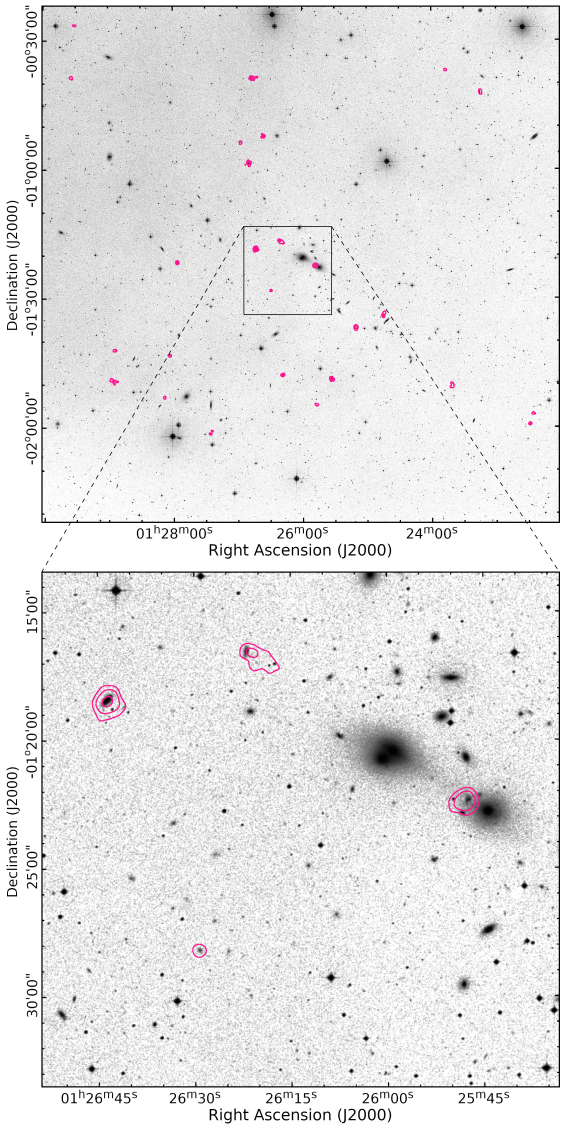

Fig. 31. H I detections in the Abell 194 field, with contours showing the H I column density (0.25, 1, 4 $M_\odot$ pc^{-2} levels), overlaid on DSS1 optical images. The H I resolution is $19'' \times 14''$, p.a. 147°. *Top*: full cluster region showing more than 25 H I detections. *Bottom*: zoomed-in view of the boxed region from the top panel, showing the richness of resolved structures. Both bound H I and that in the process of being stripped from galaxies are evident. The compact H I source at RA = $01^h25^m47^s$, Dec = $-01°22'18''$ is Minkowski's object, shown also in Fig. 1D.

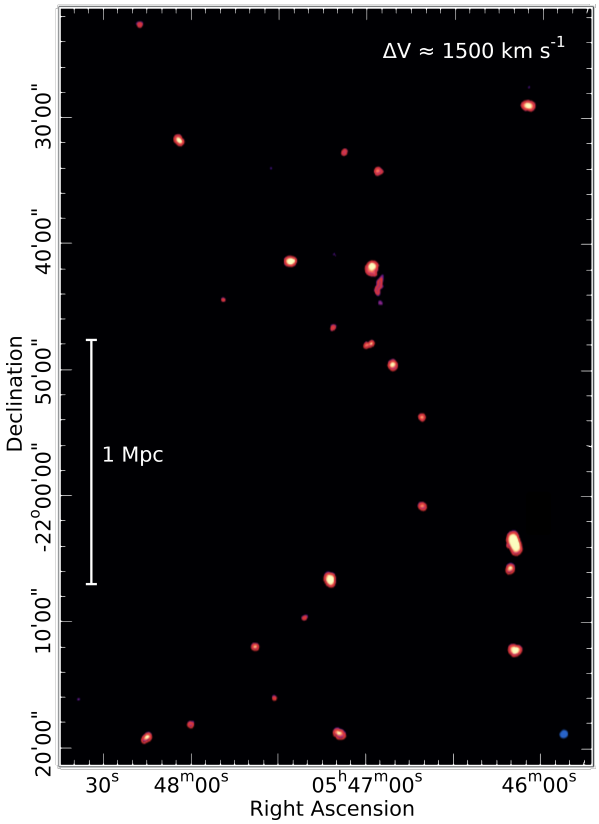

Fig. 32. H I moment-0 map of the newly discovered H I group at $z = 0.040$, which is in the foreground of the Abell 3365 cluster at $z = 0.093$. The colour scale has a linear stretch and is clipped outside of the range of 0 to 150 Jy beam^{-1} Hz. A conservative estimate is that this group has a total of 26 members within a radius of ∼2 Mpc and a velocity range of $\Delta V \sim 1500$ km s^{-1}, with a mass range $8 \lesssim \log(M_{\rm HI}/M_\odot) \lesssim 10$. The tapered beam is shown in the lower right corner and has a dimension of $30'' \times 26''$. The physical scale at the group redshift is indicated.

maps, are also provided. The data products are available via the DR1 web page[23] and the MGCLS website[24]. The website will be updated when additional data products become available.

To facilitate community usage of the MGCLS DR1 products, we produced a compact source catalogue with more than 626 000 radio sources over the 115 cluster fields (Sect. 5.2), as well as optical and infrared DECaLS cross-match catalogues for the compact sources in the Abell 209 and Abell S295 fields (Sect. 5.2.2). We have also provided a list of 59 multi-component extended radio sources in these two cluster fields (Sect. 5.3). Finally, in Table 4 we have provided a catalogue of diffuse cluster radio emission, containing 99 distinct sources detected in 62 of the MGCLS fields, 56 of which are new.

We have also presented some early science results using the DR1 data, with some significant science findings, and have highlighted the potential for future community study. In particular, we reported:

- The lowest luminosity radio relic candidate detected to date (Sect. 6.2.3) by exploiting the excellent surface brightness sensitivity of the MGCLS.
- Diffuse structures in several clusters that do not fall cleanly into the typical classes of mini-halo, halo, or relic, indicating the need for new dynamical, particle acceleration, or field amplification processes in the ICM (Sect. 6 and Table 4).
- Radio galaxy structures that cannot be explained using current models (Sect. 7), including trident-like structures, jets that stay well collimated far past their bending radius, and filamentary features connecting, at least in projection, with otherwise normal radio galaxy structures.
- The detection of 459 star-forming galaxies out to $\sim 3.5\,R_{200}$ in Abell 209 (Sect. 8.2). We find no SFR evolution with distance from the cluster centre, and a reduction in the ratio of radio to 100 µm flux densities with increased cluster-centric distance.

[23] https://doi.org/10.48479/7epd-w356
[24] http://mgcls.sarao.ac.za

– Early results from H I studies of four MGCLS clusters (Sect. 9), including H I mass distributions in three clusters, and a new foreground H I group in the Abell 3365 field.

The results presented here represent only a small fraction of what can be achieved with the DR1 legacy dataset. Follow-up projects by the MGCLS team and the broader community are likely to make significant contributions to many areas of astrophysics.

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