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H I Image Synthesis of Southern Compact Groups

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Abstract.

Four southern compact groups, the Hickson Compact Groups HCG 22 and HCG 26 (Hickson 1982), and the groups AM 1238−396 and ESO 410-G(024−026) have been imaged in H I, along with 12 cm continuum using the Australia Telescope Compact Array (ATCA). The initial findings for the latter two groups are presented here. While ESO 410-G is not in fact a physical group, due to the discordant redshifts amongst the members, it is however presented here.

Overall for all the groups we find no other sources of H I in the field that might indicate that these are part of a larger loose group structure. This is not always the case, as with HCG 23 (Williams 1995) and HCG 95 (Hutchmeier 1999), both of whom find additional H I sources within the primary beam accordant with the compact group's velocity.

The H I is also clearly associated with each of the individual member galaxies in all cases, except for HCG 26, which envelopes the whole group as was also shown by Williams and van Gorkom (Williams 1995).

1. The Groups

1.1. AM 1238−396

This group consists of three spirals, all containing H I and two of which also show continuum emission. It is a fairly tight group, with the separation being on the order of the optical diametres of the galaxies, ~20 kpc. The galaxy labeled **b**, also known as Tololo 74, a Seyfert 2 galaxy, (Ulvestad and Wilson 1989), shows an H I bridge which connects with **a**, in position space, but not in velocity space, as can be seen from the integrated H I map in Figure 1. (The figures presented in this paper were all generated using a $\sim 2\sigma$ cutoff level, after all the initial reduction procedures had been performed. The maps were also smoothed in the spatial domain to remove small scale irregularities). The velocity contours and the integrated H I map from Figure 1, do indicate that there is some gas which seems to be extending out from these two galaxies. A lobe like feature to the south-east of **b** is also prominent with an adjoining lobe feature at the north-western end of the galaxy, which lies close to the dynamical position angle of the galaxy. There is a high velocity dispersion close to this

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northern lobe feature, which is very evident at the 2σ level, and can be seen in the tight velocity contours in the H I velocity map which appear as a solid black clump, but which is most likely due to noise still present at the 2σ level, as this disappears at a higher cutoff level of 3σ.

The northern most member, **c** also has an H I structure which seems to indicate a warped disk, there are also signs of an H I bridge in one of the channel maps at $\sim$3185 km s^{-1} between **c** and **b**.

Component **c** is also a continuum source, previously only **b** had been classified as a strong radio-source embedded in diffuse emission (Ulvestad and Wilson, 1989). This galaxy is also an infrared source, with emission in the 25, 60 and 100 μm wavelengths, which is a good indicator of star formation occuring within this galaxy.

1.2. ESO 410-G(024–026)

This group is also a triplet system, consisting of early type spirals, although as mentioned it is not an actual physical system due to the discordant redshifts, with two of the members having a velocity of $\sim$10,000 km s^{-1}. This group is a good example of chance alignment.

H I was only seen for member 025; whether there is any H I in the other two galaxies is uncertain, as the search for H I did not go deep enough. The H I seems to be asymmetric, as can be seen from Figure 2. The H I mass and velocity width is also comparable to that of the previous group, although the H I profile shows a significant central drop.

The galaxies all show continuum emission, emanating from a centrally located nuclear source within each galaxy.

2. Remarks

The AM 1238–396 group shows signs of tidal interactions, and these may be helping the activity that is seen from one of its members, Tololo 74. The ESO group on the other hand doesn't show any signs of interaction, and this is not a major surprise due to the group not being an actual physical group. Further work remains to be done on these groups, and more southern hemisphere groups also need to be studied. This will complement the ongoing H I imaging of CG's that have been mainly done in the northern hemisphere, such as the imaging of the HCG's by Williams (1998, 1991, 1995), and Verdes-Montenegro (1999).

Table 1. H I Properties

	AM 1238−362			ESO 410-G		
	a	b	c	024	025	026
RA (J2000)	$12^h40^m41.1^s$	12 40 52.9	12 40 58.4	00 36 27.4	00 36 37.3	00 36 42.1
DEC (J2000)	$-36^\circ 44' 11''$	−36 45 22	−36 43 55	−27 47 07	−27 47 21	−27 49 04
Morphology	Scd	SB(rs)bc Sy2	SB(r?)d	S0?	S0?	Sc
Vel ($\mathrm{km\,s^{-1}}$)[a]	3081	3271	3264	-	6882	-
$F_{\mathrm{H\,I}}$($\mathrm{Jy\,km\,s^{-1}}$)	1.8	4.7	4.5	-	1.4	-
$I_{12\mathrm{cm}}$(mJy)	-	61	16	30	1.7	0.5
$M_{\mathrm{H\,I}}$($10^9 M_\odot$)	0.7	2.1	2.0	-	2.9	-
Δv_{20cm}	166	198	180		212	

[a]The mean velocity calculated from the 20% H I Flux width.

