Conformal Gravity Rotation Curves for the THINGS Survey

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Abstract

The use of Galactic Rotation Curves has long been thought to provide evidence for the existence of Dark Matter. Although dark matter is currently the commonly accepted solution to the discrepancies found in galactic rotation curves between observation and theory [**?**], numerous dark matter alternative theories are beginning to emerge as possible solutions as well, in part because the galactic halos used in dark matter fits involve one or two extra external free parameters per galaxy. Among these alternative theories, the Conformal Gravity theory first presented by Weyl and recently advanced by Mannheim and Kazanas [**?**] presents a renormalizable, fourth order theory, which does not assume the existence of dark matter, nor is inferred as an ad hoc addition to standard gravity. Instead it provides a working alternative to the standard gravity picture, which is well defined and derived from a fourth order general coordinate invariant action. Moreover, Conformal Gravity can serve to define the rotation curves of spiral and dwarf galaxies with no external free parameters, thus eliminating the ambiguity of the current dark matter halo mass models. The THINGS survey is a recent sample of 18 galaxies, consisting of both dwarf and spiral galaxies, at distances between 2 and 15 Mpc [**?**]. This survey combines high resolution photometry data from the SINGS Survey [**?**], as well as the newly obtained HI data to produce well defined rotation curves [**?**]. We thus apply the conformal theory to the THINGS data to produce rotation curves that fit the data with very high accuracy without the need for dark matter. The results yield rotation curves, which being parameter free, are strikingly more convincing than those of the standard gravity with dark matter.

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