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Replacing dark matter with a slow force ELIZABETH LOGGIA, KRIS SIGURDSON, Univ British Columbia — Historically, dark matter emerged to explain inconsistencies in general relativity and galaxy rotation curves, and it has since had success through indirect observation. However, after several decades of searching, there have not been any direct detections, and the constraints on dark matter keep increasing. As such, it is important to explore alternatives. One alternative theory is to describe gravity as an entropic force, implying it is an emergent phenomenon rather than a fundamental interaction. This theory serves as motivation for the toy model presented here. Instead of dark matter, we consider an extra force. This force couples to baryonic matter and acts in much the same way that gravity does, but with an important distinction: speed. Where gravitational interactions propagate at the speed of light, the interactions from this new force propagate more slowly. The idea is to explore how this delayed gravity-like force affects the dynamics of baryonic matter that were originally explained via dark matter. Theories associated with dark matter have a rich phenomenology. As the parameter space for dark matter continues to shrink with ongoing experiments, this study will provide important insight into the validity of theories alternative to dark matter.

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