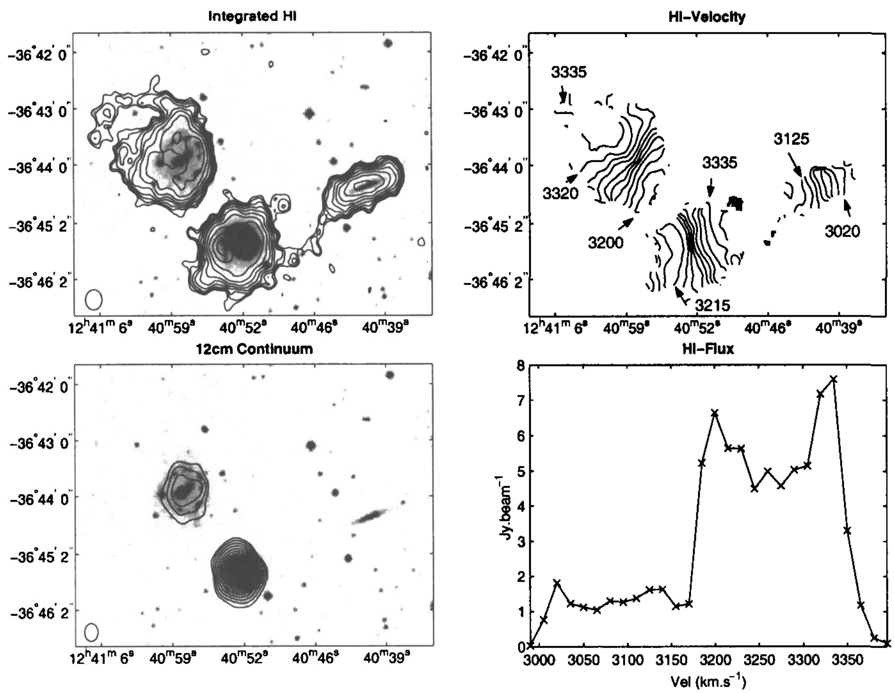

Figure 1. AM 1238−396: Integrated H I, H I-Velocity Field, 12 cm Continuum and H I-Flux. The contour values are $2^{-N}\times 0.69$ $\mathrm{Jy\,beam^{-1}km\,s^{-1}}$, (N=.5,1,..,4) for integrated H I, and $2^{-N}\times 0.034$ $\mathrm{Jy\,beam^{-1}}$ for the continuum, (N=.5,1,..,6).

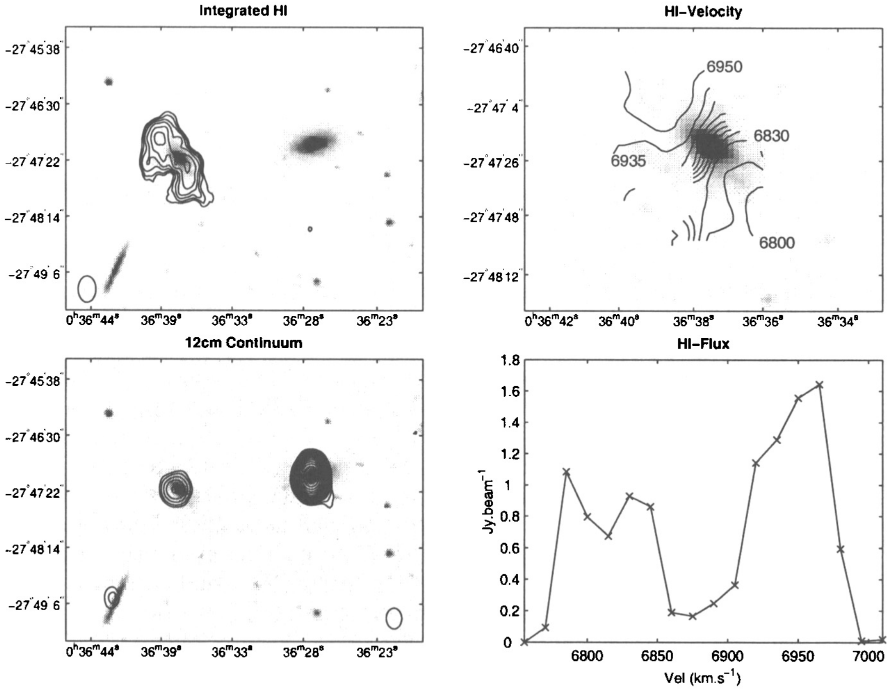

Figure 2. ESO 410-G(024−026):Integrated H I, H I-Velocity Field, 12 cm Continuum and H I-Flux.The contour values are $2^{-N}\times 0.33$ Jy beam^{-1}km s^{-1}, (N=.5,1,..,2.5) for integrated H I, and $2^{-N} \times .03$ Jy beam^{-1}km s^{-1} for the continuum, (N=.5,1,..,6).

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