U04a Discriminating Gravitational Potential Models on Galactic Scales

Haixia Ma (1), Xiaobo Dong (2), Yongda Zhu (3), Zhaoran Liu (4) ((1) Nagoya University; (2) Yunnan Observatories, Chinese Academy of Sciences; (3) University of California, Riverside; (4) Tohoku University.)

The dynamics of gas and stars in and around galaxies have been observed to be in excess of the Newtonian gravity of the total baryonic content of the galaxies. The tight couplings (e.g., the Tully–Fisher relation) between the excess gravity and the baryonic content have inspired modified gravity theories such as "modified Newtonian dynamics" (MOND) proposed by Milgrom (1983), instead of the popular cold dark matter (CDM) paradigm. So far, however, no observational test is conclusive for the two competing paradigms on galactic scales. We propose a set of new tests based on the latest widely-used mass profiles and recently obtained kinematic observations of the Galaxy and the Andromeda galaxy. And we creatively use the two independent Jeans equations, R-directional and z-directional, as two determinants of the consistency between gravitational potential models and kinematic data. The technique is a more independent universal test, in comparison to the popular two-integral velocity dispersion test, and is also independent from the traditional rotation curves comparisons. I will present our results and discuss the implications for these gravitational potential models.