A Model of Glassy Polymers that Includes both Spatial and Temporal Fluctuations GRIGORI MEDVEDEV, JAMES CARUTHERS, Purdue University — Glass forming polymers near and below Tg are dynamically heterogeneous as has been found via a number of experimental techniques, where the dynamic heterogeneity is the probable cause of the non-exponential decay of the orientation correlation function of probe molecules embedded in polymer matrix as well as "breaking" of the Stokes-Einstein relations for rotational and translational diffusion. Although dynamic heterogeneity in glassy polymers is well established, constitutive models for describing the mechanical behavior employ quantities that ignore fluctuations. Consequently, the mechanical implications of dynamic heterogeneity are largely unexplored. In this talk we report on a finite element type model, where the local relaxation times in the material experience fluctuations, i.e. both the temporal and spatial nature of the fluctuations is explicitly acknowledged. The stochastic force between neighboring domains is assumed to be uncorrelated; however, since neighboring domains tile space, there is spatial and temporal correlation in the stochastic response of the system. The mechanical response of the sample under different deformation histories, including constant strain rate tensile and compressive loading as well as creep under constant load, will be presented.

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