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**To the concerned Editor**
Ecological Modelling

Dear Editor,

We would like to submit the manuscript entitled "*Can inverse calibration help improving process-explicit species distribution models?*" to be considered for publication in Ecological Modelling.

Predictive modelling approaches have been more and more used to provide projections of the dynamics of species and ecosystems for the upcoming decades. In particular, process-explicit models (PEMs, also called process-based models) hold great promise for providing robust projections of species distributions under novel climatic conditions[1], but their broader application is often hindered by the extensive data requirements needed to calibrate them[2].

The original work we present investigates the potential of inverse calibration to improve the accuracy and applicability of PEMs, specifically addressing the challenges of model performance and parameter realism. Specifically, we used a powerful optimization algorithm[3] to calibrate the PHENOFIT model—which focuses on tree phenology and stress resistance. We explored two calibration strategies and evaluated their impacts across eight European tree species.

Our work highlights the strengths and limitations of inverse calibration, proposing strategies to balance model accuracy and biological realism. This research provides new insights into improving the applicability of PEMs to a broader range of species and scales, contributing to more robust ecological forecasting under changing climatic conditions.

We confirm that this work is original and has not been published elsewhere, nor is currently under consideration for publication elsewhere.

Thank you for your consideration of this manuscript.

Sincerely,

Victor Van der Meersch
*PhD student*

Isabelle Chuine
*Research director*

[1] M. C. Urban et al. Improving the forecast for biodiversity under climate change. *Science* (2016)
[2] Evans et al. Towards process-based range modeling of many species. *Trends in Ecology & Evolution* (2024).
[3] Van der Meersch & Chuine et al. Estimating process-based model parameters from species distribution data using the evolutionary algorithm CMA-ES. *Methods in Ecology and Evolution* (2023).