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Accounting for the impact of slope on fire spread in a dynamic global vegetation model

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Fire modelling incorporated into global dynamic vegetation models (DGVMs) allows for the projection of changes to fire-related biogeophysical and biogechemical processes under future climate scenarios, including anthropogenic climate change. Due to the large grid sizes often required to efficiently model fire and vegetation dynamics in a global manner, fire-enabled DGVMs generally neglect some finer-scale effects, including slope. However, slope can have a significant impact on the spread of individual fires and, therefore, the global area burned. As a fire moves uphill, the angle of flames is better suited to heating nearby fuel, thus increasing the rate of spread relative to fires on level ground. In this study, we apply a function to account for the impact of slope on fire spread in the SPITFIRE model incorporated into the LPJmL5.3 DGVM to improve the calculation of fire-related processes, including burnt area. We aggregate slope data across a grid cell to account for the impact of slope in a general way appropriate to the grid size used in SPITFIRE. Our approach, while focused on the SPITFIRE model, may also be applicable to other DGVM-based fire models.