environmental sciences proceedings

MDPI

Abstract

A New Tool to Assist the Calibration of Fire Growth Models †

Bruno A. Aparício *, Akli Benali and Ana C. L. Sá

Forest Research Centre, School of Agriculture, University of Lisbon, 1649-004 Lisboa, Portugal
* Correspondence: bruno.a.aparicio@gmail.com
† Presented at the Third International Conference on Fire Behavior and Risk, Sardinia, Italy, 3–6 May 2022.

Abstract: Wildfire spread models are commonly used to estimate fire exposure and risk, locate optimal fuel-treatment units, and study alternative management strategies. One of the most used algorithms to estimate fire spread is the minimum travel time (MTT). This algorithm requires a very time-consuming calibration process to produce reliable fire-spread estimates. Usually, the calibration process includes matching the simulated with observed fire sizes, frequently relying on tuning the fire duration. First, the user sets different duration classes based on the observed pattern and for each class sets a unique value, then runs the model and then assesses its performance. If the model fails to reproduce the historical fire size pattern, the user needs to redefine the fire duration values and repeat the entire process. Here, we present a new tool, specifically developed to assist the user during model calibration. This tool was developed for the command-line version of the MTT algorithm (FConstMTT) and was implemented in R software. We started by testing the optimal number of ignitions/fire seasons needed for the calibration and set it as default. The user can then specify multiple values per class of duration to be tested at the same time (instead of one single value per duration class). All the required input files are created for all the combinations of class durations and fire growth simulated for each combination. These combinations are ranked according to their accuracy, using the root mean square error statistic to compare simulated and observed fire size classes (as defined by the user). We demonstrate the potential of using this tool to speed up and improve the model's calibration by applying it in four different study areas that are characterized by different fire regimes. We will gather feedback from the scientific community to further develop the tool.

Keywords: model calibration; R software; fire modelling

Citation: Aparício, B.A.; Benali, A.; Sá, A.C.L. A New Tool to Assist the Calibration of Fire Growth Models. *Environ. Sci. Proc.* **2022**, *17*, 2. https://doi.org/10.3390/environsciproc2022017002

Academic Editors: Pierpaolo Duce, Donatella Spano, Michele Salis, Bachisio Arca, Valentina Bacciu, Grazia Pellizzaro and Costantino Sirca

Published: 5 August 2022

Author Contributions: Conceptualization, B.A.A., A.B. and A.C.L.S.; methodology, B.A.A., A.B. and A.C.L.S.; software, B.A.A.; validation, B.A.A., A.B. and A.C.L.S.; formal analysis, B.A.A.; investigation, B.A.A., A.B. and A.C.L.S.; resources, B.A.A., A.B. and A.C.L.S.; data curation, B.A.A. and A.B; writing—original draft preparation, B.A.A.; writing—review and editing, A.B. and A.C.L.S.; visualization, B.A.A.; supervision, A.B and A.C.L.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Portuguese national funds through FCT—Foundation for Science and Technology, I.P., under the project FIREMODSAT II (PTDC/ASP-SIL/28771/2017). The authors would like to acknowledge the support of FCT by providing funding to the Forest Research Centre (UIDB/00239/2020). B.A.A. was supported by the individual research grant from the FCT (UI/BD/150755/2020). A.C.L.S. was supported under the framework of the contract-program nr.1382 (DL 57/2016/CP1382/CT0003). A.B. was supported by the research contract (CEECIND/03799/2018/CP1563/CT0003).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.