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Anelastic Effects on Reverse Loading – Connection to Evolving Dislocation Structure¹ NATHAN BARTON, RYAN AUSTIN, Lawrence Livermore Natl Lab, JUSTIN BROWN, Sandia National Laboratories, MOONO RHEE, Lawrence Livermore Natl Lab — Many experiments of interest, particularly those meant to probe flow strength response, involve reversals in the loading condition. Transients during the material response during these reversals can significantly influence experimental observables. In materials for which deformation is mediated by the motion of dislocations, aspects of the transients are thought to be associated with motion of dislocations during the transient; and the strains so produced are sometimes described as being anelastic. Appropriate formulations for anelastic response can be distinct from standard models used to capture plasticity response over larger monotonic strains. We present results from a new anelasticity formulation and its numerical implementation. In this formulation, the anelastic strain production is influenced by the characteristics of the dislocation network, with these characteristics evolving over the course of material deformation.

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