Geochronology Discuss.,
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Interactive comment on "Technical note: AI-Track-tive: automated fission track recognition using computer vision (Artificial Intelligence)" *by* Simon Nachtergaele and Johan De Grave

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Review by Ray Donelick and Andrew Donelick, Apatite.com Partners, LLC

Three broad review areas:

1. Scientific Significance: an initial paragraph or section evaluating the overall quality of the preprint ("general comments")

This paper should be published – unchanged if necessary – so that it becomes an important part of the journey to create AI-assisted tools to increase the confidence a fission track analyst has in his/her data. Using this paper, the workload of the analyst

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Discussion paper

experiences a net shift from searching for fission semi-tracks to assessing the quality of fission semi-tracks. Future software based on this paper will assist the analyst with assessing the quality of the fission semi-tracks.

The approach to machine learning used and described by the authors is both state-of-the-art and a basis for future software development.

The paper is concise and provides all the necessary background information for independent verification and testing of the software described.

2. Scientific Quality: followed by a section addressing individual scientific questions/issues ("specific comments")

âĂć Title: We suggest the authors change “recognition” to “recognition and counting” or “surface fission track recognition”. We have been using ‘surface fission track’ or its acronym ‘SFT’ as a companion to ‘confined fission track’ or ‘CFT’. We use of SFT vs. CFT is much easier than the proper ‘fission semi-track’ or its never-used acronym FST vs. CFT. This study concerns specifically etched fission tracks that intersect a polished and etched surface. âĂć line 7 change “fission track recognition” to “fission semi-track recognition” or “surface fission track (SFT; an etched fission semi-track intersecting a surface of interest) recognition”. âĂć line 17 change “developed” to “described in detail”. Fleischer, Price, and Walker describe the development of the technique in their book. âĂć line 18 change “(Gleadow et al., 1986)” to “(e.g., Gleadow et al., 1986)”. Andy can chime in here but the use of CFTs in apatite implied by “reconstructing thermal histories” was well underway by 1986. âĂć line 22 change “accurate and consequent track counting” to “accurate fission semi-track identification and counting” for “accurate SFT identification and counting”.

3. Presentation Quality: and by a compact listing of purely technical corrections at the very end ("technical corrections": typing errors, etc.).

âĂć lines 25-26: replace “The most successful attempt by the Melbourne Ther-

mochronology Group in collaboration with Autoscan Systems Pty was the first" with "The Melbourne Thermochronology Group in collaboration with Autoscan Systems Pty was the first". âĂć line 118 "highly recommended" to "required". âĂć line 147 delete "(to our knowledge)" because this qualifies the whole paper.

And address these questions:

1. Does the paper address relevant scientific questions within the scope of GChron?

Absolutely, as this work constitutes "...high-quality basic...research in geochronology..." and relates to "...developments in standardization and intercomparison..." (https://www.geochronology.net/about/aims_and_scope.html).

2. Does the paper present novel concepts, ideas, tools, or data?

Yes, as AI-assisted tools are relatively new to the issue of finding and characterizing fission semi-tracks intersecting polished and etched surfaces. A poorly understood source of error in fission track methods derives from choices made by individual users regarding fission tracks. This paper seeks to develop and provide vision and AI tools to help the analyst make choices with greater confidence and, ultimately, with greater uniformity among analysts.

3. Are substantial conclusions reached?

Yes.

4. Are the scientific methods and assumptions valid and clearly outlined?

Yes.

5. Are the results sufficient to support the interpretations and conclusions?

Yes.

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)?

Yes, and especially so because the authors are sharing their software with the scientific community.

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution?

Yes. The introduction section does a good job of introducing the problem at hand, reviewing the development and testing of the current-state-of-the-art, and providing context for the new software developed and tested in this study.

8. Does the title clearly reflect the contents of the paper?

Yes.

However, we suggest the authors change “recognition” to “recognition and counting” or “surface fission track recognition”. We have been using ‘surface fission track’ or its acronym ‘SFT’ as a companion to ‘confined fission track’ or ‘CFT’. Our use of SFT vs. CFT is much easier than the proper ‘fission semi-track’ or its never-used acronym FST vs. CFT. This study concerns specifically etched fission tracks that intersect a polished and etched surface.

9. Does the abstract provide a concise and complete summary?

Yes.

10. Is the overall presentation well structured and clear?

Yes.

11. Is the language fluent and precise?

Yes.

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used?

Yes.

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated?

No.

14. Are the number and quality of references appropriate?

Yes.

15. Is the amount and quality of supplementary material appropriate?

Yes.

We applaud the sharing of this software by the authors with the scientific community. Well done and thank you! The authors are developing tools that the fission track community will someday wonder how it survived without.

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