI95 on best fit between both methods overlap. We conclude consistency of parameter estimates if there is no overlap of the lower CI95 of the higher best fit with the upper CI95 of the lower best fit of each parameter $\overline{\sigma\phi_0}$ and μ .

$$\Delta_i = param_{best_fit1i} - param_{best_fit2i} \quad (S2.1)$$

Propagate the errors with

$$\sigma_{upper}(\Delta)_i = \sqrt{((param_{upperCI1i} - param_{best_fit1i})^2 + (param_{best_fit2i} - param_{lowerCI2i})^2)} \quad (S2.2)$$

$$\sigma_{lower}(\Delta)_i = \sqrt{((param_{best_fit1i} - param_{lowerCI1i})^2 + (param_{upperCI2i} - param_{best_fit2i})^2)} \quad (S2.3)$$

with $\sigma_{upper}(\Delta)_i$ and $\sigma_{lower}(\Delta)_i$ being the upper and lower half-widths of the 95% confidence intervals CI95 and $param$ being either $\overline{\sigma\phi_0}$ or μ respectively.

The two methods agree if an overlap of the upper and lower CI95 is detected via:

$$\Delta_i - \sigma_{lower}(\Delta)_i \leq 0 \leq \Delta_i + \sigma_{upper}(\Delta)_i \quad (S2.4)$$

The overlap is also visualised in Fig. S2.1.

Furthermore, the differences between the two methods were assessed using a two-tailed paired t-test (Student, 1908) (see Tab. 2 in main text)

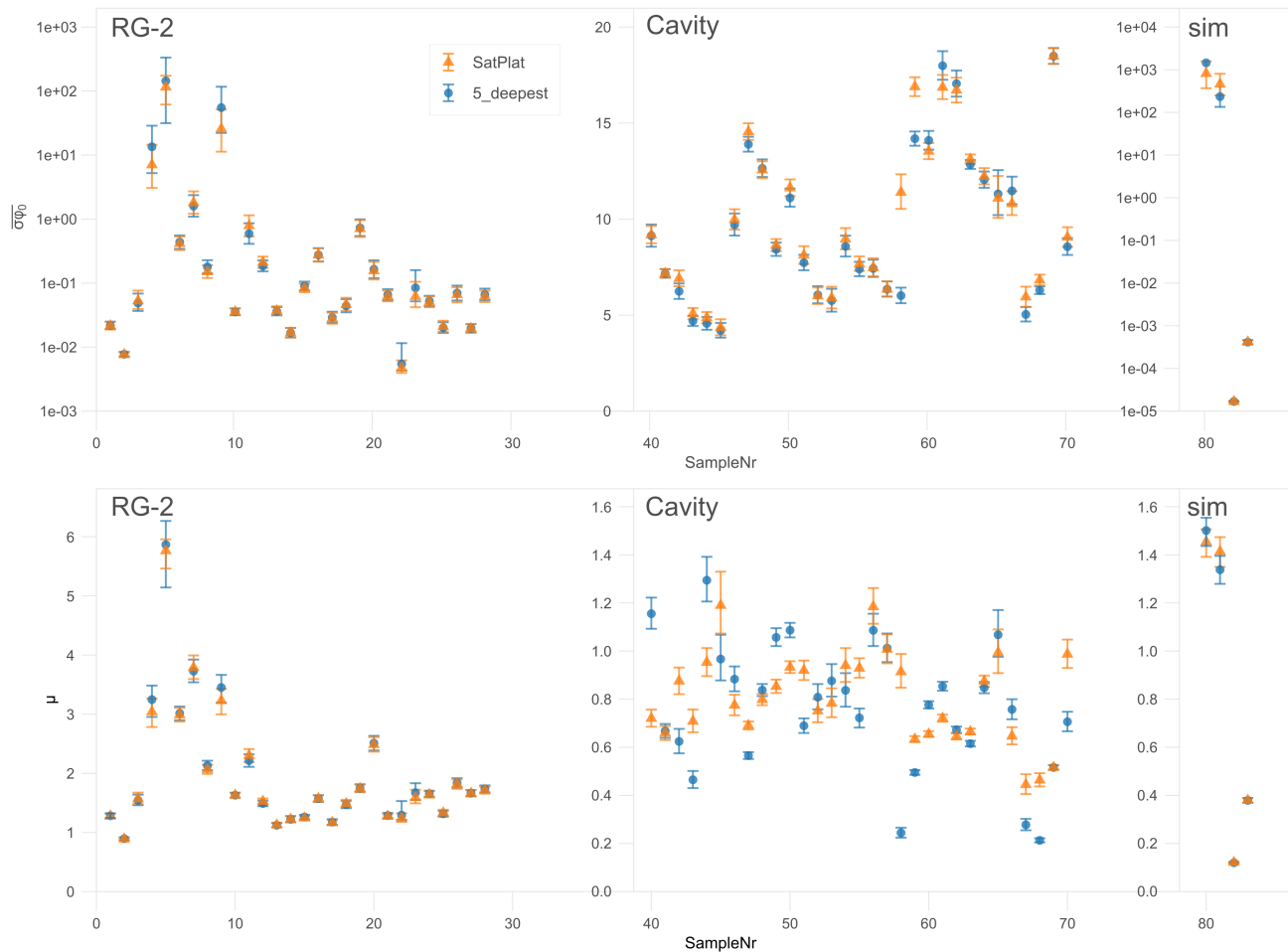


Figure S2.1: Difference in calibration results between the two plateau determination methods. The saturation plateau was determined with SatPlat for the orange, triangular data points and the five deepest data points were considered for calculating L_0 for the blue, circular data points. Shown are the fitted $\sigma^*\phi_0$ and μ values and their respective upper and lower CI95 for datasets RG-2, Cavity, and Sim. The SampleNr is an arbitrary order of the individual LDPs.

References

- Andričević, P., Sellwood, E.L., Eppes, M.C., Kook, M., Jain, M., 2023. Passive atomic-scale optical sensors for mapping light flux in ultra-small cavities. *Scientific Reports* 13, 5309. doi:10.1038/s41598-023-32010-y.
- Meyer, M., Freiesleben, T., Riedle, T., 2026. The Python time machine – an open source software application for luminescence-based rock surface dating, Vienna, Austria. doi:10.5194/egusphere-egu26-22933.
- Meyer, M.C., Freiesleben, T., Mancho-Bacaicoa, G., Fuhrmann, S., 2023. The Python time machine - an open source software application for rock surface dating. Place: Copenhagen, Denmark.
- Munroe, J.S., Laabs, B.J.C., Corbett, L.B., Bierman, P.R., Handwerger, A.L., 2024. Rock glacier movement and debris transport over annual to multi-millennial timescales. *Journal of Geophysical Research: Earth Surface* 129. doi:10.1029/2023JF007453.
- Sohbati, R., Murray, A., Jain, M., Buylaert, J.P., Thomsen, K., 2011. Investigating the resetting of OSL signals in rock surfaces. *Geochronometria* 38, 249–258. doi:10.2478/s13386-011-0029-2.
- Sohbati, R., Murray, A.S., Chapot, M.S., Jain, M., Pederson, J., 2012a. Optically stimulated luminescence (OSL) as a chronometer for surface exposure dating. *Journal of Geophysical Research: Solid Earth* 117. doi:10.1029/2012JB009383.
- Student, 1908. The Probable Error of a Mean. *Biometrika* 6, 1. doi:10.2307/2331554.