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Modelling of interglacial paleosol development in the Chinese Loess Plateau

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Introduction and Rationale of Research
The loess-soil sequences in Chinese Loess Plateau (CLP) are considered as an inevitable and continuous terrestrial record for evaluating paleoclimate. Paleosols and intercalated loess layers have long been studied and correlated with modelled paleoclimates.
Interglacials are the major periods of soil formation and greatly differ from other interglacials by duration and strength. It has been identified that paleosol formation does not strongly concur with globally established paleoclimate signals especially for interglacial Marine Isotope Stages (MIS) 5e, MIS9 and MIS13. Analysis of just soil data would not be straightforward to identify relations between modelled past climate intensity and soil development. Not only the past climate (precipitation, temperature) has an effect on soil formation but also vegetation and interglacial duration plays a vital role. Additionally, pedogenetic overwriting during later periods of soil formation may affect the observed soils. Therefore, there is still a knowledge gap: which of these variations would contribute most to soil formation during interglacials. The intention of this research study is to identify the relative importance of soil forming factors on soil formation during six interglacials in the past 500 000 years in the CLP in China under paleoclimate changes.
In the meantime, this research study facilitated to resolve a doubtful question, why and how soil development became weaker in strongest interglacial during MIS 5e than MIS13, which was a less warm interglacial, but prevailed in a longer period. MIS 5e, the last interglacial about 125 kyr B.P resulted in a poorly developed paleosol unit in a shorter period than MIS 13 paleosol. However, the best-developed paleosol S5-1 is attributed as a result of strong East Asian Summer Monsoon (EASM) during the MIS 13, a relatively weaker interglacial about 500 kyr B.P.
Research methodology
Combination of the soil formation model SoilGen and the earth system model LOVECLIM is a promising tool to compare simulated paleosol properties to paleoclimate.
Results
The combination of LOVECLIM-SoilGen model was used to unravel differences in paleosols corresponding to MIS 5e and MIS 13 and paleoclimate. Simulated soil properties showed that, significantly higher clay content and mineral Anorthite content in MIS5e paleosol in studied eight sites in the CLP.
Conclusion
There were much stronger weathering of the mineral Anorthite and clay migration in MIS13 than MIS5e paleosol. The clay differences between MIS 5e and MIS 13 soils become less with increasing aridity.
Precipitation surplus is the leading soil forming factor for soil horizonation during MIS13 than MIS5e.

References
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