$^{40}Ar/^{39}Ar$ dating of Neogene pseudotachylytes

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If fresh, abundant, and formed over a sufficiently long time interval, $^{40}Ar/^{39}Ar$ dating of pseudotachylytes provides a means of assessing the active histories of exhumed faults. Due to the combination of generally low K-content and young formation age, the $^{40}Ar/^{39}Ar$ dating of Neogene pseudotachylyte is analytically difficult. Moreover, interpretation of ages is complicated by different extraneous and radiogenic argon isotope source reservoirs and by the intimate coexistence of unmelted clasts, neoformed minerals, and frictional glass. High-spatial resolution UV-laser ablation $^{40}Ar/^{39}Ar$ geochronology of pseudotachylytes, together with careful textural and chemical characterization, provides a means of precisely dating these fossil paleoseismic events.

We report results of UV-laser ablation $^{40}Ar/^{39}Ar$ geochronology on Neogene pseudotachylyte from tectonically active areas in Japan and the Swiss Alps. Our data yield age probability plots forming near-normal distributions, but have discernible tails at older ages due to the contribution of partially outgassed clast material. Therefore, we interpret the peak of the age probability function as a maximum age of pseudotachylyte formation. Pseudotachylytes at the top of the Leventina nappe, the deepest part of Lepontine dome (Central Alps, Switzerland), contain few large clasts and yield an age of 10 Ma, consistent with prior estimates of orogen-parallel extension in Alps. In contrast, two pseudotachylyte samples from the Uchinoura shear zone (Southern Kyushu, Japan) yield an age of 11 Ma, approximately 2 m.a. younger than previously determined ages [1]. We attribute this age difference to the fact that our high-spatial resolution UV-laser analyses were focused on areas with fewer clasts, thus minimizing the effects of argon incorporation from partially outgassed clast material.

References

[1] Fabbri O., Monié P., Fournier M. (2004) *Geol. Soc. London, Sp. Publ.* **227,** 297-312.