The line-of-sight velocity profile inferred from the Gemini GMOS-N long-slit spectra along the minor axis shows the decoupled kinematics of stars and gas in the very inner region ($r \approx 5-7$ kpc). Such a feature in the stellar kinematics in spectra along the minor axis shows the decoupled kinematics of stars and gas.

The oxygen abundances estimated in HI regions 1-8 (top left panel) at intermediate distances to the galactic centre (20-30 kpc) suggest a metallicity of ~0.3 dex, which is in good agreement with the spectroscopic estimations from GMOS-N for the central region of the galaxy, slightly subsolar values for both gas and stars.

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Spectroscopy at APO 3.5-m ARC telescope

From our long-slit spectroscopic observations performed at the 3.5-m ARC telescope, we confirm a small satellite that is projected on to the main disc of Malin 2. The mass of the satellite is small, 1/500 of that of the main galaxy, and its radial velocity is very close to that of Malin 2.

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One of the unique properties of Malin 2 turned out to be the apparent imbalance of the interstellar media: the molecular gas is in excess with respect to the atomic gas for given values of the gas equilibrium turbulent pressure.

Such position of Malin 2 in the diagram can be explained neither by errors of pressure estimate or M/L or by low conversion factor $X_{\text{H}_2}$ due to almost solar metallicity.

Most likely the reason for the apparent gas balance violation is a specific structure of the ISM in the Malin 2 disc. It can be an excess of low-mass molecular clouds and a higher fraction of unobserved dark gas with respective to normal galaxies. Once we assume the excess of the dark gas, the total gas surface density increases and reaches its critical value for the gravitational instability. This allows us to explain the observed ongoing star formation in the disc of Malin 2.

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The features of Malin 2 are different from those of non-giant LSB galaxies primarily because of the dark halo scale. The peculiar properties of this galaxy can be explained by the shallow potential well of the host dark halo and by a poor gas environment taking place during the disc formation. These factors should impose restrictions on the rate and efficiency of the accretion of intergalactic gas and they should affect the luminous matter distribution, which can lead to the formation of a low surface density disc with high scalelength.