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Janievi, S.; Laurson, L.; Måløy, K. J.; Santucci, S.; Alava, M. J.

**Janićević et al. Reply**

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**Janićević *et al.* Reply:** Recently, we proposed a general mechanism leading to power-law distributed waiting times separating avalanches measured in a crackling-noise signal, due to their detection procedure [1]. We demonstrated its applicability for experimental and numerical data on intermittent crack front dynamics. Ramos and Stojanova (RS) argue that this mechanism would only produce power-law distributed waiting times up to the time scale set by the longest event [2]. Thus, it could not explain power-law distributed waiting times in systems such as earthquakes exhibiting a separation of time scales between the longest waiting times and the duration of the longest observed events. We strongly disagree with their comment, and point out here their misunderstanding and mistakes.

First, it is important to underline the general character and importance of our results. Considering the critical depinning of elastic manifolds [3], relevant for a wide range of systems from Barkhausen noise to earthquakes [4,5], we derived a general scaling behavior for the waiting times between avalanches detected by thresholding a crackling noise signal. Such a procedure is always necessarily applied to subtract explicitly background noise, and/or implicitly due to the limited accuracy of measurement apparatus. We verified our scaling prediction by analyzing crack front propagation in disordered media, an archetypal example of a system displaying crackling dynamics. Interestingly, those experiments share many statistical properties with seismicity catalogs [6]; moreover, the numerical model describes a wide range of systems belonging to the same “universality class,” including contact line wetting dynamics and deformation of crystalline solids [7].

Based on the results of our Letter [1], we show in Fig. 1 how the cutoffs  $T_0$  and  $T_{W,0}$  of the avalanche duration and waiting time distributions, respectively, evolve with the threshold level  $V_{th}$ . Contrary to the wrong claim of RS, for large  $V_{th}$ ,  $T_{W,0}$  is more than an order of magnitude larger than  $T_0$  for both experiments and simulations. RS confuse “real and true” avalanche events with the ones empirically detected. This confusion is probably due to the difficulty (or even the impossibility) of directly detecting those “true” events, the cutoff duration of which sets the maximum of the empirical  $T_{W,0}$ . At the critical point of the depinning phase transition [3,4], this time scale *diverges*, implying that a high enough  $V_{th}$  may result in an arbitrarily large time-scale separation between the empirical  $T_0$  and  $T_{W,0}$ .

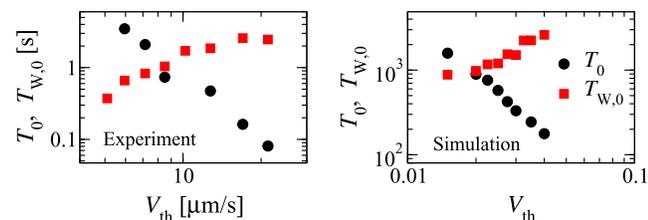


FIG. 1. Scaling of the cutoffs of the avalanche duration and waiting time distributions,  $T_0$  and  $T_{W,0}$ , respectively, with the threshold level  $V_{th}$  for crack propagation experiments (left) and simulations of the crack line model (right).

Furthermore, RS claim that “there are no earthquakes with durations larger than a few minutes to be broken into subavalanches by a given threshold.” Unfortunately, this statement is also wrong, due to the very same confusion. Because of the limited accuracy of seismograms (among various other difficulties) [8], seismicity catalogs are only complete above a finite earthquake magnitude (estimated to be as high as 3 for the Southern California Seismic Network [9]): low levels of seismic activity below such magnitudes are not recorded in typical catalogs. Nevertheless, slow slip events, lasting several months, and also called “silent earthquakes” since imperceptible to seismograms, have been detected thanks to the use of GPS networks and shown to trigger large quake events [10].

Finally, RS propose “toughness correlations” as an alternative explanation for power-law distributed waiting times. However, the critical depinning dynamics we studied does not require structural correlations but arises from the interplay between elasticity, short-range correlated disorder, and slow external driving. Ultimately, the question of which mechanism is responsible for the empirical observations of interevent correlations in a given system should be tested in each case, e.g., by employing our scaling predictions as discussed after Eq. (1) of our Letter [1], since various mechanisms including inertial effects or viscoelasticity [11] could also play a role.

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S. Janićević,<sup>1</sup> L. Laurson,<sup>1,2,\*</sup> K. J. Måløy,<sup>3</sup> S. Santucci<sup>3,4,5</sup> and M. J. Alava<sup>1</sup>

<sup>1</sup>COMP Centre of Excellence Department of Applied Physics, Aalto University

P.O. Box 11100, 00076 Aalto, Espoo, Finland

<sup>2</sup>Helsinki Institute of Physics Department of Applied Physics, Aalto University

P.O. Box 11100, 00076 Aalto, Espoo, Finland

<sup>3</sup>Department of Physics, University of Oslo

PB 1048 Blindern, NO-0316, Norway

<sup>4</sup>Laboratoire de physique, CNRS UMR 5672 Ecole Normale Supérieure de Lyon

46 Allée d’Italie, 69364 Lyon Cedex 07, France

<sup>5</sup>Lavrentyev Institute of Hydrodynamics

630090 Novosibirsk, Russia

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\*[lasse.laurson@aalto.fi](mailto:lasse.laurson@aalto.fi)

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