

GIAmachine: A community-driven rescue and recovery initiative for legacy sea level and glacial isostatic adjustment modeling data

Roger C. Creel¹, Samuel T. Kodama², Joseph P. Tulenko³, Rebekka Steffen⁴, Holger Steffen⁴, Riccardo Riva⁵, Justin Quinn⁶, Jason P. Briner³

1. Department of Geology & Geophysics, Texas A&M University, College Station, TX, USA | 2. Department of Earth & Planetary Sciences, University of California, Santa Cruz, USA | 3. Department of Earth Sciences, University at Buffalo, Buffalo, USA | 4. Lantmäteriet, Gävle, Sweden | 5. Delft University of Technology, Delft, The Netherlands | 6. Tidbit Software, California, USA



Motivation

The glacial isostatic adjustment (GIA) and sea level modeling communities have historically lagged other fields in adhering to the FAIR principles of making model outputs findable, accessible, interoperable, and reusable – a delay that has slowed scientific discovery. While sharing model outputs has improved recently, usability of available outputs continues to be hindered by lack of standardization. Meanwhile, legacy model outputs can be lost as the technology storing them grows obsolete and their creators retire or leave academia.

The *GIAmachine* initiative works to address this problem. *GIAmachine* aims to make accessible as many published GIA and sea level model outputs as are retrievable by (1) cataloguing published GIA and sea level model outputs and standardizing available outputs; (2) contacting authors of published-but-inaccessible models to encourage them to upload their outputs to DOI-minting repositories; (3) partnering with the GHub science gateway to make a long-term home for these newly available outputs; (4) building Jupyter notebooks on GHub that make these models interoperable and easy to use; and (5) encouraging the GIA and sea level modeling communities to follow the FAIR principles. We report on initial progress towards *GIAmachine*, outline outstanding challenges, and encourage community input. By designing a living resource that meets the specific needs of current and future scientists, we aim to build the *GIAmachine* ecosystem into a powerful tool to understand the large-scale effect of climate change on past, present, and future sea level, and Earth's diverse response to continental glaciations.

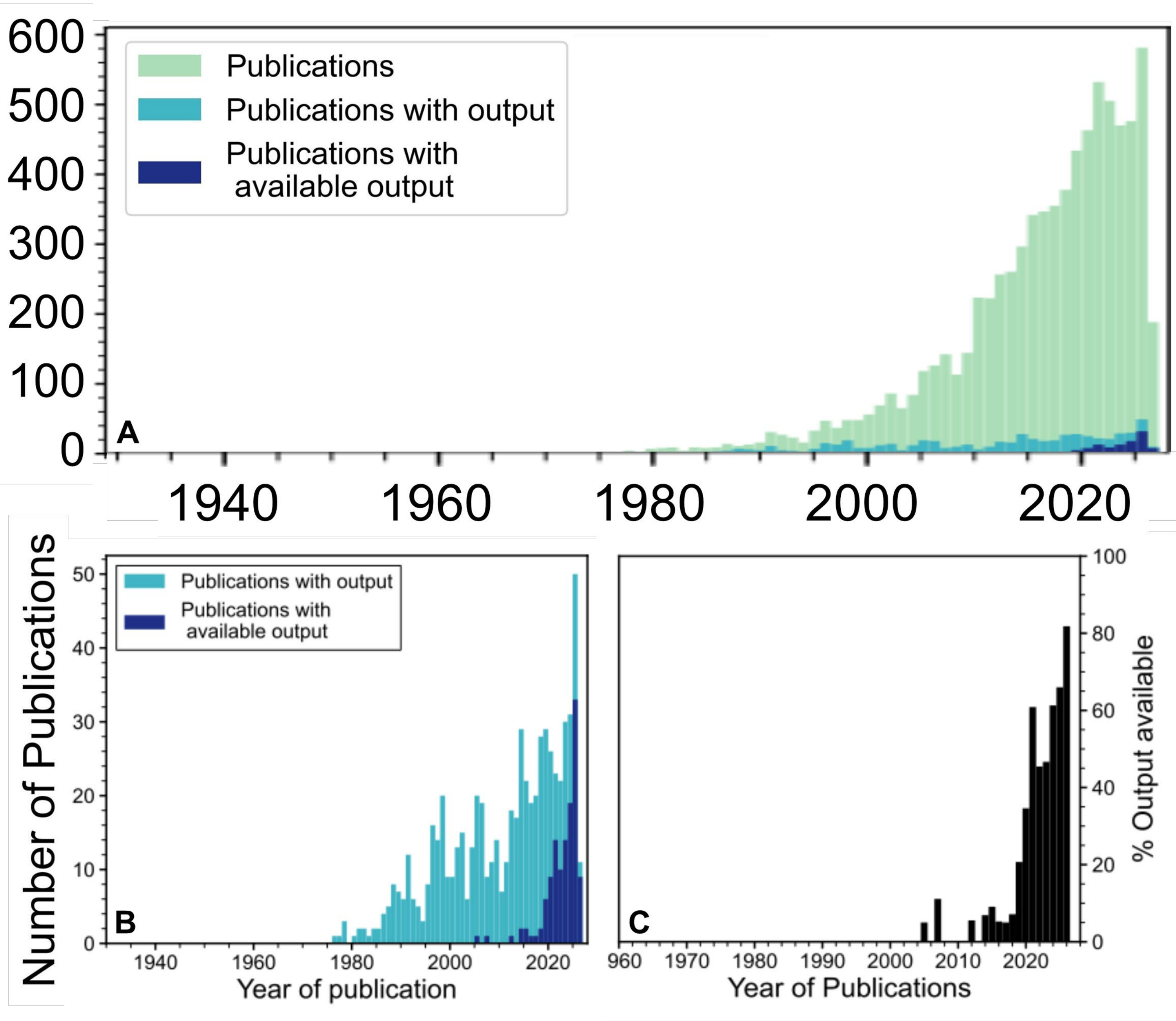


Figure 1. Glacial Isostatic Adjustment (GIA) model publication and output availability. (A) Annual frequency of publications mentioning GIA (light green), presenting GIA model results (cerulean), and making those results available (dark blue). (B) Zoom-in of (A) to highlight publications with [un]available outputs. (C) Percentage of GIA model outputs available.

