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A Tidal Dwarf Galaxy in the Hercules Cluster?

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Abstract. A candidate Tidal Dwarf Galaxy, ce-61, was identified in the merger system IC 1182 in the Hercules supercluster. The multi-wavelength data we obtained so far do not prove, however, that it is kinematically detached from the IC 1182 system and gravitationally bound.

The Hercules supercluster (D=150 Mpc, H_0=75) is one of the most massive structures in the nearby Universe. We studied (Iglesias-Páramo et al. 2003) 22 H I-selected galaxies in this cluster, from the blind VLA H I survey by Dickey (1997), obtaining: deep CCD B, V and I-band surface photometry of 10 galaxies, optical spectroscopy of 8 of these, Arecibo H I observations of all 22 galaxies and Hα line Fabry-Perot observati ons of the IC 1182 merger system.

Based on these multi-wavelength observations, the object ce-61 was identified as a candidate Tidal Dwarf Galaxy (TDG) in a tidal tail of the peculiar IC 1182 system. IC 1182 (B_T=15.4, V=10,223 km s^{-1}) shows several characteristics typical of a merger system, e.g., a blue optical jet-like structure towards the East and tidal debris towards the NW, and an extended H I distribution with two tidal tails, towards the E and the NW. The candidate TDG ce-61 ($M_B = -18.24$ mag) lies at the tip of the eastern optical/H I tail, at about 1.5 arcmin (65 kpc) projected distance from the centre of the parent system. Its CCD image shows two distinct peaks and the maximum in the H I tail coincides with the easternmost optical peak. Its metallicity (8.41) is on the high side for a dwarf galaxy of its luminosity, but typical for a TDG. It is a very gas-rich system, with an estimated M_{HI}/L_B ratio of 6 $M_\odot/L_{\odot,B}$; its H I line width is about 220 km s^{-1}. CO line observations (Braine et al. 2001) show about 7 10^9 $M_\odot$ of H_2 in a resolved distribution in IC 1182, but none was detected in ce-61, putting an upper limit to its H_2 mass of about 6 10^7 $M_\odot$.

In order to study whether the TDG candidate is already kinematically detached from the IC 1182 system and gravitationally bound, we obtained and analyzed Hα line Fabry-Perot observations and found (Bournaud, Duc & Amram 2003, in prep.) that: (1) the brightest knot at the tip of the tail, coinciding with ce-61, seems to be kinematically detached from the overall velocity field along the tail (which is governed by streaming motions); the offset is about 30 km s^{-1}. However, our numerical simulations show that this offset can be consistent with a projection effect along the line of sight (with the tail, seen edge-on, being bent in 3D space), (2) along direction 2 (see Fig.), there is a hint of an internal velocity gradient, of 70 km s^{-1} maximum, associated with one of the knots. We lack the spatial resolution to confirm it, however.

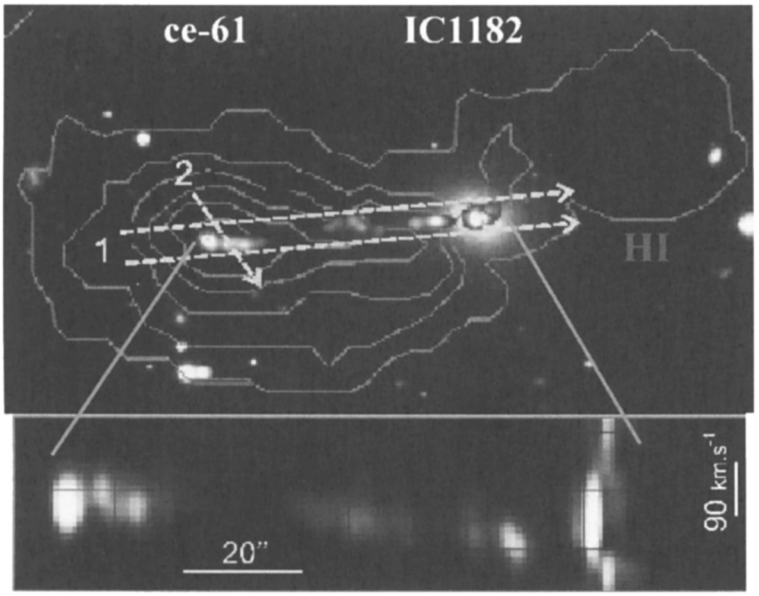

Figure 1. Hα line Fabry-Perot observations of the candidate TDG ce-61 in the merger system IC 1182: (top) the clumpy distribution of the Hα gas in the tidal tail of IC 1182, superimposed on a V-band optical image of the system + H I column density contours; (bottom) an Hα line position-velocity diagram along the tidal tail (following the lines marked '1' in the top panel).

References

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