

Geochronology Discuss., author comment AC1
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Reply on RC1

Cécile Gautheron et al.

Author comment on "Technical note: Analytical protocols and performance for apatite and zircon (U-Th)/He analysis on quadrupole and magnetic sector mass spectrometer systems between 2007 and 2020" by Cécile Gautheron et al., Geochronology Discuss., <https://doi.org/10.5194/gchron-2021-1-AC1>, 2021

Dear reviewer RC1,

Thanks for your positive and constructive review, that point some unclear sections. Some suggestions were similar to those raised by reviewer RC2, and all suggestions were taken into consideration. We specifically add a new paragraph 2.1 about (U-Th)/He dating principles and better highlight the point that will be discussed in this contribution.

In the following, detailed responses are given in bold

All the best

Cécile Gautheron, on behalf of the co-authors

General comments:

The authors present the analytical details (lab protocol) about apatite and zircon (U-Th-Sm)/He dating using two types of instrumentation. The given information is to my knowledge very detailed and complete and can be of great help for other labs to compare and improve their lab protocols.

Scientific comments:

Most of the manuscript is well structured and does only need slight modifications (see technical corrections). I would however ask the authors to state clearly (in the introduction) what the manuscript is about (mostly He, U, Th and Sm measurement). Parts of the analysis, e.g. Ft-correction, is not discussed in detail, which is fine, but should be stated somewhere. Alternatively add a paragraph 2.1 that shortly introduced all steps to get from a rock to an (U-Th-Sm)/He age and state which part of the steps this lab protocol is about.

We totally agree with this comment and the ms was rewritten to better state that the paper is focused on He, U, Th and Sm measurements. We added a short 2.1 paragraph that introduced all the steps to get from a rock to an (U-Th)/He

age, and indicate which steps will be developed in this contribution.

Technical corrections:

Line 24: That is a bit too broad, please specify (e.g. cooling and exhumation history).

Done

Line 25: Please note that it is also dependent on the accuracy of the Ft-correction (grain shape measurement), and the geological implications are also influenced by everything that comes are the dating (e.g. diffusion models).

Yes, we agree totally with this comment and the text was changed accordingly. References have also been added in the text.

Line 25-27: That does not more structure, e.g. you mention crystal picking, but not grain-dimension measurements. Either list all steps or just list the analytical steps that your contribution is about.

We list all the steps to be more accurate.

Line 31: Change to '...we present all the ..., focusing on ...'

Done

Line 32: What do you mean with 'dissolution', please clarify.

We replace dissolution by "acid digestion"

Line 34: Change to '...spectrometer or a.... An efficient method...'

Done

Line 35: Change to '...is presented, and obtained long-term (6 to 8 months) laboratory data for...'

Done

Line 36: Change to 'The wealth of data (xx measurements) does allow to gain new insights about...'

Done

Line 58: Change to '...temperature (65°C), which is...'

Done

Line 77: If you do so, say that you prepare the tubes (pre-etching) before using?

No, we are not pre-etching the tubes before use and add this information to the text

Line 85-87: The heating protocol is not clear, how do you perform the heating (IR lamp, heating tape) and are you doing both heating the line and at some point an empty capsule?

We agree that the section was confusing and changed the order of the text to be clearer. 'After Pt/Nd tubes loading, the lines are heated at low temperature (<50°C) to remove any gas absorbed on the inner walls of the lines by the use of heating taps'. We also specified how we heat the empty capsule using the IR laser.

Line 87: Please specify what inox is, I guess not everyone knows this.

Done

Line 176: Change to 'borosilicate'

Done

Line 200: Change to '... is scheduled within...'

Done

Line 268-270: I would give the reference to Guenther here and not in line 275.

Done

Line 290: What are you doing if the age is >150 Ma?

We added a statement about it "When the age is older than 150 Ma, we use a trial-and-error code to calculate the age, that turns out to change never more than a few percent.

Line 315-321: It is not clear to me, if the ^3He content in the pipette is really deviating from the defined equation or the problem is on the side of the mass spectrometer. Please justify more clearly. If the latter case, why not calculating a correction factor based on the deviation of the Durango ages obtained over 1-2 months?

Sorry, it is was unclear. We are effectively calculating a correction factor based on the deviation of the Durango ages obtained over 1-2 months. We add this information in the text.

Line 440: I guess the reported Th/U ratios do not have a unit.

Yes, the Th/U and Sm/Th ratios have no unit, as it is ratios of content g/g