Thaxted Astronomical Society

News
Features

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Milky Way is Much Bigger Than Thought

https://www.dailymail.co.uk/sciencetech/article-8146523/Milky-Way-extends-1-9-MILLION-light-years-thanks-dark-matter.html

Edge of the Galaxy: Milky Way is bigger than astronomers first thought after a study finds it extends 1.9 MILLION light years across - and most of that is dark matter

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- The Milky Way disc of which Earth is part has a diameter of 260,000 light years
- Most of the Milky Way is made up of a dark matter halo surrounding the disc
- Astronomers discovered the size by looking at neighbouring dwarf galaxies

The Milky Way galaxy is a staggering 1.9 million light years across, according to a new study, but most of it is made up of dark matter.

Astronomers from Durham University calculated the true size of our galaxy by looking at the gravitational pull of smaller neighbouring galaxies.

The actual Milky Way disc, made up of stars, black holes, planets moons and other stellar objects is 260,000 light-years across - a fraction of the total galactic size.

The rest of the Milky Way is made up of the invisible 'dark matter halo' - that is a vast sphere of dark matter enveloping the galactic disc than can't be directly observed.

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Dark matter can only be detected by the impact its gravity has on other objects - it can't be directly observed, according to astronomers.

Astronomers realised the Milky Way is surrounded by a sphere of dark matter after observing that the stars on the outer edge of the disc move faster than they should be moving based on the gravitational influence of detectable matter.

A team led by astrophysicist Alis Deason from Durham University set out to see just how far this sphere of invisible matter actually extended from the edge of the disc.

'In many analyses of the Milky Way halo its outer boundary is a fundamental constraint,' Deason wrote in the paper.

'Often the choice is subjective, but as we have argued, it is preferable to define a physically and/or observationally motivated outer edge.

'Here we have linked the boundary of the underlying dark matter distribution to the observable stellar halo and the dwarf galaxy population.'

They used the way dark matter interacts objects around it as a starting point to see whether there was an obvious drop off in interactions towards the edge.

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The team started by creating a simulation of the dark matter haloes of Milky Way sized galaxies on their own and alongside other smaller galaxies.

They created a virtual version of our local group - a collection of galaxies about 9.8 million light years across that includes the Milky Way and Andromeda.

Andromeda, our nearest large galactic neighbour, was a major focus for the team as the Milky Way is due to collide with the galaxy in 4.5 billion years and already has some gravitational interactions.

It is about 2.5 million light-years away from the Milky Way at the moment but is getting closer.

The simulations allowed them to model the way the Milky Way's dark matter halo would look and interact with other objects.

They were able to show that beyond the dark matter halo the radial velocity - that is the orbital speed of objects moving around the galaxy - dropped off noticeably.

Deason and team compared their simulations to actual observations of nearby dwarf galaxies - because they can't observe the entire Milky Way from within it.

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The observations of other galaxies in our Local Group matched the simulations and proved the sudden drop in radial velocity - allowing them to calculate the diameter.

In the dwarf galaxies this boundary was 950,000 light-years.

They doubled that figure to get the diameter of the dark matter halo surrounding the Milky Way - and the actual full diameter of the Milky Way - 1.9 million light-years.

Deason says more refinement is needed of this figure as calculating the diameter wasn't the main focus of their work - so it is likely to vary.

The team say it could be used to find the boundaries for other galaxies and determine exactly how far apart galaxies actually are.

'There is great hope that future data will provide a more robust and accurate measurement of the edge of the Milky Way and nearby Milky Way-mass galaxies than the one we have presented here,' the team said.

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WHAT IS DARK MATTER?

Dark matter makes up roughly 27 percent of the Universe, and is invisible because it does not reflect light.

It cannot be seen directly with telescopes, but astronomers know it to be out there because of the gravitational effects it has on the matter we can see.

The European Space Agency says: 'Shine a torch in a completely dark room, and you will see only what the torch illuminates.

'That does not mean that the room around you does not exist.

'Similarly we know dark matter exists but have never observed it directly.'

Scientists are fairly sure it exists and is crucial to the universe, but they do not know what it looks like or where to find it.

Dark matter is thought to be the gravitational 'glue' that holds the galaxies together, while just 5% the Universe consists of known material such as atoms and subatomic particles.