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Mojtaba Houballah[1], Julia Le Noé[2], Fabien Ferchaud[3], Hugues Clivot[4], Pierre Barré[5], Bertrand Guenet[5], and Nicolas Delpierre[1]

[1]Paris Saclay, IDEEV, EV, France (mojtaba.houballah@universite-paris-saclay.fr)
[2]Geology Laboratory, École Normale Supérieur, PSL University, Paris, France
[3]BioEcoAgro Joint Research Unit, INRAE, Université de Liège, Université de Lille, Université de Picardie Jules Verne, 02000 Barenton-Bugny, France
[4]Université de Reims Champagne-Ardenne, INRAE, FARE, UMR A 614, Reims, France
[5]Laboratoire de Géologie, Ecole Normale Supérieure, CNRS, PSL Research University, IPSL, Paris, France

To partially compensate for CO_2 emissions, the 4 per 1000 initiative proposed an annual 4‰ soil organic carbon (SOC) stock increase. Yet, the feasibility of such an ambitious target is still under debate. The most efficient way to increase the SOC stocks is to increase the C input to the soil. Yet, knowing how much of an increase of SOC should be an objective is subjected to how much carbon is already stored within soils, and the prediction of the change of carbon pool with time. The objective of this work is to predict the carbon trends in forest soils to be able to better assess the target carbon sequestration. To this end, we use the AMG SOC model to simulate the carbon increase in French forests. AMG is a simple, two-pools model that consider the influence of environmental conditions and litter inputs to simulate the dynamics of SOC. AMG has been designed for agricultural soils, and has proved able to simulate SOC dynamics in croplands but has never been tested on forest soils. The model was run over the French RENECOFOR sites network where SOC measurements have been realized 17 years apart (1994-1996 and 2008-2012) on 95 sites and over which an average increase of +0.35 tC ha^{-1} yr^{-1} has been evidenced. We have applied the RockEval method, which mixes machine learning with thermal analysis techniques, in order to initialize AMG, separating the passive from the active carbon pool. We calibrated the model with the aim of simulating the SOC dynamics observed in the RENECOFOR. The results show that even if the model can be successful in predicting the carbon trends locally, there is no general parameterization allowing to reproduce SOC stock evolution trends at the scale of the 95 sites. Our findings suggests that even with a good performance in the case of agricultural soils, there is a need to better represent the litter inputting within the AMG model in the case of forests.