Supplement for Dislocation creep and glide in experimentally deformed glaucophane aggregates

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# Included Tables in Supplement Folder:

## Table S1: Parameters used for EBSD thin section polishing.

# S1. Sample Preparation

We took a MORB blueschist (Fig. S1) and produced glaucophane aggregates through a series of mineral separation techniques to obtain a ~98% glaucophane powder crushed with a mortar and pestle to produce a fine-grained powder (<63 µm, measured with EBSD, Fig. S2). A combination of the following techniques was used and repeated to purify the powder as much as possible before picking. After this exploratory exercise, we recommend the follow procedure to expediate the process in the future:

* Selfrag- disaggregation of rock pieces to various grain sizes
* Wilfley table- water table density separation
* Sieving
* Frantz magnetic separator
* Picking large grains and crushing (if applicable)
* Air sieving- higher precision and finer grain separation (if applicable)
* Typ-91 magnetic separator- higher precision mineral separation (if applicable)
* Heavy Liquid- methylene iodide density separation
* Picking non-amphibole grains out of powder

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Figure S1: Hand sample where glaucophane aggregate powder originates.

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Figure S2: The starting grain size fraction of the hydrostatic sample measured from EBSD data.

## S2. Electron Backscatter Diffraction (EBSD)

## S2.1 EBSD Preparation and Method

Thin sections were mechanically polished in a standard automated rotary polishing machine with water-based diamond solutions in different substrates accordingly to the Table S1. After each polishing step samples were carefully cleaned with running water, liquid soap and given an ultrasonic bath for 5 minutes. For the EBSD measurements, we coated all thin sections with 3 nm of C. Automated orientation mapping was performed with an acceleration voltage of 20 kV, beam current of 8 nA, working distance of 15 mm and stepsize of 100 nm. Due to the very poor indexation of fine-grained amphibole, we have used the Sensitivity mode of the EBSD camera (622x512 pixels), with manual gain of 1, frame averaging of 5 and >100 reflectors, reducing considerably the acquisition speed in favor of much better indexation rates. Basic post-acquisition cleaning up procedure was performed in Aztec 5.1, and included the removal of wild spikes (isolated 1-pixel “grain” with different orientation of the surrounding grain) and removal of zero solutions, the latter considering a minimum of 6 neighbor pixels. All the EBSD-derived maps, texture-related calculations and plots were performed with MTEX 5.9.0, (Hielscher and Schaeben 2008). The density functions were calculated using the complete EBSD datasets with the de La Vallee Poussin kernel, assuming a half-width of 10 degrees. Low and high angle grain boundaries were calculated assuming a threshold misorientation of 2 and 10 degrees, respectively, and all grains with less than 10 pixels at a minimum were removed from the dataset, but this threshold was varied depending on the sample.

