OTEO Survey: Properties of X-ray Emitters in the Groth Field


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Abstract

We present results from the study of broadband optical and X-ray properties of a large sample of active galactic nuclei in the Groth-Westphal Strip (GWS) field. In order to determine the morphology of all objects, we obtained different structural parameters. Combining these parameters with other optical/X-ray properties, we were searching for possible correlations between them, which could point out some of the AGN characteristics and allow us to separate between starbursts and AGNs as well as different types of AGNs.

Optical data (WHT, La Palma)

Three areas have been observed in the GWS field with broadband BVRI filters, with the total exposure time ranging from 8400 to 10000 sec and a total covered area of 0.18 sq. deg. Our limiting magnitudes are V = 25, B = 24.5 and I = 24. The final catalog contains ∼45000 objects.

X-ray data (Chandra)

We have used public data of three ACIS-I pointings in the deep 2000ssec, small ∼0.2 square degrees area survey. Data were processed using CIAO v3.3.0.1. Five energetic bands have been selected in the range 0.5-7 keV; the final catalog contains 687 sources.

Analysis and Results

Structural parameters and morphological classification

Using SExtractor (Bertin and Arnouts et al. 1996) and GIM2D (Simard et al. 1998) we have computed several morphological parameters of the optical counterparts, including concentration and asymmetry indexes, residual parameter, budge-to-total ratio and SExtractor CLASS_STAR parameter for the compact object selection. To check the reliability of all obtained structural parameters we also applied the visual inspection for all objects, observing different types of galaxy profiles and its counterpart obtained by examining IRAF tool. We have seen that when dealing with faint objects (R > 24) with small isophotal area (<200 pixels), the combination of the concentration index with the asymmetry index gives us the most reliable morphological classification.

Nuclear type classification

We propose a rough classification criterion into BLAGN, NLAGN and normal galaxies/Compton-thick AGN stars based on X-ray-to-optical ratio (X/O) and 2.4 keV/X-ray hardness ratio (HR) (Dolam Costa et al. 2004). Following this criterion, we find that 61% of objects can be classified as BLAGN. There is no clear separation between different morphological and nuclear types, but we can notice that most of our objects classified as compact (CLASS_STAR > 0.9) are situated in the region of BLAGNs.

OPTICAL CATALOG + X-RAY CATALOG CROSSING

Final catalog of 340 X-ray emitters with optical counterparts that we are using through morphology/nuclear type classification and diagnostic diagrams analysis.

X/O Flux Ratio - Concentration index anticorrelation!!!

We were combining different structural parameters with the X-ray/optical object properties in order to find the correlation between some of them which than could provide us the diagnostic diagrams for the morphology/nuclear type separation. We have seen a clear anticorrelation in X/O flux ratio

Future Prospects

Our goal is the study of AGN population in the deep X-ray (Chandra and XMM-Newton, optical, WHT and GTC) and IR (Spitzer and Herschel) surveys. Combining different galaxy properties to these three ranges, we are using obtained diagnostic diagrams to separate between different nuclear types, and we are measuring photometric redshift for the selected AGNs. We are interested in luminosity function determination, its analysis and the study of its evolution.