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Role of Phonons in Heavy Fermion Volume Collapse within the Periodic Anderson Model M. A. MAJIDI, J. MORENO, University of North Dakota , B. MORITZ, University of Waterloo, A. MACRIDIN, M. JARRELL, University of Cincinnati, A. K. MCMAHAN, Lawrence Livermore National Laboratory — X-ray and neutron diffraction studies by Jeong et al. indicate the involvement of phonons in the volume collapse of Cerium. Lattice vibrations may also be important in other heavy fermion materials with large volume changes such as Praseodymium. Whether phonons drive the volume change, or the effect has an electronic origin and phonons play a secondary role, is unknown. We address this problem within the Periodic Anderson Model by introducing Holstein phonons coupled with the localized f electrons. We solve this model in three dimensions using the dynamical cluster Quantum Monte Carlo technique to incorporate non-local correlations. In the Kondo regime we calculate the renormalized d-f hybridization with respect to the on-site Coulomb repulsion and the electron-phonon coupling at various temperatures. We also investigate the temperature dependence of the isotropic ionic displacements and compare them with Jeong's experimental results.

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