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Effects of climate change and atmospheric CO_2 concentrations on vegetation cover and landscape development

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Vegetation cover is a crucial component in determining rates of landscape evolution due the protective effect of vegetation ground cover and the stabilization of hillslopes because of increases in soil cohesion through the rooting system. However, climate, stand dynamics and mortality rates vary over time and can lead to varying rates of vegetation cover and thus hillslope protection. In the EarthShape DFG-SPP (https://esdynamics.geo.uni-Tuebingen.de/earthshape) four focus sites, ranging from the Atacama Desert, sparse xeric scrublands, sclerophyllous woodlands to southern Chilean temperate forests, that differ substantially by their climatic exposure and observed vegetation, are investigated. In previous work we established that a regional parametrization of the dynamcic global vegetation model LPJ-GUESS is capable of reproducing broad potential natural vegetation patterns of Chile. However, poor paleo-climate (precipitation) data used to drive the models make a detailed analysis with proxy data difficult. We thus resort to synthetic climate time series data to further investigate possible vegetation state changes on a centennial to millennial time scale and their impact on basin-scale landscape evolution processes. Here we will present a first attempt of coupling the dynamic vegetation model LPJ-GUESS to the landscape evolution model LandLab. We evaluate the effects of using a) a transient climate dataset (TraCE-21ka time-series data of Liu et al. 2009 *Science*), b) different synthetic climate state changes (precipitation and temperature regimes switches at centennial to millennial scale intervals using a space for time approach), and c) various atmospheric CO_2 concentrations on simulated vegetation composition, vegetation cover and denudation rates.