Recycling Intergalactic and Interstellar Matter
IAU Symposium Series, Vol. 217, 2004
Pierre-Alain Duc, Jonathan Braine and Elias Brinks, eds.

Results from a Diffuse Intracluster Light Survey

John J. Feldmeier, J. Christopher Mihos, Heather L. Morrison, Paul Harding, C. McBride

Case Western Reserve University, 10900 Euclid Ave., Cleveland OH, 44106, USA

Abstract. We give an update of our ongoing survey for intracluster light (ICL), in a sample of distant Abell clusters. We find that the amount of intracluster starlight is comparable to that seen in nearby clusters, and that tidal debris appear to be common.

1. Introduction

The concept of intracluster starlight (ICL), or stars between the galaxies in galaxy clusters is not a new one: it was first proposed over 50 years ago (Zwicky 1951). However, progress in studying ICL has been slow due to its low surface brightness, which is less than 1% of the brightness of the night sky. This is unfortunate, because ICL is a powerful probe of the evolution of galaxies in clusters (Dressler 1984), and of cluster evolution overall. It is also an important part of the ejection of matter out of galaxies discussed at this conference.

We have undertaken a deep imaging survey of galaxy clusters, intended to quantify the properties of ICL as a function of environment, and overall galaxy cluster properties. From our deep imaging, with careful attention to systematic errors (e.g., Morrison, Boroson, & Harding 1994), we are able to measure the ICL to faint surface brightnesses many magnitudes below that of the night sky ($\mu_{V,ICL} \approx$ 26–28). In tandem with the observations, we are constructing numerical simulations of galaxy clusters in a cosmological context, similar to those of Dubinski (1998). Here we summarize some recent results: previous results can be found in Feldmeier et al. (2002).

2. Intracluster Tidal Debris

Models of intracluster star production predict that intracluster light may not always be in a smooth, elliptically symmetric, component but instead can be in tidal tails and arcs (Moore et al. 1996; Napolitano et al. 2003). In our deep imaging survey, we have found intracluster tidal debris in almost every cluster we have surveyed (see Figure 1 for one of the most striking examples). However, at this time, we have detected more plume-like structures than the long arcs originally predicted by the models. Since only half of the survey has been completely reduced, the significance of this result is unclear.

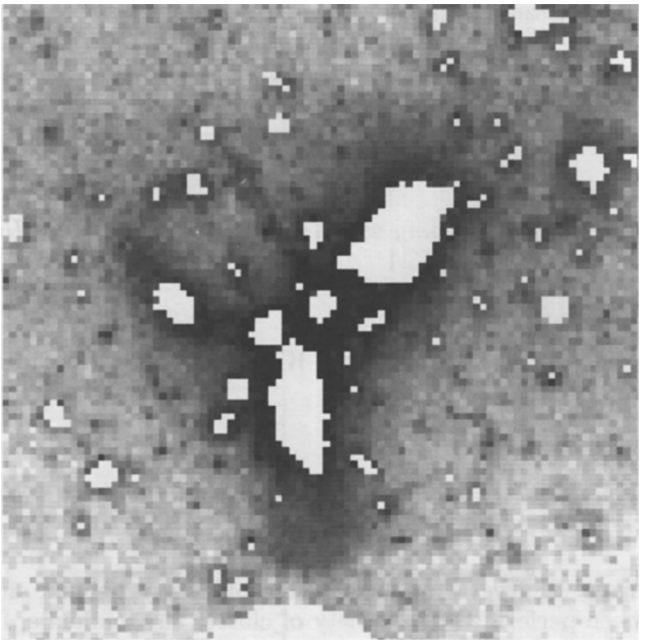

Figure 1. An image of the central region of Abell 1914, with the galaxies partially masked out, and the image binned into 11 x 11 pixel bins to show detail. There is a large fan-shaped plume at the bottom of the image, as well as multiple other low surface brightness features.

3. The amount of intracluster light

Determining the amount of ICL from our imaging observations is non-trivial because it is difficult to separate the outer edges of galaxies from the underlying background ICL. To make a model-independent estimate of ICL fraction in the clusters observed, we used an isophotal cutoff. The exact value of the cutoff is problematic, so we have adopted a range of values to set reasonable limits. We find that for the clusters surveyed thus far, the amount of ICL is 10–20%, including a correction for the edges of galaxies still unmasked. This is similar to the amount of intracluster light found in the nearby Virgo and Fornax clusters (see Arnaboldi, this volume).

References

Dressler, A. 1984, ARA&A, 22, 185
Dubinski, J. 1998, ApJ, 502, 141
Feldmeier, J. J., et al. 2002, ApJ, 575, 779
Morrison, H. L., Boroson, T. A. & Harding P., 1994, AJ, 108, 1191
Napolitano, N.R., et al. 2003, ApJ, 594, 172
Zwicky, F. 1951, PASP, 63, 61

https://doi.org/10.1017/S0074180900197189 Published online by Cambridge University Press