Testing the Rothamsted Carbon Model against data from long-term experiments on upland soils in Thailand

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Summary

We tested the Rothamsted Carbon Model (RothC) against three long-term (27–28 years) experimental sites on Thai upland soils in order to see how this widely used 'temperate' soil carbon turnover model performed in a typical farming region in the tropics. We were able to verify – over a much longer period than had been examined in previous studies – that RothC performs well in a tropical region in plots used for continuous cropping experiments of maize and cassava without organic matter application. However, the model overestimated soil organic carbon (SOC) in some plots to which large amounts of organic matter (rice straw or cassava stalks) were applied. This overestimate could not be attributed to errors in estimating either the
amount of C input to the soil or the ratio of decomposable plant materials to resistant plant materials entering the soil. Among many factors affecting SOC dynamics (e.g. weather conditions, soil characteristics, etc.), which are different in tropical regions from temperate regions, we conclude that the activity of soil fauna might be a major factor which makes the performance of RothC worse where much organic matter was applied. We suggest that care should be taken when applying RothC to tropical soils with large amounts of added organic matter.