HI line properties and relationship to star formation in nearby dwarf galaxy DDO 43

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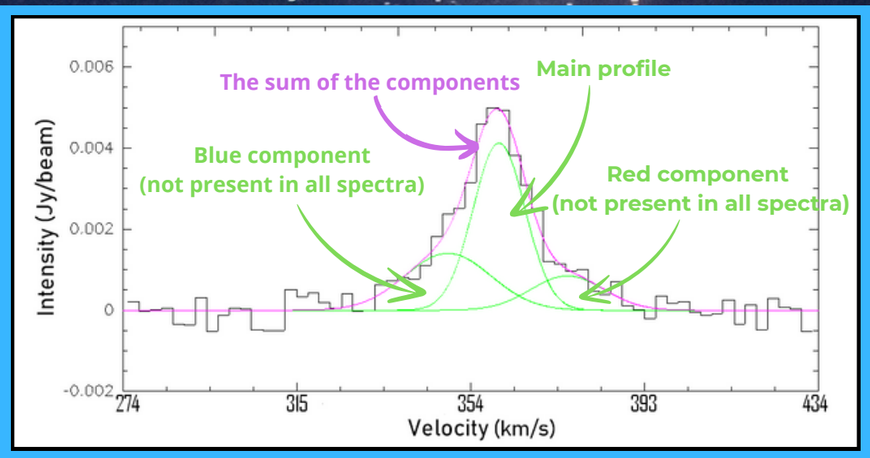
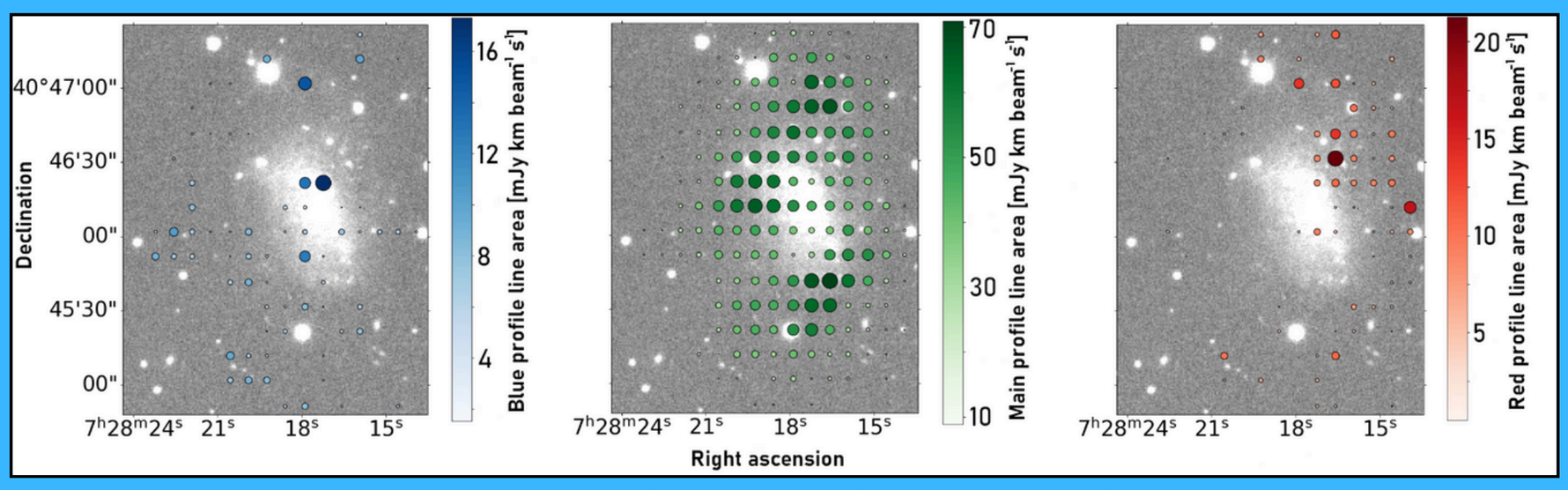
DDO 43 is an isolated irregular dwarf galaxy at a distance of 7.8 Mpc [1]. Its 21-cm HI content, tracer of star formation induced gas kinematics, was measured within the framework of the LITTLE THINGS survey [2].



