# Microstructural and rate effects in crackling noise systems

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**Abstract**

The scale invariant statistical distributions observed in crackling systems are usually interpreted as universal laws, regardless of the specific characteristics of the process. In this talk, we report measurements of different variables during twin boundary motion in Ni-Mn-Ga and martensitic phase transformation in Cu-Al-Ni; both are induced under uniaxial compression. We show that the distributions of certain variables demonstrate a power law while the distributions of other variables are centered around a most probable value (e.g., normal or log-normal distributions). The latter, reveal characteristic scales that are determined by the microstructure or by the kinetic law of the physical process. In addition, we show that the distribution of part of the variables is rate-sensitive, while others are not. We discuss these observations in light of the physical characteristics of the investigated systems. In particular, we distinguish between events that occur at different length, energy and time scales and discuss the sensitivity of different measurement methods to events that occur at different scales.