

Bern, September 25th, 2025

Dear Editor and Reviewers,

We are delighted to re-submit our manuscript “rsofun v5.1: A model-data integration framework for simulating ecosystem processes” as a Model Description Paper. We thank you for the handling of our manuscript and greatly appreciate the extended deadline granted for this re-submission.

The manuscript has been thoroughly revised based on the feedback provided by you.

Our work constitutes an implementation of a previously published model (Stocker et al., 2020 GMD - referenced in our submission as a companion paper as gmd-2019-200), combined with the added functionality for model-data integration on the basis of Bayesian statistical methods.

The revised manuscript now calibrates the P-model to a global dataset of ecosystem fluxes and leaf-scale biochemical traits, instead of only to fluxes of a single site. We found that the model generalises robustly across diverse environments and identified model structural uncertainties with respect to the response of photosynthesis to drought.

The responses that we initially uploaded (doi: 10.5194/egusphere-2025-1260-AC1 and doi: 10.5194/egusphere-2025-1260-AC2) additionally suggested to rework the sensitivity analysis and compare the model calibration to a non-Bayesian calibration (generalized Simulated Annealling, genSA). Given the new scope of the revised manuscript with the systematic exploration of different Bayesian calibration setups, we have decided against including genSA calibration and the sensitivity analysis. First, all latent parameters (assessed in the sensitivity analysis in the initial submission) are now included in the calibration, rendering obsolete the initial parameter screening through a sensitivity analysis. Second, we felt that including another comparison to a non-Bayesian parameter calibration method (genSA) would unnecessarily extend the scope of the manuscript without adding . In the initial submission, the genSA method was included mainly to showcase the capabilities of the rsofun framework. However, the documentation of the R package itself is a much better place for these examples than this manuscript, where we now focus only on the Bayesian approach to parameter estimation.

Please consider this revised manuscript. We would be delighted if it could be considered for review in *Geoscientific Model Development*.

We sincerely thank you for handling our manuscript in advance. In the name of all co-authors, with kind regards,

Fabian Bernhard