EGU21-5713
https://doi.org/10.5194/egusphere-egu21-5713
EGU General Assembly 2021

Selecting suitable climate models for examining future changes in soil erosion

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Climate models consistently project large increases in the frequency and magnitude of extreme precipitation events in the 21st century, revealing the potential for widespread impacts on various aspects of society. While the impacts on flooding receive particular attention, there is also considerable damage and associated cost for other precipitation driven phenomena, including soil erosion and muddy flooding. Multiple studies have shown that climate change will worsen the impacts of soil erosion and muddy flooding in various regions. These studies typically drive erosion models with a single model or a few models with little justification. A blind approach to climate model selection increases the risk of simulating a narrower range of possible scenarios, limiting vital information for mitigation planning and adaptation. This study provides a comprehensive methodology to efficiently select suitable climate models for simulating soil erosion and muddy flooding. For a case study region in eastern Belgium using the WEPP soil erosion model, we compare the performance of our novel methodology against other model selection methods for a future period (2081 – 2100). The main findings reveal that our novel methodology is successful in generating the widest range of future scenarios from a small number of models, when compared with other ways of selecting climate models. This approach has not previously been achieved for modelling soil erosion by water. Other precipitation-driven impact sectors may also wish to consider applying this method to assess the impact of future climatic changes, so that the worst- and best-case scenarios can be adequately prepared for.