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Interactive comment on "Transport processes at quartz-water interfaces: constraints from hydrothermal grooving experiments" *by* K. Klevakina et al.

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This is an interesting and timely paper providing experimental constrains on quartz-water interaction based on hydrothermal grooving experiments. The paper is well written has important implications for a range of natural processes and is suitable for the publications in SE after minor improvements and clarifications proposed below.

Taras Gerya, Zurich 23.04.2014

Specific comments

P. 612. Eq.2. Factor 1/2 is not needed (?) in the left-hand side (since ALPHA is defined

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as ALPHA1=ALPHA2=ALPHA and then substituted in the Eq.1)

P.614. Line 18. Lacking reaction stoichiometry. Should the reaction be written as SiO2+2*H2O <=> H4SiO4 ?

Table 2. High-temperature experiments are performed relatively close (within 50-70oC) to ALPHA-BETTA quartz transition, where some non-linear effects of the lambda-transition could possibly become important.

P.625. “Note, asymmetry is not predicted by any of the Mullins theories. For such grooves and also grooves with steps, extended approaches have to be considered (e.g., Rabkin et al., 2001) that however lack analytic expressions suitable for our fitting exercise. Therefore, we simplistically treat the two groove flanks independently and prescribe the dihedral angle of the analytical expression by the actually observed angle between groove flank and the normal to the flat surface.” How much using of this “pseudo-symmetric” approach may affect results? How different are parameters obtained by fitting of two “shoulders” of the same asymmetric groove? Do characteristics of asymmetric grooves deviate strongly from the Mullins theories prediction (e.g. Fig. 10)?

P. 627. “The apparent activation volumes gained for the various models all range at about -100 cm3 mol-1 (Table 3), i.e., about four times the molecular volume of quartz. At face value, such large activation volumes are not easily related with any of the discussed processes.” It was suggested by Gerya et al. (2004, Phys. Chem. Minerals, 31, 429–455) on the basis of thermodynamic modeling that ALPHA-quartz has a stoichiometry of Si3O6, which thus implies 3 times larger molecular volume.

P.630. “The range of characteristic healing times deduced from this study (Fig. 15) seems fairly comparable to if not somewhat larger than the field observations.” Would be good to show the range for the field observations in Fig.15. Also, how much the obtained estimates depend on the assumed crack thickness (1 μm in Fig. 15)?

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