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The Brightest Galaxies from HIPASS

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Abstract. I present the distribution of the brightest galaxies in the southern sky as obtained from the H I Parkes All-Sky Survey (HIPASS). This survey is expected to eventually catalog at least ten thousand galaxies, about 30% of which either were previously uncataloged or had no velocity measurement. The "HIPASS Bright Galaxy Catalog" will contain the thousand H I brightest galaxies, a preliminary set of 700 is presented here. Most of the cataloged H I sources can be identified with individual galaxies, but some correspond to pairs/groups where one or several galaxies as well as tidal tails/bridges contribute to the H I emission. We found 60 previously uncataloged galaxies, 33 of which lie in the Zone-of-Avoidance ($|b| < 5°$; see Henning et al. 2000). Several sources outside the Zone-of-Avoidance have no obvious optical counterparts in the Digitized Sky Survey.

The H I Parkes All-Sky Survey was finished in March 2000, followed by the completion of the deep Zone-of-Avoidance (ZOA) survey in July 2000; northern extensions to the existing surveys are underway. These large-area blind H I surveys are possible due to the multibeam system installed at the 64-m Parkes telescope (for previous H I surveys see e.g. Kerr & Henning 1987 and Zwaan et al. 1997). For an overview, survey parameters as well as data calibration and imaging techniques see Staveley-Smith et al. (1996) and Barnes et al. (2000). HIPASS and ZOA highlights can be found in Kilborn et al. (2000), Juraszek et al. (2000), Banks et al. (1999), Staveley-Smith et al. (1998), Putman et al. (1998), as well as several contributions in these proceedings.

To produce a preliminary version of the "HIPASS Bright Galaxy Catalog" nearly 400 H I data cubes covering the whole southern sky and the full observed velocity range (i.e. –1281 to 12741 km/s) were searched for the brightest objects using Virginia Kilborn's program *gfinder*. From this extensive candidate list a sample with the following parameters was extracted: H I peak flux > 120 mJy beam^{-1}, systemic velocity 350 – 8000 km s^{-1}, velocity width 30 – 3000 km s^{-1}, and Galactic latitude > 3 degr. To this sample we added all known galaxies with systemic velocities < 350 km s^{-1} as well as all ZOA shallow survey galaxies (Henning et al. 2000) when obeying the H I peak flux selection criterion.

All sources in the sample were inspected and parameterized with the miriad program *mbspect* and "non-galaxy" entries (e.g. recombination lines, interference, continuum ripple, etc.) were removed or cataloged separately (e.g. HVCs). This procedure resulted in a sub-sample of about 700 galaxies including some

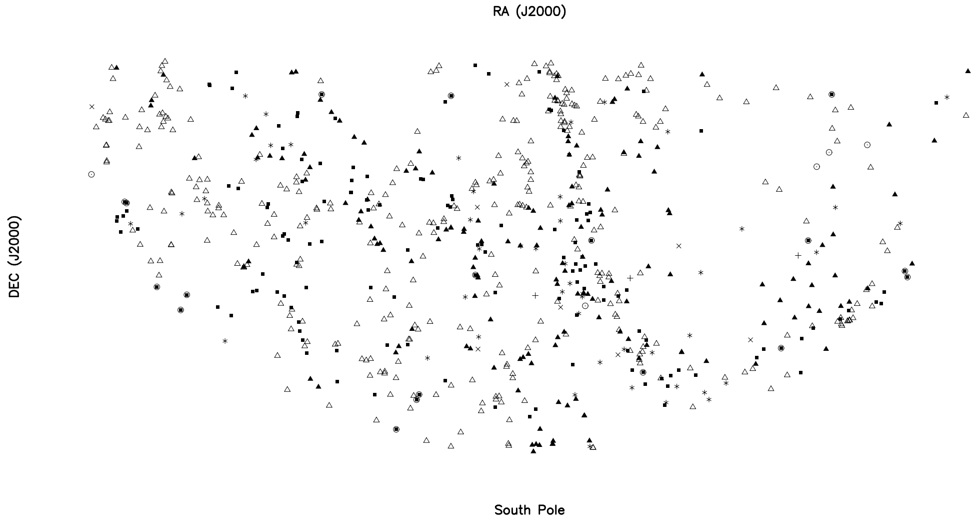

Figure 1. Sky distribution of the 700 brightest HIPASS galaxies (Aitoff projection centered on RA = $12^{\rm h}$). — The symbols denote different velocity ranges: $v_{\rm sys}$ < 350 (large dotted circle), 0 – 1000 (solid square), 1000 – 2000 (open triangle), 2000 – 3000 (solid triangle), 3000 – 4000 ($\star$), 4000 – 5000 (x), and 5000 – 6000 (+) km s^{-1}.

galaxy pairs/groups as well as a few H I clouds with no optical counterparts. For all but 60 H I sources optical identifications were obtained using NED.

