Geophysical Research Abstracts,
Vol. 11, EGU2009-1196, 2009
EGU General Assembly 2009

Climate-Vegetation feedbacks at different scales

S. C. Dekker, H.J. de Boer, M. Rietkerk, and M.J. Wassen
Utrecht University, Faculty of Geosciences, Environmental Sciences, Utrecht, Netherlands (s.dekker@geo.uu.nl)

Multiple steady states in climate and vegetation can occur due to climate-vegetation feedbacks at both macroscale and microscale At microscale, positive feedbacks between hydrology and vegetation have large impact on vegetation distribution and spatial pattern formation. At macroscale vegetation influences the climate by modifying the radiative, momentum and hydrologic balance. If both macroscale and microscale positive feedbacks are present in one region, these feedbacks markedly influence each other and they should both be accounted for in climate change models. For analysis of macroscale feedbacks, an Earth Model of Intermediate complexity is used in which large perturbations are performed to obtain minimum and maximum stable biotic (vegetation) and abiotic (climate) states. The differences between these states are due to strong climate-vegetation feedbacks at regional or global scale, and at first glance could be interpreted as bistability, or two alternative attractors. However, the regime levels between these states consist entirely of stable points in which none of them are attracting. At local scale, differences in states can be counterintuitive because atmospheric processes play at larger scale thereby affecting spatial competition for resources. We conclude that in regions with high climate-vegetation feedbacks a regime with many stable biotic and abiotic states are possible, depending on initial conditions, which can have large influences on the resilience of the system.