Geophysical Research Abstracts
Vol. 18, EGU2016-3895, 2016
EGU General Assembly 2016


# Soil surface sealing reverse or promote desertification?

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Vegetation cover in dry regions is a key variable determining desertification. Bare soils exposed to rainfall by desertification can form physical crusts that reduce infiltration, exacerbating water stress on the remaining vegetation. Paradoxically, field studies show that crust removal is associated with plant mortality in desert systems, while artificial biological crusts can improve plant regeneration. Here, it is shown how physical crusts can act as either drivers of, or buffers against desertification depending on their environmental context. The behavior of crusts is first explored using a simplified theory for water movement on a uniform, partly vegetated slope subject to stationary hydrologic conditions. Numerical model runs supplemented with field data from a semiarid Long-Term Ecological Research (LTER) site are then applied to represent more realistic environmental conditions. When vegetation cover is significant, crusts can drive desertification, but this process is potentially self-limiting. For low vegetation cover, crusts mitigate against desertification by providing water subsidy to plant communities through a runoff-runon mechanism.