## S3. Alpha Plotting for the 600, 650, and 675°C Fit

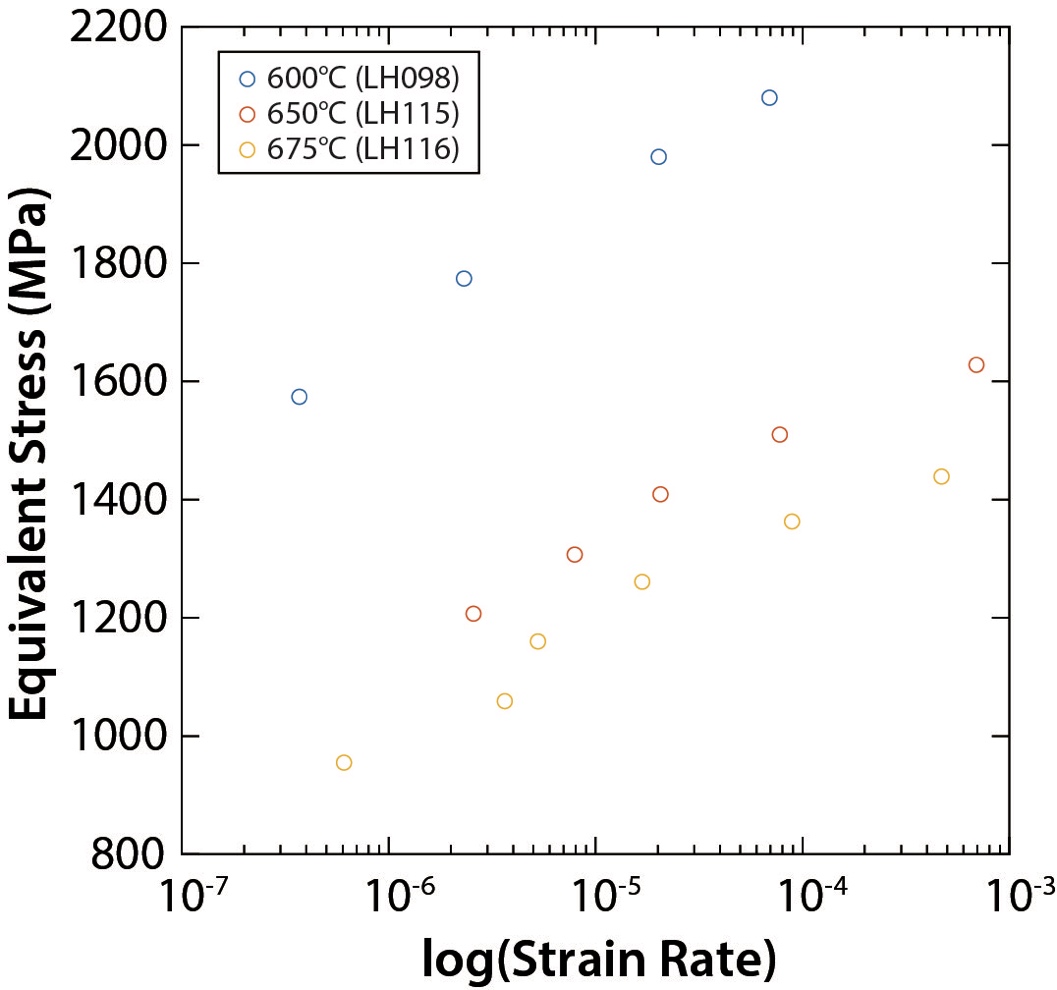


Figure S3: Plot used for the alpha calculation of the 3-temperature and high stress data fit (600, 650, and 675°C) for the dislocation glide flow law.

## S4. Deformation Mechanism Maps

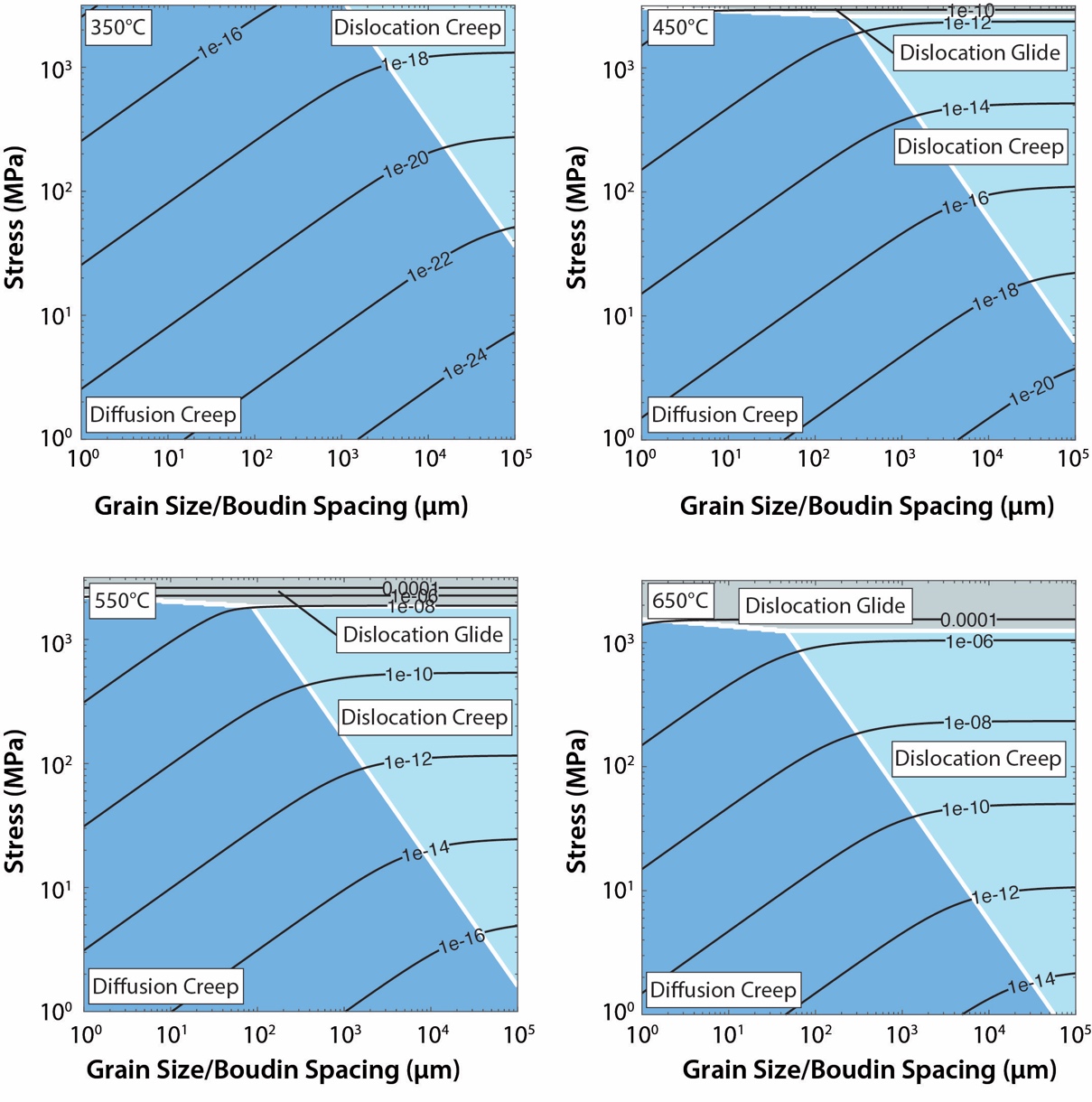


Figure S4: Deformation mechanism maps comparing stress and grain size/boudin spacing for 350, 450, 550, and 650°C with the dislocation glide flow law fit to the 600, 650, and 675°C samples. The diffusion creep flow law originates from Tokle et al., 2023. The codes used to produce the deformation mechanism maps are modified from Warren and Hirth, 2006.

