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Topological properties of aftershock clusters in a viscoelastic model of quasi-brittle failure

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Material failure at different scales and processes can be modeled as an emergent feature in terms of avalanche dynamics in micromechanical systems.
Event-event triggering -or aftershocks- is common in seismological catalogs and acoustic emission experiments [1] among other phenomena.
Stochastic branching and linear Hawkes processes are used to model the statistical properties of catalogs. In the micromechanical approach, viscoelastic stress transfer and after-slip are among the proposed mechanism of aftershocks. Here we ask this simple question: '*Do aftershock sequences in micromechanical models agree with such epidemic branching paradigm?*'

We introduce two fibrous models as prototypes of viscoelastic fracture [2] which *(i)* provides an analytical explanation to the acceleration of activity in absence of critical failure observed in acoustic emission experiments [3]; *(ii)* reproduce the typical spatio-temporal properties of triggering found in field catalogs, acoustic emission experiments; but *(iii)* display discrepancies with the branching topological properties predicted by stochastic models [4], probably due to physical constrains.

[1] J. Baró et al., *Phys. Rev. Lett.* **110** (8), 088702 (2013).
[2] J. Baró, J. Davidsen, *Phys. Rev. E* **97** (3), 033002 (2018).
[3] J. Baró, et al., *Phys. Rev. Lett.* **120** (24), 245501 (2018).
[4] S. Saichev, et al., *Pure and App. Geoph.* **162** (6), 1113-1134 (2005).