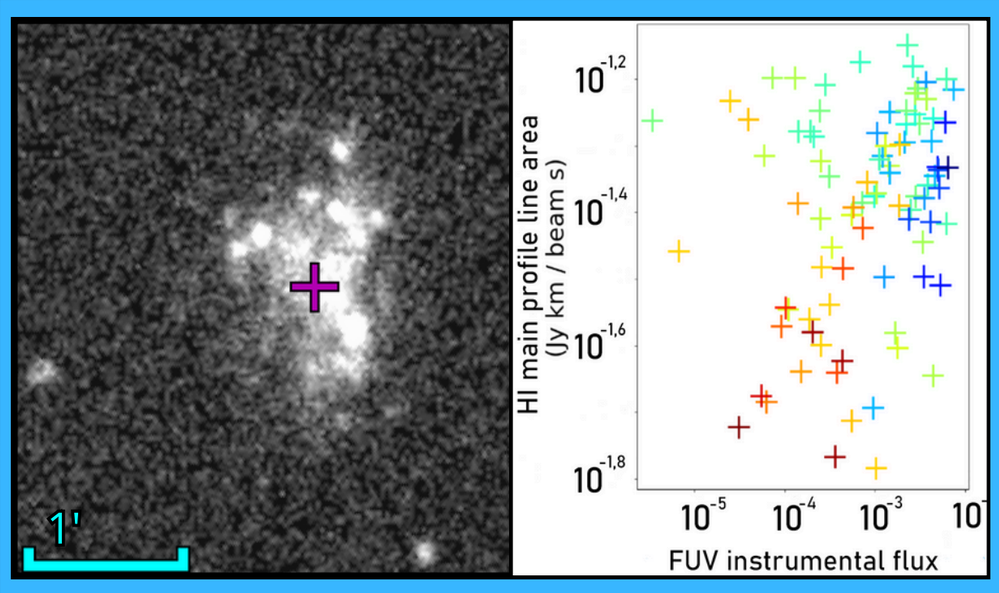
Inspecting HI spectra

Spectra with intensity higher than 2 mJy/beam were fit with Gaussian profiles in the CLASS package [3], identifying potential blue (lower velocity) and red (higher velocity) components. By examining integrated HI line areas of the components, we report our findings of local and global gas flows inside DDO 43.

What is HI like in DDO 43?



The HI line areas of the central, blue, and red components are overlaid on the optical image. Larger circles and the colourbar indicate higher values. We see significant inhomogenity in the distribution of spectral line properties. The southeast to northwest gradient in the blue-to-red components is in the same sense as the overall rotation. There are three visible maxima for the main line component (middle panel). The strengthening of the blue component on the southeastern half and the red component on the northwestern half suggest a systematic shift of velocity and intensity gradients inside each beam.

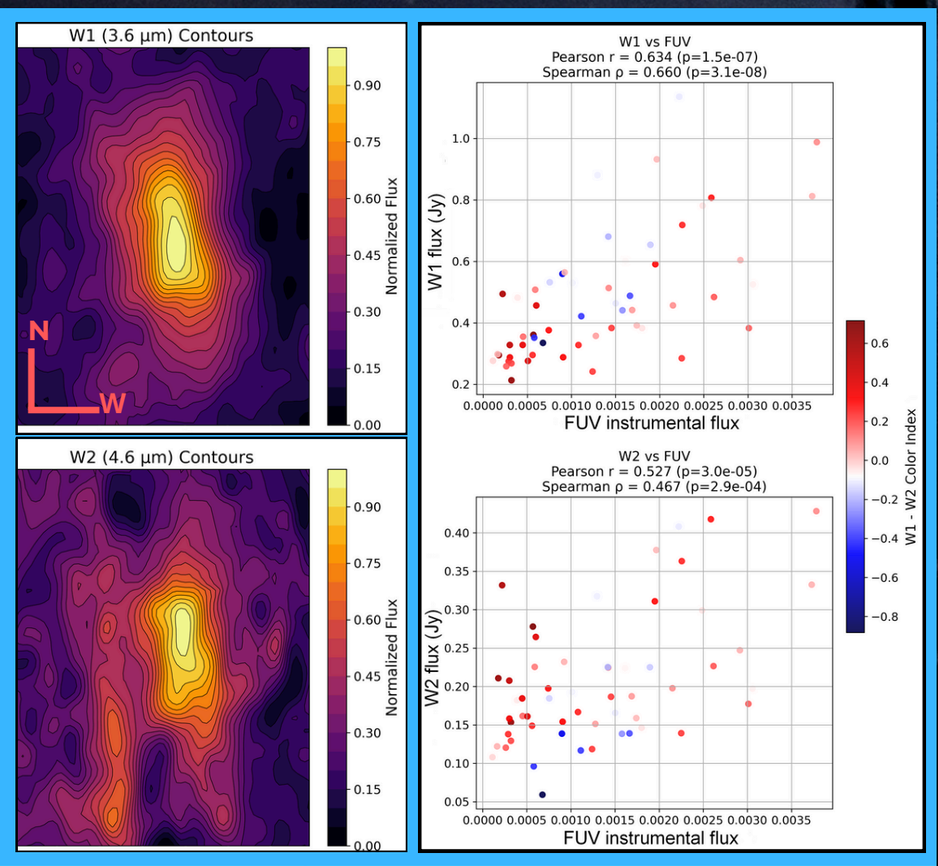


Comparison with FUV, tracer of massive star formation

GALEX far-ultraviolet image [4] traces massive star-formation areas. The purple cross indicates the galaxy's center from which the angular distance is determined on the correlation plot. FUV emission reveals young, massive stars that will contribute the most to the kinematics of interstellar gas via feedback. DDO 43's FUV is clumpy. Calculating the FUV flux in the positions of the HI spectra, the left panel was created to show the relationship between gas kinematics and star formation. We see weak correlation between HI line areas and FUV fluxes, with a Pearson coefficient of 0.39.

Comparison to infrared, tracer of dust-obscured SF areas

"What is next": On WISE infrared images of DDO 43 [5], an interesting feature shows up: W1 (3.6 μm) and W2 (4.6 μm) bands displays a difference in structure. Morphology on W2 seems to be asymmetric. IR and UV show an expected correlation, with the "second" structure on W2 deviating from the trend: there is no FUV in these data points.
Combining UV and IR data and comparing them to HI line area, we will be able to derive information about hidden star formation areas and their relationship to gas kinematics.



References: [1] Deidre A. Hunter AJ 161 71 [2] Deidre A. Hunter AJ 144 134 [3] iram.fr/IRAMFR/GILDAS [4] Deidre A. Hunter et al 2010 AJ 139 447
[5] Edward L. Wright et al 2010 AJ 140 1868

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