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High Resolution H I Mapping of the Tidal Dwarf Candidate in NGC 4038/9.

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Abstract.
We present preliminary results of high-resolution (4″ FWHM) VLA B-array observations of the H I in the tidal tail of the well known merging pair, NGC 4038/9, "The Antennae". The end of the southern tail contains a concentration of gas, blue light, and star forming regions which has been identified as a possible dwarf galaxy in formation. We identify two regions with very large gas column densities, one in the vicinity of the star-forming regions at the tip of the southern tail and the other near the base of the southern tail.

1. Observations and Results

NGC 4038/9 (= Arp 244 = "The Antennae"), is one of the best-studied examples a galactic collision. It is the nearest system with an identified dwarf-galaxy sized concentration of gas, light and young stars embedded within a luminous tidal tail. Such concentrations are often referred to as "Tidal Dwarf Galaxies" (see Duc, these proceedings). Recent H I observations of the NGC 4038/9 made with the VLA in its C- and D-array configurations reveal a high concentration of neutral gas in the vicinity of the putative tidal dwarf galaxy (Hibbard, van der Hulst, Barnes & Rich 2001, AJ, submitted). However, the observations failed to reveal the kinematic signature of a separate dynamical entity at this location. It is possible that the $\sim 20''$ resolution of the C+D-array observations do not allow the gas in this region to be isolated from the surrounding tidal material. We therefore targeted this region for higher resolution VLA B-array observations.

The results of the B-array mapping are shown in Figure 1. We do find several clumps of gas with high column density ($N_{HI} \approx 3 \times 10^{21}$ cm^{-2}). These clumps are anti-correlated with the H II regions, presumably due to sweeping and ionization of the neutral gas by young stars. Assuming a distance of 19.2 kpc, the total H I mass of the dense clumps is $2 \times 10^7\ M_\odot$, an order of magnitude less than previously associated with the tidal dwarf galaxy. Since the previous VLA observations failed to provide kinematic evidence that the larger clump of gas associated with the tidal dwarf is bound, then if the smaller clumps are bound, the scale of the condensation is more in line with dwarf Spheroidals than dwarf Irregulars.

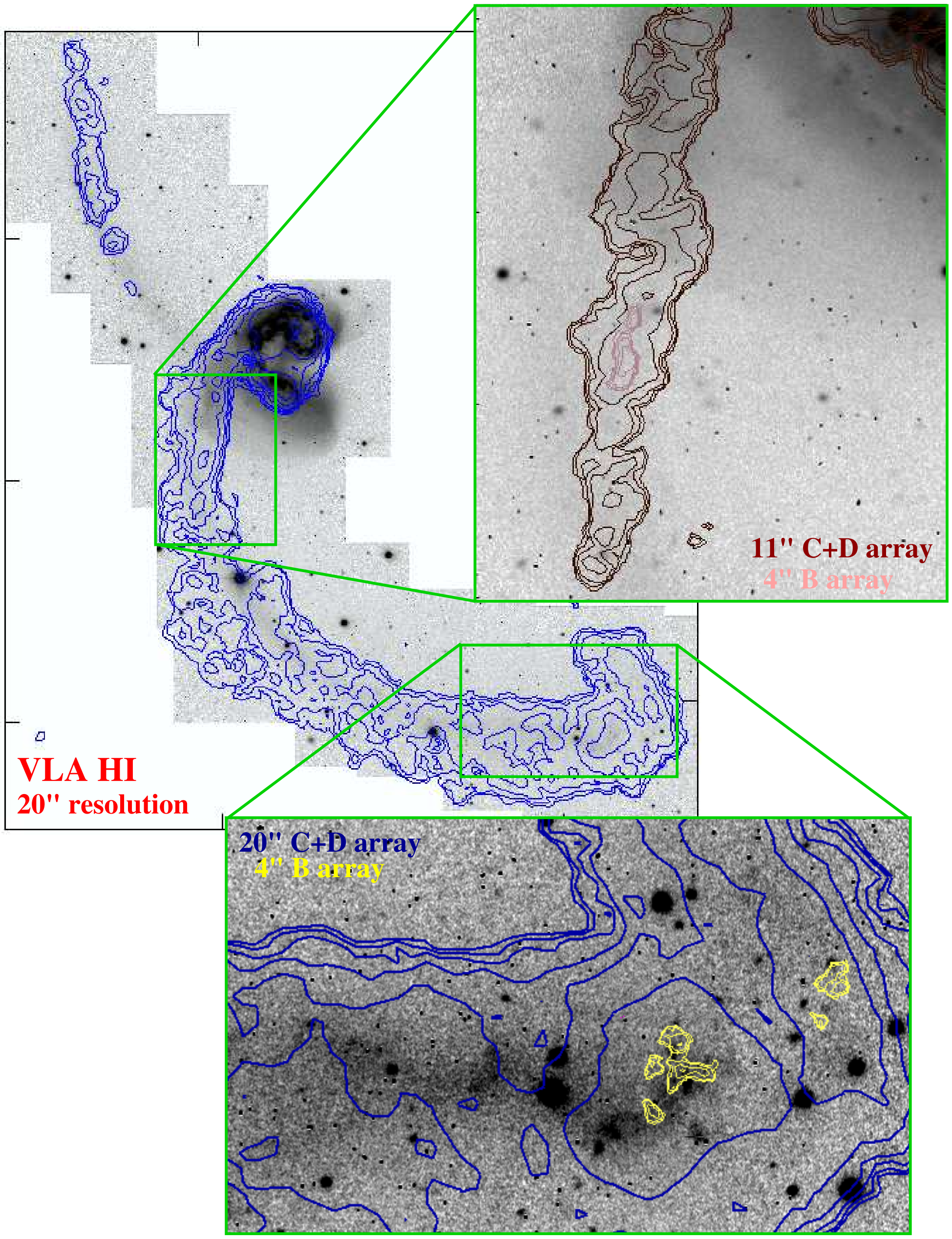

Figure 1. H I contours on an optical image of The Antennae. The dark contours are from the VLA C+D-array observations of Hibbard et al. (2001, AJ, submitted). The lighter contours are from the B-array observations reported in this paper. The lower panel shows the dense gas detected in the vicinity of the H II regions identified with the putative Tidal Dwarf Galaxy identified by Mirabel, Dottori, & Lutz (1992, A&A, 256, L19).