



## **Past and future soil carbon changes in ISIMIP2b simulations**

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The Paris climate agreement aims at holding global warming to well below 2 °, while how global soil carbon in response to such presupposed social economic scenarios is still less known. In this study, we analyzed global soil carbon changes in historical period and in next century using seven land surface models in the Inter-Sectoral Impact Model Inter-comparison Project (ISIMIP) under two concentration pathways (low RCP2.6 and high RCP6.0). In our results, ISIMIP2b ensemble suggested a global soil carbon sink of  $0.31 \pm 0.74$  Pg C yr<sup>-1</sup> from 1861 to 2005, and projected stronger carbon sink capacity in the next century from 2005 to 2099 ( $0.83 \pm 0.97$  Pg C yr<sup>-1</sup> for RCP2.6 and  $1.01 \pm 1.35$  Pg C yr<sup>-1</sup> for RCP6.0). For the future global soil carbon changes, climate change rather than land use change is the most important influential factor. At biome scale, we also find different changes of carbon sink capacity under the future RCPs among different biome, which mainly influenced by regional climate change and land use change. Although these results implied that global soil carbon pool will continually be a sink under predesigned social economic scenarios, current state-of-the-art coupled climate/carbon-cycle models for projecting soil carbon balance still has large uncertainties. We attempted to attribute the structural uncertainties of land surface models in regional and global SOC changes to the change in soil inputs (NPP), initial differences in SOC, and changes in decomposition rate following Todd Brown's method.