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Interactive comment on "The grain size(s) of Black Hills Quartzite deformed in the dislocation creep regime" *by* Renée Heilbronner and Rüdiger Kilian

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Dear reviewers, dear editors,

We are grateful for two excellent and thoughtful reviews: Mindful of their constructive suggestions, we carried out the following revisions:

(1) The manuscript is re-organized. The over-emphasized sections dealing with segmentation issues have been condensed and relegated to an Appendix.

(2) In the course of revising and checking, it was noted that the 3D modes were not calculated correctly. Instead of using the center values of the bins, the right-hand limits were used. As a consequence the modes had come out 1/2 bin size too high, i.e. 0.25 or 0.5 μm too high. This has been corrected.

(3) The comparison CIP-EBSD has been reformulated (and the figure improved) to include pole figure discrepancies.

(4) Concerning a comment of reviewer 1, we had hoped to be clear that in this paper, recrystallization is always thought of as dynamic recrystallization with ongoing deformation. In other words, contrary to the case of static recrystallization, misorientation density may very well go up during dynamic recrystallization if related to strain localization and there is no need for a dynamically recrystallized grain to stop deforming.

(5) The concern of reviewer 1 that chemical polishing will significantly alter the section thickness and hence might hamper a direct comparison is to our experience not of a great worry. Chemical polishing is used to remove the damage layer which originates from mechanical polishing which is «1μm. As also noted by the reviewer, from a statistical point of view, any polishing between separate analysis should of course not matter.

(6) The effect of strain rate – and hence of total strain – on the recrystallized grain size has been added in the conclusions.

(7) The observation that texture domains which originate from original BHQ grains only record a fraction of the total strain while behaving in an equi-viscous manner, requires some additional strain producing process to obtain the total sample strain. Grain boundary sliding is given as a potential candidate because it is very likely to operate in a material such as quartz during dislocation creep and there are good evidences for the concurrent operation reported in the literature as well as in the companion paper. The relevant section has been clarified.

The figures have been given an overhaul. The manuscript now contains 12 figures, the Appendix 2. Where necessary the font size has been increased. Graphic consistency has been improved (labeling, scale bars, . . .)

One new figure has been introduced (Fig. 3), providing a quantitative comparison of the CIP-segmented grains sizes with calculated grain sizes based on a threshold angle (c-axis and full misorientation).

Figure 1 (former 1) slight graphic changes

Figure 2 (former 11) has been improved for better comparison of the pole figures.

Figure 3 (new) addressing cut-off angles for segmentation

Figure 4 (former 4) has a new scale bar, grain size maps are shown with grain boundaries.

Figure 5 (former 5) used 0-25 μm for all, shows recalculated 3D modes (see note about this)

Figure 6 (former 6) small change of layout

Figure 7 (former 7) added two profiles of diameter and gKAM

Figure 8 (former 8) added 3D histograms (again with corrected values, see note)

Figure 9 (former 9) re-arranged histograms in rows, inserted corrected values (see note)

Figure 10 (former 10) improved font size, recalculated all using corrected values (see note)

Figure 11 (former 12) font size increased

Figure 12 (former 14) improved

Appendix Figure 1 (former 3) images improved, re-arranged, font size increased

Appendix Figure 2 (new) addressing curve fit options: Gaussian versus lognormal.

Basel, June, 8th RH & RK

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