MS No.: egusphere-2026-1924
A different take on fission-track annealing in apatite

Dear editor,

Please find below an itemized list of the proposed corrections to our manuscript "A different take on fission-track annealing in apatite", submitted for publication in a special issue of Geochronology.

Sincerely,
R. Jonckheere
F. Trilsch
B. Härtel
T. Nagel

Reviewer #1

1. We moved Supplement Figures S2 and S4 and Table T2 to the main text (Figures, 2 and 7, and Table 1).
2. We added representative error bars to the Figures (2σ).
3. We calculated and discuss the fanning point coordinates, and representative closure temperatures and partial annealing zones for different cooling rates and isothermal holding times.
4. We show that the fanning point of our model is fixed and consistent with published values for fanning Arrhenius models (Ketcham et al., 2007). We addressed moving fanning points in our replies.
5. We deleted the confusing statement referring to parameter C_1.
6. We explain the motivation and construction of the bias model used for the calculation of the KTB ages and mean lengths, showing that it is data-based and not tailored to the KTB.
7. We explain the choice of the independent variable ($S = L_0 - L$) as one that, in contrast to ($r = L/L_0$), should be independent of the etching and measurement protocol, on our assumptions. If that is correct, it allows the Ravenhurst et al. (2003) data to be combined with those of Carlson et al. (1999) and Barbarand et al. (2003). This appears to be the case except for a small residual offset ($\sim$0.11 μm), which we can only guess is related to the extent of bulk etching at the long immersion times used in the former work.
8. We improved our discussion of the "zero-length", adding additional context from published works.

Reviewer #2

The reviewer does not demand specific text corrections but is concerned about the assumptions on which our model is constructed and the extent to which it has been validated.

We emphasize that our assumptions are indeed assumptions, and not certainties or axioms. They are illustrated in Figures 1, 2, 6, 7, 10, 11 and supplement Figure S1. These should make it clear to the readers that they are reasonable and in large part based on the same data as those of earlier models. We stress that our model and its predictions are dependent on them. At the same time, we insist that they should be considered as on an equal footing as the alternative assumptions based on the same data that underlie earlier models.

The general validation of our model is based on the calculated fanning points, closure temperatures and partial annealing zones. The specific validation with reference to the KTB length data is inconclusive. Different reasons for the mismatch are considered, including experimental factors, methodological issues, and ambient temperature annealing. We stress that these are possibilities under investigation, not evident failures of the proposed model.

Comment #1

The rationale for our model is that we believe that it offers a reasonable - perhaps even a superior - explanation of the data available to date. We believe that there is not need to disprove or discredit earlier models before presenting an alternative. We admit that our model lacks some advanced features of existing models. At the same time, the mere fact that a reasonable alternative model can be presented at this stage, invites reflection on all models.