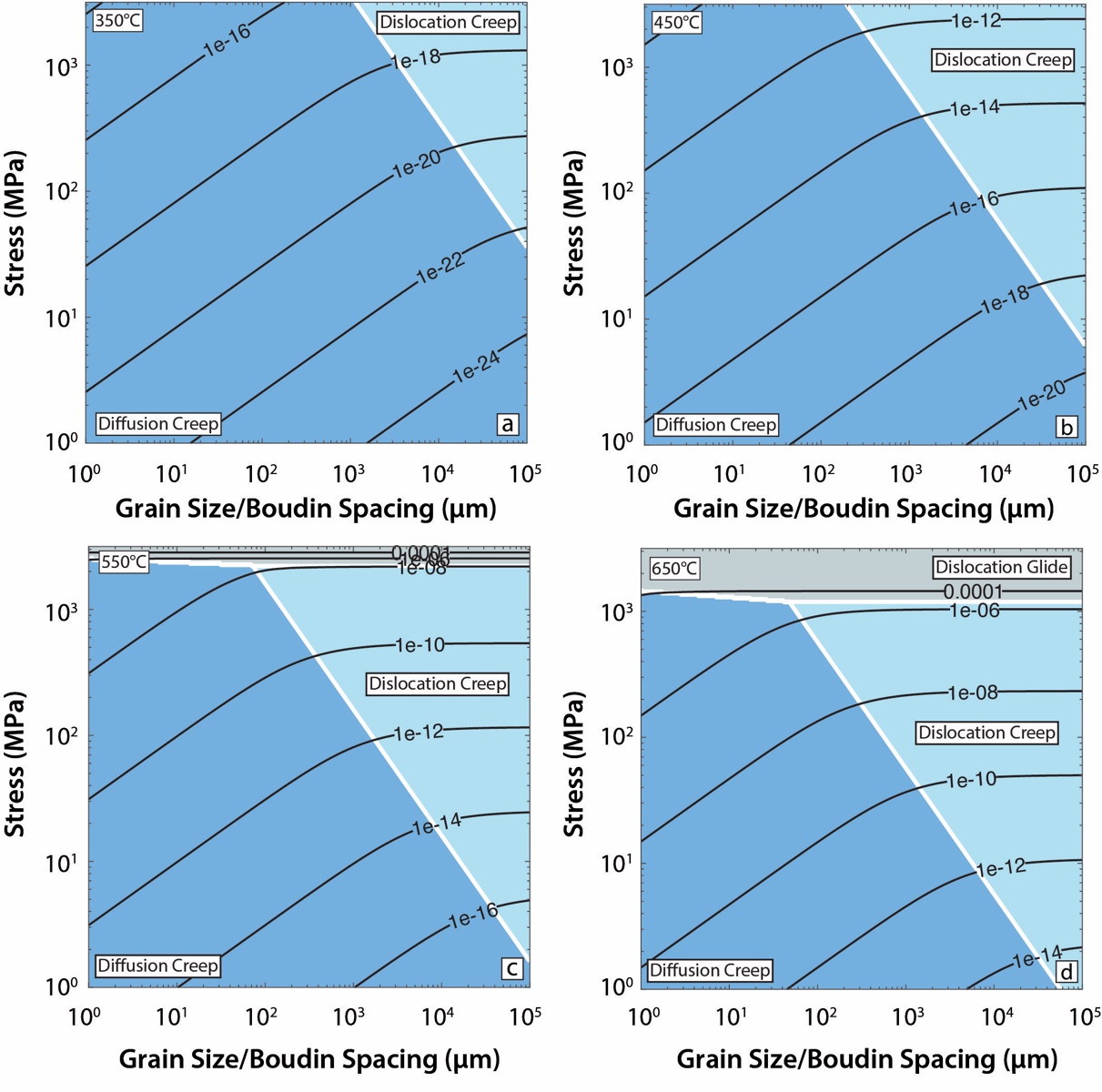


Figure S5: Deformation mechanism maps comparing stress and grain size/boudin spacing for 350, 450, 550, and 650°C with the dislocation glide flow law fit to the 600, 650, 675, and 700°C samples. The diffusion creep flow law originates from Tokle et al., 2023. The codes used to produce the deformation mechanism maps are modified from Warren and Hirth, 2006.

# References

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Tokle, L., Hufford, L. J., Behr, W. M., Morales, L. F. G., & Madonna, C.: Diffusion creep of sodic amphibole-bearing blueschist limited by microboudinage. Journal of Geophysical Research: Solid Earth, 128, doi: 10.1029/2023JB026848, 2023.

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