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Improved measurement of fission-track annealing in apatite using c-axis projection

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Abstract

Apatite fission-track length data are used extensively for thermal history inversion. However, several studies have documented instances of poor reproducibility of length data. We address this problem by using **c**-axis projection to normalize track lengths for crystallographic angle in the extensive laboratory annealing data set acquired by Barbarand et al. (2003a, 2003b). A new simplification reduces the **c**-axis projection model from six to four fitted parameters. Normalizing for track angle using **c**-axis projection improves every aspect of length measurement reproducibility examined. It accelerates convergence of mean length in single analyses; increases consistency among replicate measurements by a single analyst; enhances consistency of measurements of the same mounts by different analysts; and improves the match between analyses conducted with and without Cf-irradiation. **C**-axis projection is also shown to enhance the thermal sensitivity of length data. Based on these results, we assert that **c**-axis projection is a good means of compensating for observer bias, although it does not overcome differences caused by experimental error.

Keywords: Fission-track, apatite, annealing, anisotropy, thermochronology