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Dynamics of colloidal particles in ice MELISSA SPANNUTH, S.G.J. MOCHRIE, Yale University, S.S.L. PEPPIN, Oxford University, J.S. WETTLAUFER, Yale University — Solidification of the solvent phase of a colloidal suspension occurs in many natural and technological settings and is becoming a popular technique for creating microporous structures and composite materials. During freezing, regions of high particle density can form as particles are rejected from the growing solid and guided into a variety of macroscopic morphologies. The particles in the high density regions form an amorphous colloidal solid that deforms in response to internal and external stresses. Using X-ray Photon Correlation Spectroscopy, we studied this deformation for silica particles in polycrystalline ice. We found that the particles in the high density regions underwent ballistic motion coupled with a non-exponential decay of the intensity autocorrelation function (ACF) that transitions from a stretched to a compressed exponential with increasing scattering vector q. While ballistic motion and a compressed exponential decay of the ACF is common, the coupling with a stretched exponential decay is very rare and a transition with increasing q has not previously been reported. We explain this behavior in terms of ice grain boundary migration.

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