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Damped motion of one-dimensional Bose gases in an optical lattice[1] IPPEI DANSHITA, Department of Physics, Waseda University, Tokyo, Japan, CHARLES W. CLARK, NIST, Gaithersburg, MD — We study strongly correlated one-dimensional Bose gases in a combined harmonic and optical lattice potential. Using the time-evolving block decimation method, we simulate the dynamics of the Bose gases subject to a sudden displacement of the confining potential as was done in a recent experiment [C. D. Fertig et al., Phys. Rev. Lett. 94, 120403 (2005)]. We find that damping of the dipole oscillations of the Bose gases is significant even for shallow lattices and that the Bose gases become almost immobile as the lattice depth increases. These results are consistent with the experiments. We also find prominent growth of the noncondensate fraction of the Bose gases associated with the damping, which means that the damped motion is due to the breakdown of superfluidity of the Bose gases.

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