

Supporting Information for “Rate and State Friction as a Spatially Regularized Transient Viscous Flow Law”

Casper Pranger^{1,2}, Patrick Sanan², Dave A. May³, Laetitia Le Pourhiet⁴,

Alice-Agnes Gabriel¹

¹Ludwig-Maximilians Universität München (LMU), Theresienstrasse 41, 80333 München, Germany.

²Institute of Geophysics, ETH Zurich, Sonneggstrasse 5, 8092 Zurich, Switzerland.

³Scripps Institution of Oceanography, UC San Diego, 9500 Gilman Drive, La Jolla, CA 92093, USA.

⁴Sorbonne Université, CNRS-INSU, Institut des Sciences de la Terre Paris, ISTeP UMR 7193, F-75005, Paris, France

Additional Supporting Information (Files uploaded separately)

1. Captions for numerical simulation scripts
2. Captions for figure generation scripts
3. Dependencies

Introduction

We provide all scripts that were used for generating results and figures in the paper. These files may be found in the enclosed ZIP file. All supporting scripts require the commercial software Wolfram Mathematica (Wolfram Research, Inc., 2017) to view and

Corresponding author: Casper Pranger, Ludwig-Maximilians Universität München (LMU), Theresienstrasse 41, 80333 München, Germany. (casper.pranger@geophysik.uni-muenchen.de)

execute (version 11.1.1.0 was used). In the future we hope to make these available for a non-commercial programming environment. Each Mathematica Notebook contains concise instructions for execution but no further documentation is provided.

Numerical Simulation Scripts The Mathematica notebooks ‘code-stepping-interface.nb’, ‘code-stepping-continuum.nb’, ‘code-cycle-interface.nb’, ‘code-cycle-continuum.nb’ contain the numerical algorithms used to generate the interfacial and continuum velocity stepping results (‘stepping’) and the interfacial and continuum spring-slider (‘cycle’) results.

Figure Generation Scripts For each figure (1–12) in the paper, there is a corresponding Mathematica notebook included in the supplementary materials that was used to generate that figure. Variable degrees of further clarifications on the raw figures have been made in Keynote for MacOS – those files are not deemed necessary to publish in the supporting information.

Dependencies We depend on the MIT-licenced ‘Scientific Colour Maps’ package (Crameri, 2021) for distortion-free representation of the model results – also for readers with color vision deficiencies (Crameri et al., 2020).

References

- Crameri, F. (2021, September). *Scientific colour maps*. Zenodo. Retrieved from <https://doi.org/10.5281/zenodo.5501399> (The development of the Scientific colour maps is not funded any longer, but will continue as a pro bono project for the scientific community. - Fabio) doi: 10.5281/zenodo.5501399
- Crameri, F., Shephard, G. E., & Heron, P. J. (2020). The misuse of colour in science communication. *Nature communications*, 11(1), 1–10.

Wolfram Research, Inc. (2017). *Mathematica, Version 11.1.1.0*. Retrieved from <https://>

www.wolfram.com/mathematica (Champaign, IL, 2017)