Contribution ID: **4** Type: **not specified**

Dark matter, general relativity and the rotation curve of UGC 128

Tuesday 11 December 2018 12:10 (20 minutes)

General relativity can be used to fit the rotation curves of galaxies with less dark matter than it is necessary when other theories of gravitation are applied. In this approach a galaxy is modelled as low density baryonic dust in stationary, axially-symmetric rotation, in which case it has already been shown that non-linear gravitational effects play a significant role in the overall motion of matter. The fits can be used to determine mass densities as functions of galactocentric distances and heights, therefore yielding galactic masses. As a first approximation to their morphologies, we discovered that new information about the galaxies can be obtained from their mass-density functions. Our pproach is applied here to the galaxy UGC 128, whose results are compared to those previously obtained for NGC 2403. Studies comparing these two galaxies were published before, either assuming the existence of dark matter or using MOND. These two galaxies are at identical positions on the Tully-Fisher relation, having almost identical luminosities. As well, they have almost identical rotation velocities and they are morphologically very similar. However, they display large differences in surface brightness. Despite their almost identical rotational velocity profile, using our approach we found that their mass density profiles may be significantly different. In this poster we will display our results and highlight their implications for the understanding of the nature of dark matter.

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