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Interactive comment on "Technical note: TRACK*Flow*, a new versatile microscope system for fission track analysis" *by* Gerben Van Ranst et al.

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Dear Prof. Andy Gleadow,

Thank you for the review of our manuscript and for your constructive comments. We summarise your review to the following main issues:

1. The length of the manuscript is too lang and should be reduced.
2. Too many information on the microscope itself makes the manuscript resemble an advertising brochure.

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3. It is not clear from the current manuscript what is novel and what already exists.

4. The Nikon DS-Ri2 camera is "overkill" for large magnifications and may be slow.

We formulate the following answers to these main concerns:

1. We will reduce the length of the note, taking into account the suggestions by reviewer Dr. Hideki Iwano and by you.

2. We will drastically reduce general information on the microscope and move a summary to the Supplementary data. We refer to the Nikon website / brochures where this is needed. This should already largely take away the style from the one of a brochure, which was unintended.

3. We first of all want to acknowledge the pioneering work of your Research Group at the University of Melbourne, which has revolutionised fission track research. We however want to negate the perception that TRACK*Flow* is a mere duplicate of TrackWorks, as is implied in your review. There are obviously a lot of similarities due to the simple fact that both packages have a same purpose. As they are both intended for the fission *track* laboratory, it is indeed no coincidence that the word "track" appears in both names. We do however point out that "*Flow*" carries the main weight, as the package is intended to ease the (work)flow for, amongst others, fission track research (the first module, thus "TRACK"). Herein, also the design of the mount and wellplate come into play for example. We also want to point out that we started the development of TRACK*Flow* because we wanted to invest in a system that is capable of being used for other tasks in our lab, and wanted to provide an alternative system for fission track imaging, yet from a different approach than Autoscan/TrackWorks. We further learned from other laboratories that similar needs as ours existed. For example, we included the possibility to select up to 10 homologous points (both primary and

secondary), of which primary points can be selected in a different (random) order on the mount and the ED. Secondary calibration points can be automatically picked randomly from the "target" apatites. The system prompts a warning if the transformation appears to be off. We implemented the possibility to fit multiple custom "irregular" (round, square) samples (1″ or smaller) on the stage while maintaining automatic stage movement (without operator input) to the centre of these mounts. Field diaphragm aperture is automatically adapted for thick ($\sim$5 mm) mounts. These multiple mounts can be scanned in one run without operator intervention. An auto-exposure and *adaptive* autofocus (go to estimated surface, perform primary AF, retry with a larger interval when failed) is performed before each grain/spot is imaged. Several options, such as this AF or imaging (mount/ED) can be disabled. We focussed on task-specific protocols (flows), rather than step-by-step protocols. This contains e.g. automatic edge detection, grid generation and point inspection (epoxy, crystal edge, large crack) for large crystals (for example Durango), including imaging, without any other operator intervention except for starting the protocol and indicating the desired grid spacing. These differences are based on our experience with an older version (pre-2015) of TrackWorks and on discussions with other labs. It is thus well possible that what we believe is different, to the best of our knowledge, may be also available in newer versions of TrackWorks. We are however unable to make a detailed comparison as we do not own a license or the equipment for TrackWorks. We are therefore open for suggestions from you or the editor to improve the accuracy of our manuscript and are glad to add the necessary references. This clarification however does not resolve the fact that the impression may arise that we claim to introduce novelties which are not novel. This is by no means our intention. We believe that this impression may arise from the "generalised" writing style we adopted. For example, we state that ‘higher efficiency can be obtained by separating image acquisition from analysis’, which is indeed far from novel and is a principle that has been adopted before in other systems (e.g. TrackWorks) and

disciplines (e.g. Life Sciences). We propose that this issue can be resolved by discriminating more clearly between general principles, actual novelties inherent to TRACK*Flow* and information on the working of TRACK*Flow*. In the revised version we will take care to tune down claims of presenting a novel approach where this is not applicable. We emphasise that the main goal of our manuscript is to provide information about the TRACK*Flow* system, which itself is the novelty. We will however highlight what is novel, according to the best of our knowledge, as to make more clear which general principles have been applied. We further state that a direct comparison with similar systems, such as TrackWorks or other, non-commercialised systems, is beyond the scope of our manuscript.

4. We acknowledge that the DS-Ri2 camera has a more than sufficient resolution for the imaging of fission tracks at high (100× objective) magnifications, which can be seen as a disadvantage (e.g. raw image size) from a certain point of view. There are however also major advantages to this camera, which have led us to prefer this one over several other carefully tested camera's in 2016. First of all, we did not at all experience a speed drop, as is mentioned in your review. On the contrary, we selected this camera because of its smooth refresh and imaging, even at high magnifications. As we mention in the manuscript and as we demonstrate in Fig. 7, the speed can be modified e.g. by increasing analog gain, without compromising image quality whatsoever. Furthermore, this camera has an excellent signal/noise ratio due to its large pixel size. The camera also has excellent high dynamic range and colour reproduction, which becomes a strong advantage when imaging thin sections at different polarisation angles. The high resolution also proves its purpose when scanning at small magnifications. We emphasise that we selected this camera to meet the needs of a versatile system with many applications, which thus requires a top end camera. Finally, we state that the DS-Ri2 is the camera which we recommend and which we use on the prototype microscope. The user is free to select any other microscope camera

that is compatible with the Nikon NIS-Elements software suite.

Best regards,
Gerben Van Ranst, on behalf of all co-authors

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