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Controls of the turnover of soil organic carbon fractions in Chinese cropland

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Improving the prediction of changes in global soil organic carbon (SOC) lies in accurate estimate of C inputs to soils and SOC turnover time. Since C inputs to soils in cropland can be estimated due to well documented data of crop yields, SOC turnover rate becomes critical for accurate prediction of changes in SOC. The laboratory incubation is widely used but cannot well represent the turnover of slow soil C that accounts for the majority of total SOC, while the long-term observation of temporal changes in SOC stock offers an opportunity to estimate the turnover of slow soil C. Using the time series data of SOC stock and crop yield of multiple long-term agricultural trials that represent a range of climate, soil properties (e.g. soil pH, texture, and mineralogy), and agricultural management (e.g. fertilization and rotation) in China, we estimated SOC turnover rates and aimed to identify the primary controls of SOC changes across Chinese cropland. We used the first-order kinetic soil C model and the inverse modeling with Markov chain the Monte Carlo algorithm to estimate the turnover rates of SOC fractions and carbon use efficiency. The preliminary results show that the turnover rate of slow soil C is positively correlated with climate (i.e. mean annual temperature and precipitation) but negatively correlated with the clay content, demonstrating that the clay content is important in regulating SOC turnover rates. Further results will inform us the main controls on SOC turnover in Chinese cropland.