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Ultralight Dark Matter in the Solar System: Analytic Approaches and Detection ANGELINA PARTENHEIMER, NOAH ANDERSON, TIMOTHY WISER, Truman State University — A small amount of dark matter gravitationally bound to the protosolar nebula could result in a significant density at Earth (comparable to or greater than the local galactic halo density) after adiabatic contraction during the formation of the Sun. We use analytic approaches to estimate the fraction of such dark matter that could remain in stable, Earth-crossing orbits today, if it interacts only gravitationally. We find that a significant fraction of phase space is long-lived in the presence of gravitational perturbations from Jupiter and from Earth. Finally, a lower velocity dispersion makes dark matter bound to the Solar System a promising target for resonant-type detectors searching for axions or dark photons. In particular, this low velocity dispersion could be distinguished by the high-resolution setting of the ADMX experiment. We conclude that a detectable amount of Solar System dark matter could remain in bound orbits today, and would have distinct observable signatures in direct detection experiments.

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