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Evaluating paleoclimate-paleosol linkages and soil ecosystem services with a combined soil-climate model

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Loess deposits often contain paleosols that are documenting phases of soil formation associated with interglacials or interstadials. Linkage of the paleosols to paleoclimates is not straightforward when paleoclimates are represented by dynamic (simulated) variables and paleosols by static (measured) soil parameters. We therefore propose to combine a dynamic soil model with a climate model. We define the required processes in such soil model and the output variables that would allow usage of the soil-climate model combination to be used for (past and future) climate change studies. Issues to be considered are the time- and spatial scale of the soil and the climate model. For predictive (global change) studies, the usage of (soil) model outputs to quantify the evolution of the soil natural capital and of ecosystem services must be considered. We give examples for the Chinese Loess Plateau of the evaluation of paleoclimate-paleosol linkages and of simulated soil natural capital and soil ecosystem services with the LOVECLIM-earth system model linked to the SoilGen soil evolution model and conclude that such model combination is an important step forward.