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► **To cite this version:**

D Bonamy, J Barés, A Dubois, M L Hattali, D Dalmas. Statistical organization of acoustic events induced by the slow propagation of a single crack in a heterogeneous solid. 14th International Conference on Fracture 2017 (ICF-14), Jun 2017, Rhodes, Greece. hal-04443411

**HAL Id: hal-04443411**

**<https://hal.science/hal-04443411>**

Submitted on 7 Feb 2024

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# Statistical organization of acoustic events induced by the slow propagation of a single crack in a heterogeneous solid

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In heterogeneous materials under slowly increasing compressive loading, damaging processes are sometimes erratic, with random sudden cascades of microcracking events spanning a variety of sizes. Such so-called crackling dynamics [1] are e.g. revealed by the acoustic emission accompanying the compressive failure of porous materials or, at much larger scale the seismic activity going along with earthquakes (see [2] for review). In both cases, statistical analyses have revealed complex time-energy organization in mainshock-aftershock sequences obeying a range of robust empirical scaling laws [3] (Gutenberg-Richter and Omori-Utsu being the most well-known) that help carry out seismic hazard analysis and damage mitigation. These laws are usually conjectured to betray the collective dynamics of microcrack nucleation.

The experiments presented at CFRAC were designed to unravel to which extent such a seismic-like time energy organization for acoustic events (AE) hold in the much simpler situation of a single propagating. Such cracks were slowly driven in artificial rocks under tension [4] and the statistical organization of the so produced acoustic events was characterized. This organization shares some similarities with that observed in compressive or shear fracture and, at much larger scales, in earthquakes. Some specific features however emerges and, as will be discussed at CFRAC, constraint the seismic laws and their interrelations.

## References

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- [4] J Barés, ML Hattali, D Dalmas, D Bonamy Fluctuations of global energy release and crackling in nominally brittle heterogeneous fracture, *Phys. Rev. Lett.* 2014, 113:2614301.