# INTERMITTENCY OF PLASTIC EVENTS IN MICROSCOPIC CRYSTALS

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The process by which many crystalline materials irreversibly deform without cracking (plastic deformation) is due to dislocation motion. Temporal intermittency, scale invariant distributions of plastic slip (plastic avalanches) and crackling noise are commonly reported in experimental and theoretical studies involving collective dislocation dynamics [1,2] at mesoscopic scales. Yet, only very recent indentation tests on metal microcrystals had also provided direct experimental evidence of size-dependent fluctuations and scale-invariant intermittent plastic flow at these small scales [3].
The investigation of size effects on the mechanical properties of micrometer- to nanometer scale systems is fundamental for modern technological applications. Here, we present results obtained from the numerical simulation of small colloidal crystals under constant strain-rate compression tests. We observe a serrated-like flow response of the stress measured on the driving walls corresponding to heterogeneous sequences of elastic loading and stress release during plastic deformation, and step changes or discontinuities in the corresponding displacement-strain curves. Plastic slip seems to be power-law distributed in good agreement with experimental observations in these crystals. Moreover, the spatial distribution of slip steps, the influence of the driving rate, as well as size and shape effects are extensively analyzed and discussed.

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[2] M.-C. Miguel et al., Nature **410**, 667 (2001).

[3] D.M. Dimiduk et al., Science **312**, 1188 (2006).