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Dark matter halo shapes in the Auriga simulations

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We present shape measurements of Milky Way-sized dark matter halos at redshift $z = 0$ in a suite of 30 zoom simulations from the Auriga project. We compare the results in full magnetohydrodynamics against dark matter only simulations and find a strong influence of baryons in making dark matter haloes rounder at all radii compared to their dark matter only counterparts. At distances $\sim$ 30 kpc, rounder dark matter distributions correlate with extended massive stellar discs and low core gas densities. We measure the alignment between the halo and the disc shapes at different radii and find a high degree of alignment at all radii for most of the galaxies. In some cases the alignment significantly changes as a function of radius implying that the halo shape twists; this effect correlates with recently formed bulges and is almost absent in the dark matter only simulations. In a comparison against observational constraints we find that 20% of halos in our sample are consistent with observational results derived from the Pal 5 stream that favours an almost spherical shape. Including baryons is a required element to achieve this level of agreement. In contrast, none of the simulations (neither dark matter only nor with baryons) match the constraints derived from the Sagittarius stream that favour an oblate dark matter halo.

Authors: PRADA, Jesus (Uniandes); FORERO-ROMERO, Jaime (Uniandes); GRAND, Robert (Max Planck for Astrophysics); PAKMOR, Ruediger (Max Planck for Astrophysics); SPRINGEL, Volker (Max Planck for Astrophysics)

Presenter: FORERO-ROMERO, Jaime (Uniandes)

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