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**Atom loss in a matter-wave soliton train** RICK MUKHERJEE, KADEN R. A. HAZZARD, Rice University — Solitons are localized perturbations that propagate and collide without distortion, which appear in integrable models. One such notable model is the Gross-Pitaevskii equation realized in Bose-Einstein condensates (BEC), which allow one to control the model parameters and tunably break integrability. One approach to forming solitons in a BEC is to sweep the interaction strength to a negative value, forming a train of $\sim 10$ matter-wave solitons . Even though this was realized in a BEC over a decade ago, questions remain about details of their formation and decay. For example, which properties are manifestations of the physics of single solitons, and which arise from inter-soliton interactions? Recent experiments at Rice University find surprising behavior in the atom loss after an interaction quench. To understand the atom loss mechanism better, we numerically solve the Gross-Piteaevskii equation including dissipation. We compare these results to simpler analytic models that include the effects of dissipation in simplified manners, for example including the effect of dissipation by a rate equation. We find that some aspects of the non-trivial behavior of the number of atoms can be captured by simple models of single soliton physics.

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