A GMRT H I imaging survey of the ERIDANUS group of galaxies

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Abstract. This project aims to image a subset of galaxies in the nearby Eridanus group in H I emission and in radio continuum using the GMRT. The typical resolution of H I images will be $\sim$1 kpc with a 3σ sensitivity to H I mass of a few times 10^7 $M_\odot$. The rotation curves obtained using the H I velocity field together with the 2MASS magnitudes in the near infrared will be used to construct the Tully-Fisher relation for this group. High resolution (sub-kpc) multi-frequency radio continuum images will be used to study star-formation rates, radio morphologies and spectral indices of Eridanus galaxies. About half of the galaxies have already been observed and further observations on some late type galaxies are proposed with the GMRT. We present here the H I image and the rotation curve for a member of this group viz. NGC 1385.

Keywords : Galaxy – H I: Galaxy – ISM: group – galaxy

1. Introduction

Eridanus is a nearby group of galaxies at a distance of $\sim$20 Mpc. The group members are arranged in a filament-like structure joining Fornax and Dorado clusters of galaxies. Total number of optically identified galaxies in this group is $\sim$ 100. This group has an almost equal number of early type and late type systems. The redshift is known for all the galaxies through optical spectroscopy. The velocity dispersion of this group is $\sim$ 350 km s^{-1}. The dynamical study of this group shows that the group is a bound system comprising of several sub-groups (Willmer 1989). These sub-groups are merging together and will eventually evolve to a massive cluster.

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2. Motivations for the present study

The GMRT data of H I emission and radio continuum from the Eridanus galaxies, combined with the existing optical and infrared data will be used to study −

1. Rotation curves of the disk galaxies
2. Tully-Fisher relation using the rotation curve and 2MASS magnitudes
3. M/L ratios and dark matter halos of the disk galaxies
4. Star formation rates in the disk galaxies
5. Radio continuum morphology and spectral indices of galaxies

3. Results

We have observed 26 pointings, each with a field of view of ∼24', using the GMRT and most of the data have been analysed. Further observations are proposed with the GMRT. The H I image and the rotation curve of NGC 1385, a member of this group, are shown in figure 1.
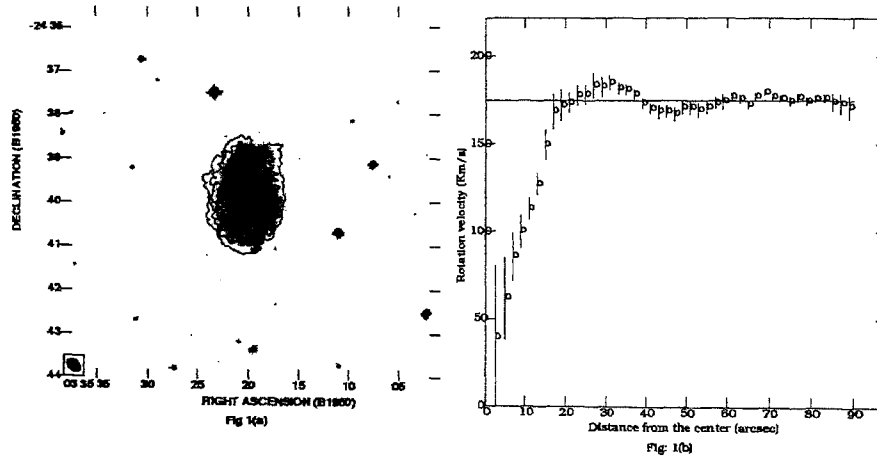
Figure 1. 1(a). The H I column density contours of NGC 1385 are shown overlaid upon the DSS image. The contour levels are 1, 3, 5, 7, 9 in units of 4.0×10^{20} cm^{-2}. The H I mass is 2×10^9 M$_\odot$. The synthesised beam (20" × 14") shown in the lower left corner corresponds to a resolution of ∼1 kpc. 1(b). Rotation curve of NGC 1385 constructed using the H I velocity field. The velocity resolution is ∼ 13 km s^{-1}. 1' corresponds to a linear distance of ∼5 kpc.

References

Willmer, C. N. A. et al., 1989, Astr. J., **98**, 1531.