Modelling Fires as Pulses in Tree/Grass Interactions: Study of Long-term Impact in Forest-Savanna Dynamical Systems

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It is usually admitted that fires play an important role in tree-grass interactions in savanna ecosystems. In this talk, we present a model of tree-grass dynamics using impulsive differential equations, considering fires as discrete events [1]. This framework allows us to carry out a comprehensive qualitative mathematical analysis that revealed more possible outcomes than the analogous continuous model [2]. We investigated local and global properties of the equilibria and show that various states may co-exist. Though fire periodicity may drive the system to different and abrupt shifts between vegetation, we also show that direct shading of grasses by trees, through a facilitation/competition parameter, is an influential process too, leading to bifurcations. Finally, using a suitable numerical approach [3], we carried out numerical simulations related to three main climatic zones, observable in Central Africa, to illustrate our theoretical results.

References

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