The X-ray spectral properties and variability of AGN in the Chandra/SWIRE Survey

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Abstract. We present the XMM-Newton sample in the Chandra/SWIRE field. We compare the recent XMM (2008-2009) and previous Chandra (2004) observations to identify a sub-sample of variable sources. We find that variability is independent of X-ray absorption and dust obscuration. The analysis of the radio fluxes reveals a significant fraction of radio-weak AGNs and a higher incidence of absorption among radio-loud sources. The source list and multi-wavelength catalogs in the Chandra/SWIRE field can be accessed through an on-line database.

Keywords: Active Galaxies, X-rays, Radio, Variability, Absorption
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MULTI-λ DATA

In this work, we present the XMM-Newton sample in the Chandra/SWIRE survey, characterise its X-ray spectral properties and compare them with its multi-λ properties. The XMM observations consist in 4 pointings (Oct. 2008-Apr. 2009), with a total exposure of $\sim$56 ksec and covering the central 0.7 deg^2 of the Chandra/SWIRE survey [7]. The field benefits from observations in the following energy bands: X-rays (Chandra and XMM-Newton); ultraviolet (GALEX); optical (ugriz; KPNO); infrared (*Spitzer*); radio (VLA 20 and 90 cm; [5, 4]). Our sample comprises 97 sources: they all have an optical or IR counterpart, 69 are detected in the radio, and all, but two, are also Chandra sources, and 71 sources have spectroscopic redshifts[1]. The optical-IR spectral energy distribution (SEDs) are classified in four classes, AGN1, AGN2, Sey1.8, and SF following the template fitting procedure in [6]. Sources whose SEDs are best-fitted with AGN 1 or Sey1.8 templates are mostly unabsorbed in the X-rays (see right panel of Fig. 1), while those best-fitted with AGN2 or SF templates are generally X-ray absorbed.

X-RAY VARIABILITY

In order to investigate whether variability is related to absorption and/or SED class, we identify a subsample of variable sources by comparing the Chandra (Sep. 2004) and XMM fluxes and examine their SED class and X-ray absorption properties. We find that 34% of the sources display some kind of variability: in 50% of the cases variability can

[1] The source list and mult-λ catalogues relative to the Chandra/SWIRE survey can be retrieved at the page `http://cosmosdb.iasf-milano.inaf.it/CHANDRA-SWIRE/index.jsp`.

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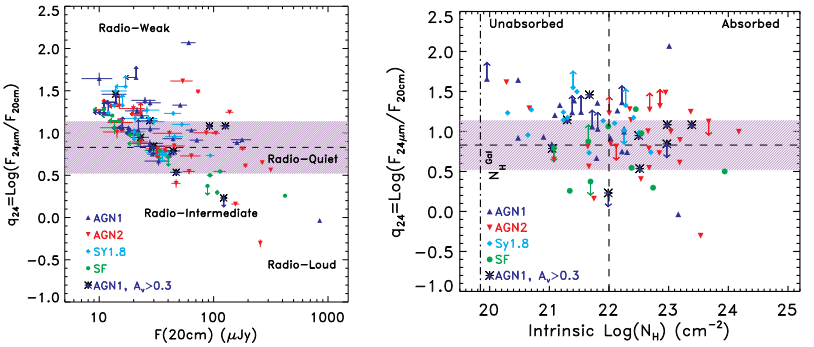

FIGURE 1. *Left Panel*: q_{24} vs the 20 cm flux. The dashed line and hatched area correspond to the relation found for star forming galaxies with q_{24}=0.83±0.31 [1]. *Right Panel*: q_{24} vs the intrinsic column density. Symbols correspond to SED classes as labelled.

be explained by a flux change, in 16% of the cases by a spectral change and in 34% both flux and spectral changes are required. The fraction of variable sources per SED class is consistent with that of the total sample. We find that 66% of the variable sources are unabsorbed (Log(NH)<22) and 34% are absorbed (Log(NH)>22). These fractions reflect those of the total sample, which are 65% and 35%, respectively. These results imply that variability is unrelated to absorption and obscuration.

RADIO PROPERTIES OF THE AGN SAMPLE

The radio properties of the X-ray sources of our sample are investigated by means of the q_{24}=Log($F_{24\mu m}/F_{20cm}$) [1]. We find that 30% of the sources are radio weak ($q_{24}>1$), 12% are radio-loud/radio-intermediate ($q_{24}<0.5$) and 58% are radio-quiet ($0.5<q_{24}<1$). Interestingly, we find a large number of radio weak sources (see Fig. 1). A similar result was obtained by [3] for an IR-selected sample. We find that radio loud objects tend to be absorbed and obscured.

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