



# 1 Climate Change and long-term Landscape Evolution

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A common approach when studying long-term landscape evolution is assuming that modern process rates are applicable over the long term, i.e. as the rates of processes responsible for shaping a given landscape. While the limitations of this assumption have long been realized for studies in formerly glaciated areas, studies of formerly non-glaciated regions often remain implicitly uniformitarian, *sensu-stricto*; precluding changes of exogene process rates. This approach is supported by recent studies that highlight the limited influence of climate on erosion rates in certain climatic regions; leaving moderate climate change little to no role in changing process rates and landscapes. This paper discusses whether this notion can be generalized, or whether there are situations where even moderate climate change can pass thresholds causing significant changes of process rates.

To a large extent, a continuous vegetation cover effectively protects soil from erosion, irrespective of the type of vegetation. Therefore in most climatic regions moderate climate change may change vegetation type, but leave continuous cover. In semi arid regions, however, moderate climate change can exceed vegetation thresholds such that cover is no longer continuous, resulting in bare ground. Consequently, unpredictable and/or less rainfall may no longer be sufficient to sustain continuous vegetation but will be more effective at removing soil. After topsoil is removed vegetation may not be able to recover, even if climate reverts to its former state. Continually fluctuating or switched climate conditions have, therefore, a high potential to fundamentally affect process rates in the transition region between semi-arid and arid climate zones. Examples of landscape changes caused by such climate changes will be discussed.