



Complex geo-ecological responses to climatic changes in an arid area: the case of the northern Negev desert

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Drylands are regarded as highly sensitive to climatic changes. A positive relationship between rainfall and environmental factors (water availability for plants, productivity, species diversity, etc.) is often assumed for areas with an annual rainfall of 100-300 mm. This assumption disregards the fact that a climatic change in arid and semi-arid areas is not limited to climatic factors. This change is often accompanied by a parallel change in surface properties, such as deposition of loess during a wet climatic phase and sand during a dry phase. The alteration of surface properties may have opposite effects on the water regime and ecosystem characteristics. Data on rainfall, runoff, soil moisture regime, soil properties and vegetation cover were collected at several sites in the Negev desert along a rainfall gradient of 86 to 160 mm. Data obtained reveal a complex response to climate change. Loess deposition resulted in an increase in salt input (by dust and rainfall) and a limited leaching depth related to the high water absorption capacity of the fine-grained material. The combined processes led to soil salinization and desertification. An opposite trend occurred during the following dry period. The negative effect of rainfall decrease was counteracted by sand deposition that allowed deep rainwater infiltration and good water preservation. However, when sandy areas along a rainfall gradient are considered rainfall increase had contrasting, positive and positive effects, on the water regime and vegetation cover. Results obtained cast doubt of the prevailing idea regarding the positive relationship between average annual rainfall and ecosystem characteristics. The findings are attributed to the decisive role played by the contrasting effects that the change in surface properties had on the hydrological regime and resulting water resources.