Referee's comments: Black (Arial)

Our replies: Blue (Arial)

Revisions made in the revised manuscript-1: Red (Times New Roman).

Revisions made in the revised manuscript-2 (this time): Green (Times New Roman).

Descriptions from the original manuscript: Black (Times New Roman)

There were comments only from Referee #3 this time. His comments, our replies, and revisions in the manuscript are shown below.

## *Replies to Referee #3's comments (Prof. A. Kronenberg)*

This manuscript shows that OH contents are reduced during recrystallization, corroborating similar results in other shear zones, and helps build the case that this is a phenomenon that is widespread.

The authors have responded to my earlier concern that OH contents of plagioclase and other minerals seem to have been reported using the same calibration as for quartz of the deformed rocks. While it is true that the Paterson calibration is based on a wide range of hydrous materials, there is still a problem reporting OH contents as ppm by weight. What weight is assumed for intermediate plagioclase? The authors note that further analysis is not warranted of the plagioclase grains due to alteration of these grains. This brings up further issues, when OH spectra include OH bands of epidote and layer silicates. Layer silicates, for example, have extremely strong and polarized OH bands. Thus, the assumption of isotropic OH bands with the Paterson relationship cannot give good results when OH bands are not measured for specific crystalline optical vibrational directions.

The authors use the word "approximate" to describe the OH contents of phases other than quartz. I suggest strengthening this a bit - you can detect variations in OH spatially withint plagioclase or other grains, but the OH contents are qualitative, not approximate. This shouldn't be such a bad thing, though, as the focus of the contribution is clearly on OH contents of quartz. And in this regard, the Paterson calibration (assuming isotropic OH bands) is reasonable given that the broad OH absorption of quartz that correlates well with mechanical properties is isotropic.

With regard to the referee's comment in the previous paragraph, indeed, structural OH of epidote, layer silicates, and plagioclase would show polarized OH bands. This means that structural OH is incorporated anisotropically in these minerals. We have given this explanation in the revised manuscript. Then, as the referee says, we realized that the word "approximate" is inappropriate. On the other hand, the word "qualitative" may not discuss "contents" but "compositions", which in our case can be "OH band(s), $H_2O$ band, their wavenumber positions, and/or their ratios, etc.". We consider that "semi-quantitative" would best fit with our case because the calibration of Paterson

(1982) gives some water content values for the above minerals which however may not be accurate. We have revised the relevant text as follows.

L177,

This calibration is based on a linear trend of absorption coefficients for any type of water ($H_2O$ and OH) in different materials but assumes isotropically distributed molecular $H_2O$ for the orientation factor of 1/3, which is already included in the above equation. The mapped areas also include plagioclase and/or phyllosilicate. Grain interiors of plagioclase are also altered to epidote, muscovite, and clay minerals (Fig. 3 and see the description in Section 2). IR spectra of plagioclase possibly including these alteration minerals as well as those of phyllosilicate exhibit a dominant band owing to molecular $H_2O$ and accessory band(s) caused by structural OH (shown later). Especially, structural OH may be anisotropically incorporated in all of these minerals. It is noted, therefore, that the calibration of Paterson (1982) used for these minerals gives semi-quantitative water contents.

L198,

the water contents of the minerals reported in this study are semi-quantitative values.

One minor mis-spelling that needs correction: on line 188 of the newly revised manuscript, "isotropic" is mispelled as "isotopic", which a spell checker won't find, but it not the intended word.

Revised.

L179,

assumes isotropically distributed molecular $H_2O$

In addition to the above revisions according to the referee's comments, we have revised the following text.

L217,

alteration minerals

We have changed "altered" to "alteration", which is more commonly used.

In the Data availability section, we will officially publish our data in Mendeley Data, and delete the following italicized part at the time of proofreading.

L409,

Raw IR mapped data for Figs 6–9 in JASCO format (e.g., Fig6.jwa) and each exported IR spectrum for each sample position (e.g., Fig6_X1Y1.txt) are available from Mendeley Data, V1, doi: 10.17632/zn24kbg9xt.1 *at https://data.mendeley.com/datasets/zn24kbg9xt/draft?a=3552fbc3-364c-4edd-b50a-fa58d198bcce [Comment from authors:*

*This is a temporary shared URL. We will officially publish the data in Mendeley Data when the manuscript is published as an article in Solid Earth]*.

We have revised the Figure 1 caption as follows; “the location of the study area” → “the location of (a) in Japan”.

L684,

The inset in (a) shows the location of (a) in Japan and major tectonic lines…