Fig. 1 shows the distribution of the brightest HIPASS galaxies. This is the first time that galaxy clustering can be studied uninhibited by foreground stars and dust from our own Galaxy. The most prominent structures in Fig. 1 are the Supergalactic Plane and the Local Void, but numerous strings of galaxies, galaxy groups (e.g. Fornax, Sculptor) as well as bubbles can be seen. A histogram of the systemic velocities of the brightest HIPASS galaxies is shown in Fig. 2. It peaks, as expected, in the interval 800 to 2000 km s^{-1}. No bright galaxies were found with systemic velocities of less than –350 or more than 5500 km s^{-1}.

We found 60 previously uncataloged H I sources, most of which lie in or close to the Zone-of-Avoidance or near individual bright stars; two of the new galaxies are displayed in Fig. 3. The narrow H I velocity widths are typical for most of the new galaxies outside the Zone-of-Avoidance, indicating either slow rotation or face-on galaxies. VLA and AT Compact Array follow-up observations of the most interesting objects are on-going, e.g. to obtain accurate positions as well as detailed structure and velocity information.

The most prominent source without an optical counterpart is HIPASS J1712–64 ($v_{\rm sys}$ = 451 km s^{-1}; see Kilborn et al. 2000), but equally exciting is the huge cloud HIPASS J1718–59 ($\sim$3 degrees in length), only a few degrees away from J1712–64, but with a slightly lower systemic velocity of $\sim$400 km s^{-1}. Together with ZOA J1616–55 (Staveley-Smith et al. 1998) and other, much weaker clouds at similar velocities, these objects might be related to the Magellanic Clouds and the Leading Arm (Putman et al. 1998). Detailed studies are under way.

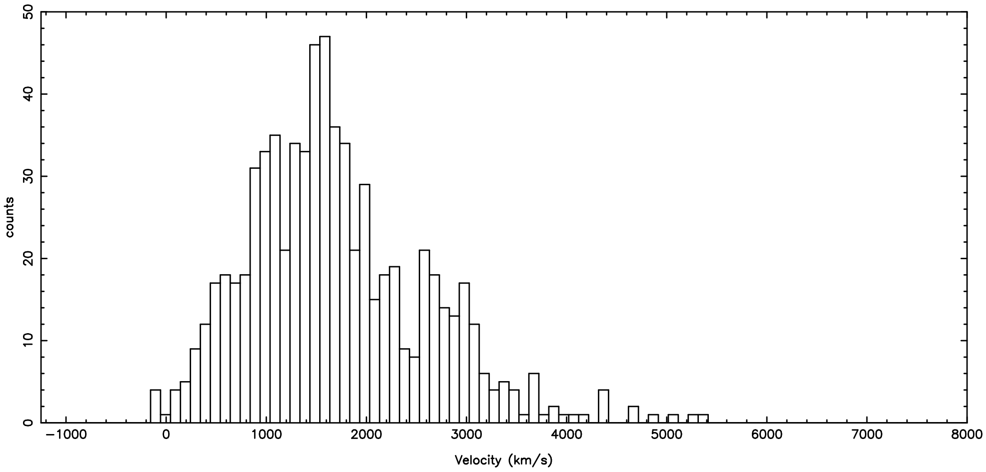

Figure 2. Histogram of the H I systemic velocities of the brightest galaxies obtained from HIPASS. The displayed velocity range was searched except for the span from –350 to +350 km s^{-1} where only known galaxies with an H I peak flux >120 mJy beam^{-1} were added.

Of the 35 potential Sculptor group members in the velocity range from zero to 800 km s^{-1} we detected 25 (20 of which are part of the current bright galaxy catalog), six were not detected and four objects (SC 02, SC 18, SC 24, and SC 42) were dismissed because the neutral hydrogen gas at the published velocities (Coté et al. 1997) appears to be part of an HVC complex.

