

## ***Interactive comment on “Effect of normal stress on the friction of brucite: Application to slow earthquake in the mantle wedge” by Hanaya Okuda et al.***

**Anonymous Referee #1**

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This manuscript reports a series of experiments on brucite at various normal stress conditions and uses the results of these experiments to make inferences on the nucleation of slow earthquakes. Specifically, the authors find a low coefficient of friction, which, together with negative values of the rate and state friction parameter ( $a-b$ ) is used to claim that brucite is a key material controlling the nucleation of slow earthquakes in hydrated mantle wedges.

The data in this manuscript is of interest to the community working on fault frictional behaviour and deserves to be published. However, the manuscript needs to be improved significantly before publication. My main comments are listed below and detailed com-

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ments are given in the annotated pdf.

1. The context of the current study needs clarification. The Introduction is not written very concisely and the role of mantle wedges in explaining any type of behaviour along subduction zones is not clearly outlined. Why focus on the mantle wedge and not the subduction plate interface? In addition, the authors use the current study to make inferences on slow earthquake nucleation but slow earthquakes are not defined and the reason for attempting to explain them is not clear. I suggest significant revision and rewriting of the manuscript as a whole (see also below) but in particular of the Introduction.
2. Slow earthquakes in subduction zones have been addressed before via experimental studies. These focus on the subduction interface rather than the mantle wedge, but I feel that they should be mentioned in the Discussion (e.g. Ikari et al., 2013, *Nature GeoScience*, DOI: 10.1038/NGEO1818; Den Hartog et al, 2012, *JSG*, DOI:10.1016/j.jsg.2011.12.001).
3. The manuscript contains a number of very bold statements which lack appropriate evidence. In particular, the interpretation of the behaviour of brucite gouge as being controlled by boundary shears is not fully justified in my view. Notably, how can the presence of Riedel shears be explained if the boundary shears would control sliding behaviour?
4. The writing style and English of the manuscript should be revised and improved. Please see the annotated pdf for examples.

Please also note the supplement to this comment:

<https://se.copernicus.org/preprints/se-2020-144/se-2020-144-RC1-supplement.pdf>

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Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2020-144, 2020>.

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