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THE TEXOX CLUSTER SURVEY: USING RADIO SOURCES AS GALAXY CLUSTER SIGNPOSTS

Pamela L. Gay and Gary J. Hill

McDonald Observatory, Austin, TX

RESUMEN

La búsqueda de Cúmulos TexOx (CTO) ha revelado más de 10 cúmulos de galaxias y candidatos a éstos, previamente desconocidos, en los primeros cuatro campos de dicha búsqueda. Estos cúmulos forman una muestra de cúmulos "radio-activos", que son aquellos ricos en fuentes potentes de radio. La fotometría preliminar de un subconjunto de campos con datos en varios colores muestran que estos cúmulos tienen una alta fracción de galaxias azules, y que tanto las galaxias azules como las fuentes de radio tienden a estar menos concentradas al centro que las galaxias rojas de los cúmulos. Estas propiedades son típicas de los cúmulos con efecto Butcher-Oemler.

ABSTRACT

The TexOx Cluster (TOC) Survey has found more than 10 previously unknown galaxy clusters and cluster candidates in the first of four fields that it is surveying. These clusters form a unique sample of "radio-active" clusters: clusters rich in powerful radio sources. Preliminary photometry of a subset of fields with multi-color data shows that these clusters have a high fraction of blue galaxies, and the blue galaxies and radio sources both tend to be less centrally concentrated than the red cluster galaxies. These properties are typical of Butcher-Oemler effect clusters.

Key Words: **GALAXIES: ACTIVE — GALAXIES: CLUSTERS: GENERAL — GALAXIES: EVOLUTION — GALAXIES:STATISTICS — SURVEYS**

1. OUR SURVEY

The advent of sensitive large–area radio maps (e.g. NVSS and FIRST) offers astronomers several new approaches for finding galaxy clusters. Above the disk of the Milky Way, the majority of radio sources are identified with galaxies, and in several instances these galaxies have serendipitously been identified as members of moderate–redshift clusters (Owen 1996). The Texas–Oxford Cluster (TOC) Survey team hopes to maximize the probability of finding galaxy clusters by using radio source overdensities as cluster signposts. We are imaging 7'-square fields centered on overdensities of 5 or more sources (S $\geq$ 2.3 mJy) in a 6' radius using the McDonald Observatory 2.7m telescope. We have HET time for spectroscopic conformation of optically identified clusters. Clusters confirmed to date have redshifts of: z = 0.41, 0.49, 0.51 and 0.61.

We find that radio source overdensities provide efficient guides for locating galaxy clusters. Application of our technique to the region that was surveyed optically in the Palomar Distant Cluster Survey (PDCS) (Postman et al. 1996) re–discovers 8 (7.5%) of 107 clusters and finds no extraneous non–cluster overdensities. Our technique also finds 18 (9.9%) of 182 clusters in the X–ray selected sample of Vikhlinin (1998). This leads us to believe that we can identify roughly 8% of the total cluster population in the redshift regime covered by these samples (z < 1.2). However, these "radio–active" clusters do not form an unbiased sample. We find that 14 (43.8%) of 32 clusters in Dressler, Gunn & Schneider's (1985) sample of Butcher–Oemler (BO) (Butcher & Oemler 1978) clusters are radio–active, indicating that we are particularly sensitive to BO clusters. These clusters are all rich in blue galaxies. The excess blue galaxies are thought to be infalling field galaxies or

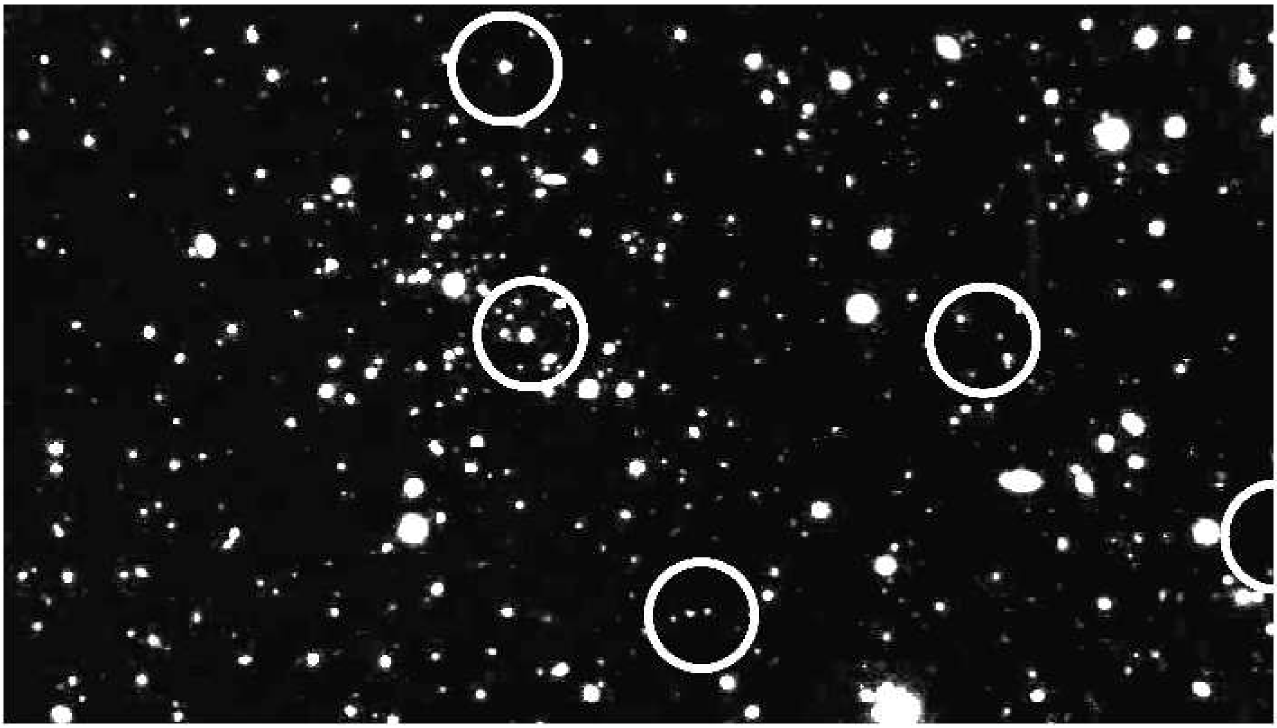

Fig. 1. TxOx 1602+4335. This cluster, at z=0.41, was discovered in 3x300s exposures in the *R*–band using the McDonald Observatory 2.7m. The circles are positional error circles for NVSS radio sources.

sub–cluster galaxies undergoing star formation triggered by interaction with the intracluster medium (Caldwell & Rose 1997) and galaxy harassment (Rakos, Odell & Schombert 1997). Spatially, both blue galaxies and radio galaxies tend to be found in the outskirts of clusters, and work by Owen et al. (1999) and our group indicates that there is a connection between a cluster's radio activity and blue galaxy fraction.

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Pamela L. Gay and Gary J. Hill: McDonald Observatory, The University of Texas, Austin, Texas 78712, USA (pamela,hill@astro.as.utexas.edu).