DWARF GALAXIES

One halo mass to rule them all

Astron. J. (in the press); preprint available at https://arxiv.org/abs/1911.09694

Credit: NASA/JPL/Caltech

Dwarf galaxies around central galaxies trace dark matter substructures within the dark matter halo of their host. As such, studying their distribution and properties can tell us something about the assembly history of galaxies and provide a direct test of the Λ cold dark matter (ΛCDM) model. Ananthan Karunakaran and collaborators find that the gas content of dwarf satellites around the spiral galaxy M101 is very similar to those around our Galaxy, in agreement with ΛCDM expectations.

The authors use the Robert C. Byrd Green Bank Telescope to measure the H I content towards 27 low-surface-brightness dwarf galaxies around M101 (pictured in the ultraviolet together with some of its satellites). Their dataset allows the association of each of these galaxies with M101 to be checked and finds that a subset of these 27 dwarf galaxies is associated either with the background galaxy group NGC 5485 or are background field galaxies. Only five H I detections are reported, while the remaining 22 low-surface-brightness galaxies get tight upper limits to their atomic gas content.

The gas richness of these dwarf galaxies can be directly compared to those of satellite galaxies around the Milky Way, given M101's similarity to our Galaxy — it is also a spiral galaxy with similar mass. Karunakaran et al. find that the two satellite populations show broadly consistent gas richness distributions, in contrast to previous results indicating that Milky Way satellites may be anomalously gas-poor. Their findings therefore confirm the idea that environmental quenching of satellites — their gas being striped by ram pressure and tidal interactions — mainly depends on the dark matter halo mass of the central galaxy.

Marios Karouzos

Published online: 12 December 2019
https://doi.org/10.1038/s41550-019-0994-6