The final version of the "HIPASS Bright Galaxy Catalog" will contain 1000 galaxies with H I peak flux $\gtrsim$90 mJy beam^{-1} and velocity width > 10 km s^{-1} (Koribalski et al. 2000, in prep.). The H I mass function, catalog completeness, as well as H I and optical galaxy parameters will be discussed.

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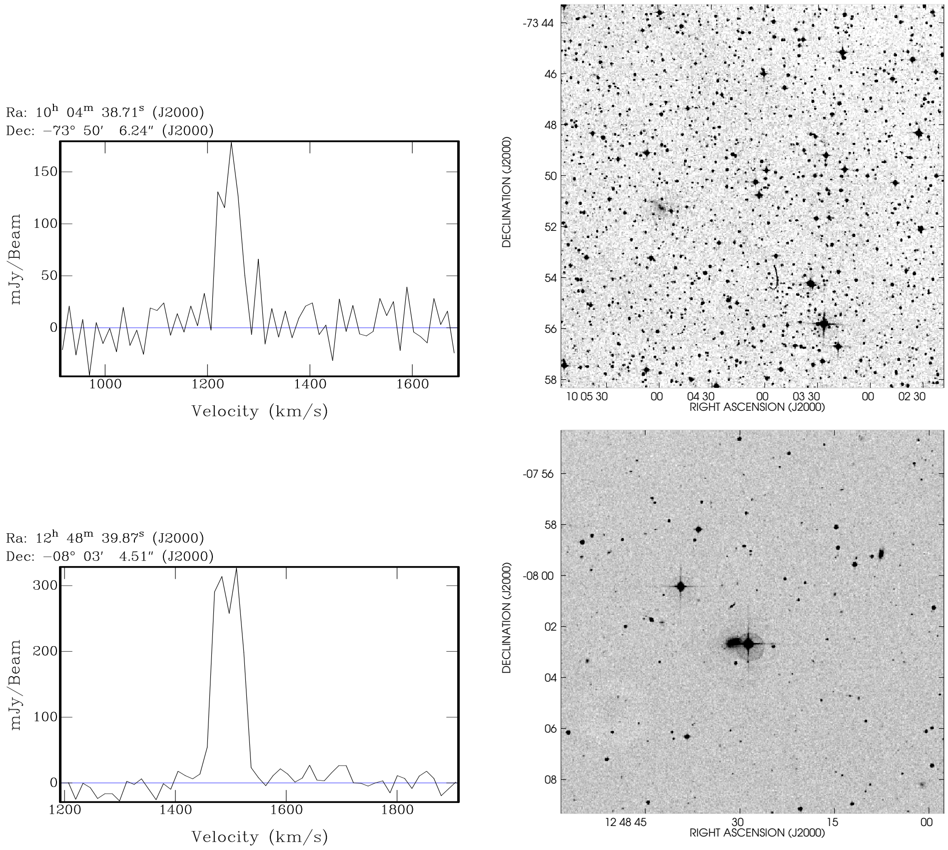

Figure 3. Two of the new galaxies, HIPASS J1004–73 (top) and HIPASS J1248–08 (bottom), are displayed: HIPASS spectra on the left and optical DSS images, centered on the H I position, on the right. **Top:** HIPASS J1004–73 ($v_{\rm sys}$ = 1245 km s^{-1}, w_{20} = 90 km s^{-1}, b = –14$\stackrel{\circ}{.}$4). There is only one extended source in the DSS image within the error radius of the H I position ($10^{\rm h}\,04^{\rm m}\,07^{\rm s}$, $-73^\circ\,50'\,50''$), a diffuse, possibly face-on optical galaxy at $10^{\rm h}\,04^{\rm m}\,57\stackrel{\rm s}{.}5$, $-73^\circ\,51'\,17\stackrel{''}{.}3$. — **Bottom:** HIPASS J1248–08 ($v_{\rm sys}$ = 1493 km s^{-1}, w_{20} = 80 km s^{-1}). Although there are numerous uncataloged optical galaxies in this DSS image, the optical counterpart is most likely the closest object to the H I position ($12^{\rm h}\,48^{\rm m}\,28^{\rm s}$, $-8^\circ\,1'\,49''$), a bright compact galaxy at $12^{\rm h}\,48^{\rm m}\,31\stackrel{\rm s}{.}2$, $-8^\circ\,2'\,37\stackrel{''}{.}8$ situated near a bright star.