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"Crackling at the mesoscale: Micromechanical modeling of dynamic plasticity"

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Αίθουσα σεμιναρίων στο ισόγειο του ΕΙΕ

Crackling at the mesoscale: Micromechanical modeling of dynamic plasticity

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Crystal plasticity displays a complicated set of behaviors, dependent on the form of the mesoscale dislocation microstructure. Inhomogeneous features of the microstructure can give rise to unconventional dynamic features, posing an obstacle for generally applicable constitutive plasticity laws. In micron-sized crystals these dynamic effects become clear: Plasticity is intermittent and the strain-burst probability distribution is strain-rate dependent. First, I will demonstrate a simple stochastic continuum dislocation density model that explains how the rate effect stems from the interplay of intermittency with a viscoplastic mechanism that may be associated to natural kinematic hardening effects. Then, I will provide evidence that the mechanism for the aforementioned rate dependence can be applied to a wide range of continuum models and is associated to a general non-linear dynamical phenomenon known as self-induced stochastic resonance.