

Dear Editor,

As requested, I have reviewed the manuscript titled “Influence of water on crystallographic preferred orientation patterns in a naturally-deformed quartzite” by Rahl et al., please find my general and specific comments below.

Rahl et al. present evidence from a naturally deformed quartzite that informs our understanding of the relationship between water content, strain, slip systems and rock texture. They show that the amount of water in quartz grains inversely correlates with a proxy for strain and that the dominant slip systems in grains changes with water content. Dry grains showing activity of basal  $\langle a \rangle$ , prism  $\langle a \rangle$  (and possibly rhomb  $\langle a \rangle$ ), while wet grains show a decrease in activity of prism  $\langle a \rangle$  and an increase contribution of prism  $\langle c \rangle$  slip. From this they show clearly that applying opening angle thermometry on such a rock would be problematically sensitive to water content.

The dataset is statistically significant, the results clear and compelling, and the text excellently written. The authors have already revised the manuscript in response to three reviews and I think I have little to add. I think that the main text could mostly be published as is, but I have provided some data presentation suggestions from the figures, a comment on the supplement and some very minor specific comments.

I congratulate Rahl et al. on an excellent piece of science that was a pleasure to read.

Best wishes,

James Gilgannon

### **Data presentation comments**

Figure 1 - I think that an overview image that shows the overall quartzite microstructure would be of benefit to give the reader a sense of what kind of rock they are looking at. I read Singleton et al. (2020) so I have a rough idea but I think it would be better to see the specific rock microstructure you are analysing and discussing alongside the other detailed panels you present.

Figure 4 - I think that the colour coded figure in D should come first as it sets the key for all of the other plots. I also wasn't sure of how you got your slip system label for grains in this figure: does it come from pole figure fibre analysis (cf. Kilian and Heilbronner 2017 [doi:10.5194/se-8-1095-2017]) or your misorientation axes analysis? From how the text is written in section 5.1 it seems that the slip system labels in figure 4 are based on the IPF from figure 5. I wasn't sure if I had misunderstood this. If I haven't then I think you will need to change the order of the text to introduce the misorientation axes method results before figure 4.

### **Supplement**

As it is, the supplement is unusable. I think you should provide the tabulated data in csv or excel files. PDF is the wrong format for that data.

### **Specific comments**

Line 75:

In the methods I would state how you calculated the ODFs: did you use a constant halfwidth or did you optimise between subsets?

Line 147:

“This framework implies that that the drier grains...” feels like the wrong phrasing. It took me a while to clearly understand the sentence. I think you mean the framework of interpreting pole figures? What about something like:

“Plotting our data in pole figures with a strain axes reference frame implies that...”