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Interaction of rainfall, runoff and erosion on dryland slopes in the Negev desert

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Dryland vegetation is expected to respond sensitively to climate change and the projected variability of rainfall events. Rainfall as a water source is an obvious factor for the water supply of vegetation. However, the interaction of water and soil on rocky desert slopes with a thin and patchy soil cover is also vital for vegetation. In particular, the presence (or absence) of a substrate for vegetation to grow determines the vegetation density. The effect of changing rainfall, infiltration and runoff on soil cover, e.g. through erosion or weathering, is not considered by common models used to assess the impact of climate change on vegetation density in drylands. This study therefore aims at developing a suitable procedure for examining rock-soil interaction, in particular the relevance of limited soil cover sensitive to erosion, for vegetation density and its future development in the northern Negev, Israel. A series of rainfall simulation experiments was conducted to determine the water storage capacity of the soil patches. The results were compared to erosion data observed in earlier research. The preliminary analysis indicates that soil volume and frequency of rainfall events sufficient to fill up the soil water storage capacity determine the density vegetation cover. More importantly, the limited soil cover is at risk of erosion during high magnitude rainfall events. This combination of surface properties and relevant rainfall characteristics generates a scenario where more rainfall can actually lead to a lower vegetation density due to the erosion of the limited and erodible soil cover.