Impulsive Modelling for Tree-grass Interactions in Fire-prone Savanna

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The study of tree-grass interactions in savanna (fires prone or not) remains an important issue for research. In African savanna, it is well known that fire is a major disturbance that shapes tree-grass ratio along a rainfall gradient. Several mathematical models have been developed that addressed fire prone savanna dynamics. Such models rely mostly on continuous-time modelling of tree-grass competition. In these frameworks, fire is a time-continuous forcing (see [1] and references therein) while the relationship between woody plant size and fire-sensitivity is not systematically considered. In this work, in order to takes into account both the discrete nature of fire occurrence and size-dependent fire sensitivity, we propose a new mathematical model for tree-grass interaction featuring impulsive differential equations [2]. The impulsive modelling is able to yield a more realistic array of solutions and therefore, able to account for many dynamical scenarios observed in savanna-like ecosystems. Extension of the temporal model to a spatio-temporal model, using local and nonlocal operators, will be also considered.

References

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