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Feedback and Clusters in the Sdm Galaxy UGC 1281

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1. Introduction

UGC 1281is a nearby (D$\sim$ 4.2 Mpc), isolated, dwarf Sdm galaxy seen edge-on. With $M_B = -16.04$ it is somewhat less luminous than the SMC. UGC 1281 also belongs to the class of low surface brightness (LSB) galaxies, where the buildup of the stellar disk occurred more slowly or started later than in normal galaxies (Rosenbaum & Bomans 2004). Surprisingly, Mould (2005) claimed the presence of a red stellar thick disk in UGC 1281, which appears at odds with the LSB nature of the galaxy.

2. Current Star Formation Rate and Star Formation History

Based on the total Hα flux of the H II regions in UGC 1281 of 3.81 10^{-13} erg cm^{-2} s^{-1} (van Zee 2000), we can estimate a recent star formation rate of 0.006 M$_\odot$ yr^{-1} using the calibration of Kennicutt (1998), which leads to a SFR per unit area of 7.9 10^{-4} M$_\odot$ yr^{-1} kpc^{-2}. In comparison, the SFR of the SMC is 0.046 M$_\odot$ yr^{-1} (Kennicutt et al. 1995) and 1.1 10^3 M$_\odot$ yr^{-1} kpc^{-2}. With such a low current SFR it is surprising that UGC 1281 is able to create bright diffuse ionized structures (see Fig. 1a and van Zee 2000). While a detailed analysis of the star formation history based on synthetic color magnitude diagrams (CMDs) is still needed, simple isochrone comparison of our WFPC2 based CMDs already demonstrate an enhanced SF episode in the last $\sim 6 \times 10^7$ yrs with the well populated blue plume of supergiant stars, see Fig. 1b.

3. Feedback and Clusters

UGC 1281 was observed as part of the edge-on galaxy survey for diffuse ionized gas (DIG) in galaxy halos by Rossa & Dettmar (2003). They claimed a non-detection of DIG above the disk. Re-analysis of the deep Hα and R images lead us to the detection of a DIG layer. Filtering with h-transform and other adaptive filters clearly support our detection (see Fig. 1a). While the southern part of the halo may be contaminated by residual light of the bright background galaxy VI Zw 51, diffuse emission is clearly visible above the northern side of

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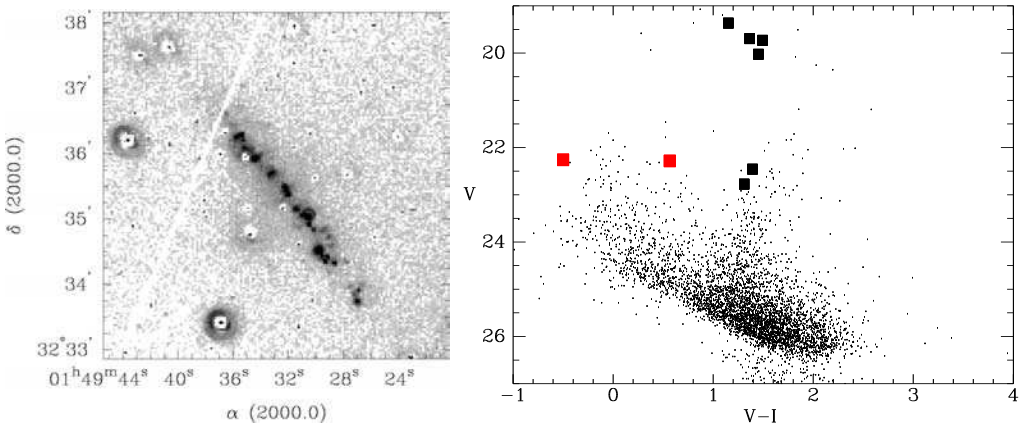

Figure 1. The left panel (Fig. 1a) shows the continuum subtracted Hα image of UGC 1281 further processed with an h-transform filter. The ionized halo is clearly discernable on the NW side of the galaxy. The right panel (Fig. 1b) shows a CMD based on the WFPC2 images of UGC 1281. The cluster candidates are marked with squares, the two blue objects (gray squares) are with high probability clusters members of UGC 1281.

the disk. There we measured a z extent of at least 55″ (1.2 kpc) and a scale height of 39″ (0.53 kpc). Interestingly, the DIG flux fraction in UGC 1281 is about 40%, higher than in LMC and SMC (Kennicutt et al. 1995).

Based on the image analysis of the WFPC2 data, we could identify 8 cluster candidates. While most of these objects appear to be linked to the background elliptical galaxy (VI Zw 51), the 2 blue objects are star clusters or dense stellar associations in UGC 1281 (see Fig. 1b). While the absence of red clusters is possible with a galaxy of this luminosity, it is still tempting to link the claimed red, thick disk to cluster destruction in the past (see e.g. Kroupa, these proceedings).

4. Conclusions

Hα imaging of UGC 1281 shows a DIG halo with a scale height of at least 500 pc despite a low current SFR. The CMD indicates an enhanced SF since about 6 10^7 yrs. UGC 1281 also contains two young star clusters. This implies that UGC 1281 just passed an exceptionally active phase in its evolution, while the thick stellar disk hints at an older active phase. We may witness an LSB galaxy building up its disk and transforming into a high surface brightness galaxy.

References

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