EGU21-13726
https://doi.org/10.5194/egusphere-egu21-13726
EGU General Assembly 2021

Spatial prediction of soil parameters after wildfire and their relationship with ecological process of soil and vegetation

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Novel estimations of burn severity consequences are relevant to improve the understanding of spatial ecosystem dynamics between soil and vegetation. In this study, we implemented digital soil mapping (DSM) with Random Forest (RF) and generalized additive model (GAM) as internal statistical models, to generate maps for spatial prediction of chemical parameters of post-fire litter (N, P, C and OM) in the Purapel River basin, Maule region of Chile. Response variables were the chemical characterization of 67 samples of litter collected in different hillslopes of the basin during the first post-fire winter. The predictive variables that fed the RF model were spectral, topographic, and vegetation structure derivations, obtained from free and private use satellite products (Sentinel 1, Sentinel 2, LiDAR and TanDEM-X). As a result, we generated maps of post-fire spatial distribution of N, P, C and OM with acceptable adjustment (R^2 0.52-0.61, nRMSE 54-72, pbias 0.35-1.20). The uncertainty associated with the predictions of these variables was successfully evaluated with the prediction interval coverage probability (PICP). A clear decrease on the concentration of litter elements is observed respect to the degree of burn severity, and this relationship depends on the type of cover and the environmental gradient where they are distributed.