Geophysical Research Abstracts, Vol. 7, 09027, 2005
SRef-ID: 1607-7962/gra/EGU05-A-09027

Vegetation patterns, facilitation, cooperation and competition in arid regions

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The development of spatial vegetation patterns, commonly observed in arid regions, can be explained by the competition between vegetation patches for the water resource and the presence of positive feedback mechanisms between the water and the biomass distributions. We study the interaction of vegetation with surface and soil water densities in water-limited regions, by a mathematical model which we recently introduced. This model reproduces observed patterns and allows for studying the dynamics of the system along a precipitation gradient. The prediction of coexistence of patterned states allows for an interpretation of desertification phenomena. We use the model to reproduce and study the interaction of different species in arid regions. In particular, we study the dynamics of ecosystem engineers, which are plant species capable of modulating the landscape and to create habitats favorable for other species.