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Solid Earth
Discussions

Interactive comment on "Uniaxial compression of calcite single crystals at room temperature: insights into twinning activation and development" *by* Camille Parlangeau et al.

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The idea behind the set of experiments reported in this paper is good: previous experiments on calcite twinning have almost always been done at high temperature, bringing up questions about the extrapolation to the lower temperatures of importance in calcite deformation in nature.

De experiments as such are well described, and the approach with high-resolution pictures made during the experiments is of great value compares with a post-mortem approach.

However, I find the number of samples used, namely 3, really too low to make conclusions with confidence about the effect of orientation and the effect of grain size. One would at least want to see duplication tests. But prefarably more

For example, CRSS values obtained from the tests were 0.44 MAP in experiment 1 ([2110] orientation), and about 1.2 MPA ([0110] orientation, two sizes). That is roughly a factor of 3 difference. That is a rather large uncertainty. Many other CRSS determinations have shown higher values (see Fig. 5). The CRSS in the current paper are based on taking the overall stress value at the moment of the first twin, but perhaps there are local stress concentrations that play a role. The different strains at which the first twin develops (0.3-0.7%) and the fact that microcracks develop already at low strains might be an indication for such stress concentrations. The authors do bring up this point in the discussion (p.7), but without a clear inference.

I would say that these first results are promising, but that more experimental work is needed to get a convincing story.

One other question I have is: are you sure that no other mnechanism than twinning plays a role in straining? Does the volume of twins fit the amount of axial strain?

And finally, a couple of very good points are mentioned as discusison points, but the paper doesn't really go into it in-depth. I actually think it should. It concerns: - the possible role of (the lack of) confining pressure; relevant when extrapolating to nature. - the effect of multiple grain boundaries in an aggregate, i.o.w. how to relate single crystal observations to polycrystals.

I do want to motivate the authors to continue the project. At present the basis is a bit thin.

In terms of presentation: it would be useful to clearly indicate the stages I, II, IIIa en IIIb in Figures 2, 3 and 4.

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