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**3D X-Ray Microscopy and Dislocation Dynamics Simulation Investigation of Deformation in Copper**[1] B. C. LARSON, ORNL, JIE DENG, ANTER EL-AZAB, FSU, J. Z. TISCHLER, ORNL — We have combined submicron resolution 3D x-ray microscopy measurements at the Advanced Photon Source and discrete dislocation dynamics (DD) simulations to initiate fundamental investigations of deformation in metals. Half-micron resolution 3D x-ray microscopy measurements of local plastic rotation deformation were performed on initially dislocation free Cu single crystals that were compression deformed axially along [100] to strains varying from 1% to 7.6%. Accordingly, dislocation dynamics simulations of axial [100] deformation in fcc Cu were performed for strains ranging up to 1.6%. The overlapping range of the measured and simulated strain magnitudes provides the first direct and quantitative link on mesoscopic length scales between first principles simulations of deformation and submicron resolution deformation measurements. Quantitative comparisons between the measured and simulated local lattice curvatures will be presented in graphical and statistical form.

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