Deficient Reasoning for Dark Matter in Galaxies

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Abstract. In this universe, not all of the matter around us can be readily seen. The further an object is away from us and the less luminous it is, the less visible it becomes. Just by looking at an object is usually difficult, if not impossible, to tell the amount of mass it contains. But astronomers have been using the measured luminosity to estimate the luminous mass of stars, based on empirically established mass-to-light ratio which seems to be only applicable to a special class of stars---the main-sequence stars---with still considerable uncertainties. Another basic tool for astronomers to determine the mass of a system of stars or galaxies comes from the study of their motion, as Newton demonstrated with his law of gravitation, which yields the gravitational mass. Because the luminous mass can at best only represent a portion of the gravitational mass, finding the luminous mass to be different or less than the gravitational mass should not be surprising. Using such an apparent discrepancy as compelling evidence for the so-called dark matter, which has been believed to possess mysterious nonbaryonic properties having a dominant amount in galaxies and the universe, seems to be too far a stretch when seriously examining the facts and uncertainties in the measurement techniques. In our opinion, a galaxy with star type distribution varying from its center to edge may have a mass-to-light ratio varying accordingly. With the thin-disk model computations based on measured rotation curves, we found that most galaxies have a typical mass density profile that peaks at the galactic center and decreases rapidly within 5% of the cut-off radius, and then declines nearly exponentially toward the edge. The predicted mass density in the Galactic disk is reasonably within the reported range of that observed in interstellar medium. This leads us to believe that ordinary baryonic matter can be sufficient for supporting the observed galactic rotation curves; speculation of large amount of non-baryonic matter may be based on an ill-conceived discrepancy between gravitational mass and luminous mass which appears to be unjustified.