Geophysical Research Abstracts
Vol. 16, EGU2014-12813, 2014
EGU General Assembly 2014

Tree-grass competition for soil water in arid and semiarid savannas: the role of rainfall intermittency.

Donatella D'Onofrio (1,2), Mara Baudena (3), Fabio D'Andrea (4), Max Rietkerk (3), and Antonello Provenzale (1)

(1) CNR-ISAC, Torino, Italy , (2) Department of Physics, University of Torino, Torino, Italy, (3) Copernicus Institute of Sustainable Development, Utrecht University, Utrecht, the Netherlands, (4) LMD, Ecole Normale Superieure, Paris, France

Savannas occupy about one fifth of the global land surface and, despite their importance for socio-economical issues, their origin, nature and dynamics are still only partially understood. Owing to the large extent and productivity of savanna biomes, future climate-driven changes in these ecosystems could have large impacts on global biochemical cycles.

In the last decades, it has been widely debated which mechanisms are responsible for the coexistence of trees and grass, which characterizes savannas. Along a gradient of water availability, tropical grasslands and forests represent limiting ecosystems where either one or the other life form dominate, respectively in the drier and moister environments.

The purpose of this work is to explore tree-grass competition as a function of soil moisture availability, focusing on the drier part of the moisture gradient, where not only water is scarce but also it is highly intermittent and characterized by strong seasonality. To this aim, we developed a simple implicit-space model of tree and grass competition explicitly including soil moisture dynamics and temporal intermittency of rainfall. Assuming that the colonization rates of grasses and trees are soil-moisture-dependent and that tree seedlings are inferior competitors than grasses, the model is able to predict stable grassland, savanna (tree-grass coexistence) and forest along a gradient of mean annual rainfall, as well as variations in tree-grass cover at a fixed mean annual rainfall value, due to precipitation intermittency.