Interactions of Pulsed Fires and Water in Tree–Grass Savanna Ecosystems

<u>A. Tchuinté Tamen</u>[1,4], Y. Dumont[2], S. Bowong[3,4],
J.J. Tewa[1,4], P. Couteron[3],
[1] University of Yaounde I, Cameroon
alexis.tchuinte@yahoo.fr
[2] CIRAD, Umr AMAP, Montpellier, France
[3] University of Douala, Cameroon
[4] CETIC, University of Yaounde I, Cameroon
[5] IRD, Umr AMAP, Montpellier, France

In [1,2], we have developed and compared two variants of a minimalistic tree-grass model which account for fire as periodic pulse events using impulsive differential equations (IDEs). Our models explicitly consider both a generic non-linear increasing function of grass and the response function of woody biomass to fire intensity. In particular, in [2], this fire response function has been choosen nonlinear in order to recover various bistability situations and periodic equilibria in different ecological regions.

In recent papers, some authors proposed to take into account soil water because it is directly related to the hydrologic cycle (rainfall) and the climate forcing on the ecological system. Thus, based on our previous models, we build a new model involving water competition in addition to fire responses. We analyze the new system and compared to the previous models. We will illustrate our discussions with several numerical simulations.

References

[1] A. Tchuinté Tamen, Y. Dumont, S. Bowong, J. J. Tewa, P. Couteron. *Tree-grass interaction dynamics and pulsed fires: Mathematical and numerical studies*, Applied Mathematical Modelling (2016). Online.

[2] A. Tchuinté Tamen, Y. Dumont, J. J. Tewa, S. Bowong, P. Couteron. *A minimalistic model of tree-grass interactions using impulsive differential equations and non-linear feed-back functions of grass biomass onto fire-induced tree-mortality*. Accepted in Mathematics and Computers in Simulation.