Approach

- ✓ Catalogue all published GIA outputs and build a link library
- ✓ Partner with *Ghub* (thegub.org) to make a central home for outputs
- ✓ Build Jupyter notebooks on *GHub* that make outputs interoperable
- Encourage authors of published models to upload outputs to DOI-minting repositories
- Publicize *GIAmachine* to shift norms around output sharing

Progress

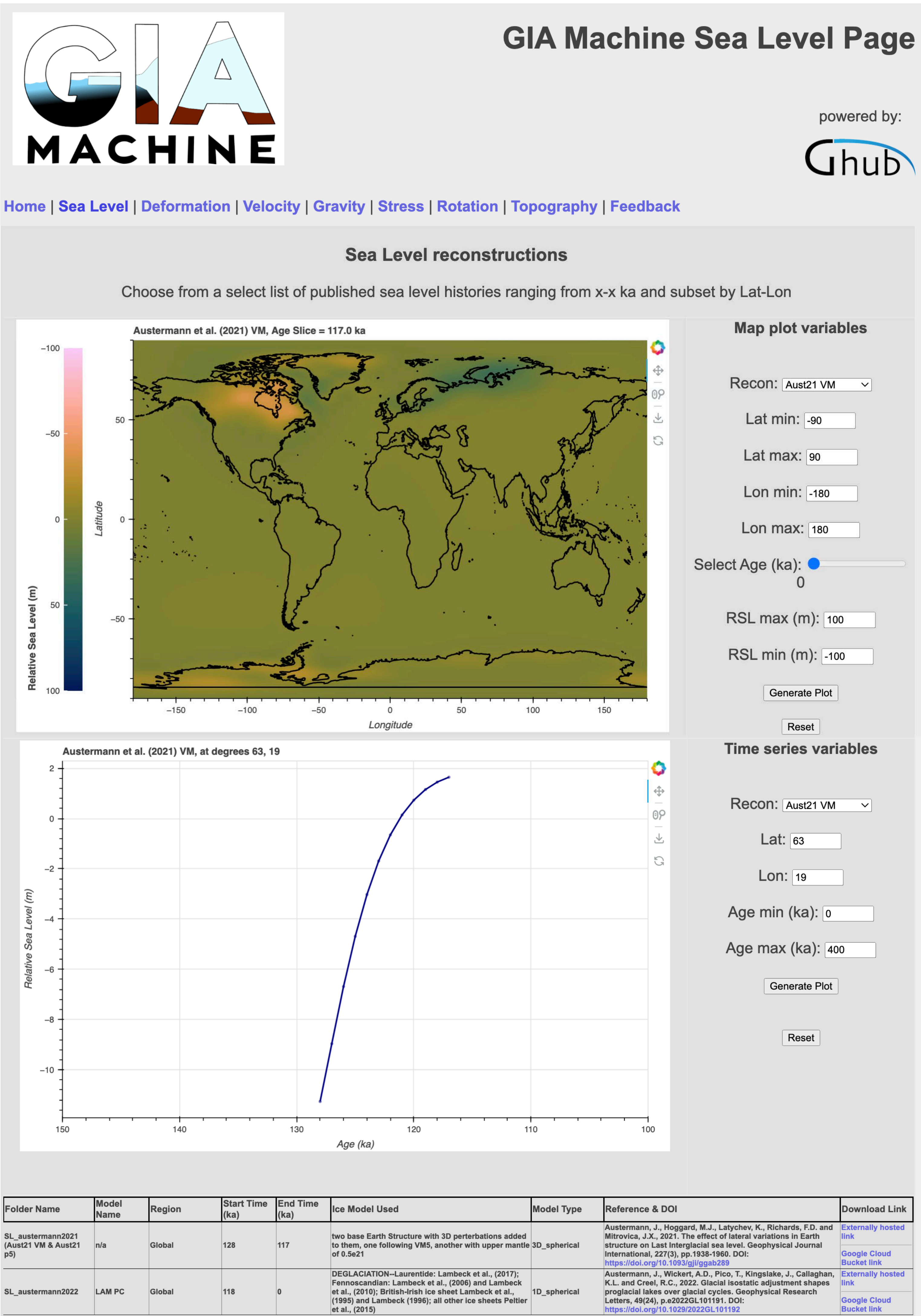


Figure 2. GIAmachine web portal demo. Portal includes spatial and temporal visualization tools, tabular catalogue of model outputs, and download links to both original and GIAmachine-standardized files.

WE NEED YOUR HELP

- Upload your published outputs to a DOI-minting repository (e.g. Zenodo)
- Contact us if you want help uploading your outputs
- Email us with your DOI data links
- Give feedback on *GIAmachine* and test the website

