The dependence of AGN activity on host and environment

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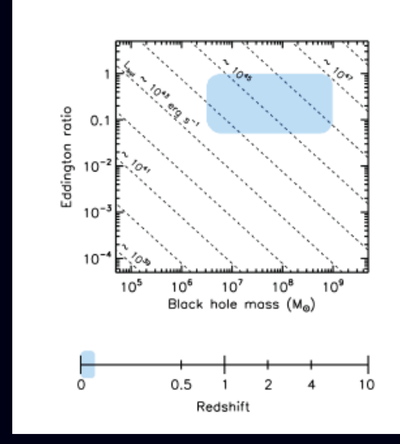

Abstract
The activity of a supermassive black hole (SMBH) depends on its mass, and on the environment in which it resides. We calculate the mass of SMBHs in galaxy bulges in the nearby Universe from the SDSS, and show that the black hole mass function does not depend on environment. We investigate the role of black hole mass on the probability of having a radio and X-ray AGN, and conclude that the mode of AGN activity is not a function of black hole mass but of the environment

The supermassive black hole mass function in the SDSS survey redshift < 0.1

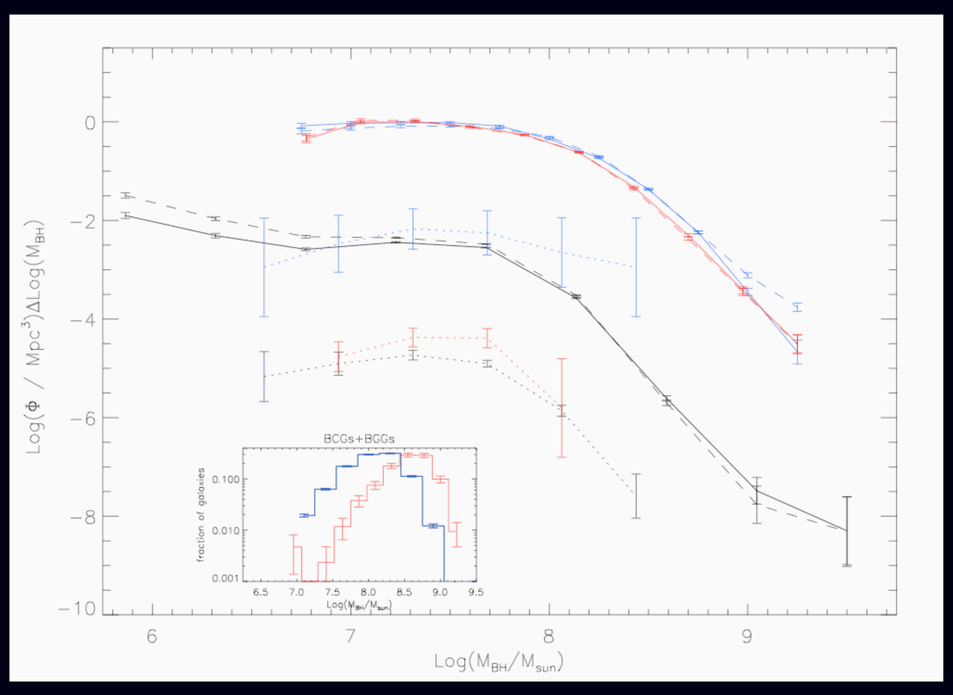

Figure 2
The supermassive black hole mass function (SMBHMF) for the three samples used in this work (black: field, blue: galaxies in groups, red: galaxies in clusters), corrected for V/Vmax. The SMBHMF for groups and clusters includes the BGGs and BCGs (the distribution of the mass of the BGGs/BCGs is shown in the insert). There is no appreciable difference between the SMBHMF of galaxies in groups and in clusters. The situation for Sample C is very different, where the density of SMBHs for optically active BHs in groups (blue dotted line) is 2 orders of magnitude higher than in clusters (red dotted line).

Galaxy samples of BH hosts from the SDSS survey

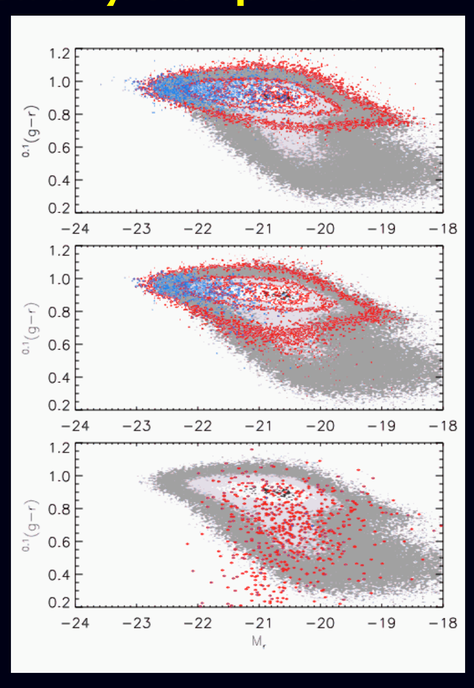

Figure 1
The colour of host galaxies plotted against the r-band absolute magnitude for all the galaxies in the SDSS catalogue with z<0.1 and r<17.77, with galaxies in Sample A (red contours in the top panel), Sample B (red contours in the middle panel) and Sample C (red contours in bottom panel), and galaxies in each of the samples with radio counterparts in the FIRST catalogue (blue contours).

We consider galaxies in SDSS DR7 with z < 0.1 and r < 17.77
Colour selected hosts:
Sample A: All galaxies with u-r > 2.2 (N=140,153)
Morphology selected hosts:
Sample B: All galaxies with concentration R_{50}/R_{90} < 0.33 (N=142,649)
Optically active hosts:
Sample C: All galaxies with Hα EW > 30 and Hα FWHM > 1000 km/s (N=629)

The supermassive black hole mass function in groups and clusters of galaxies

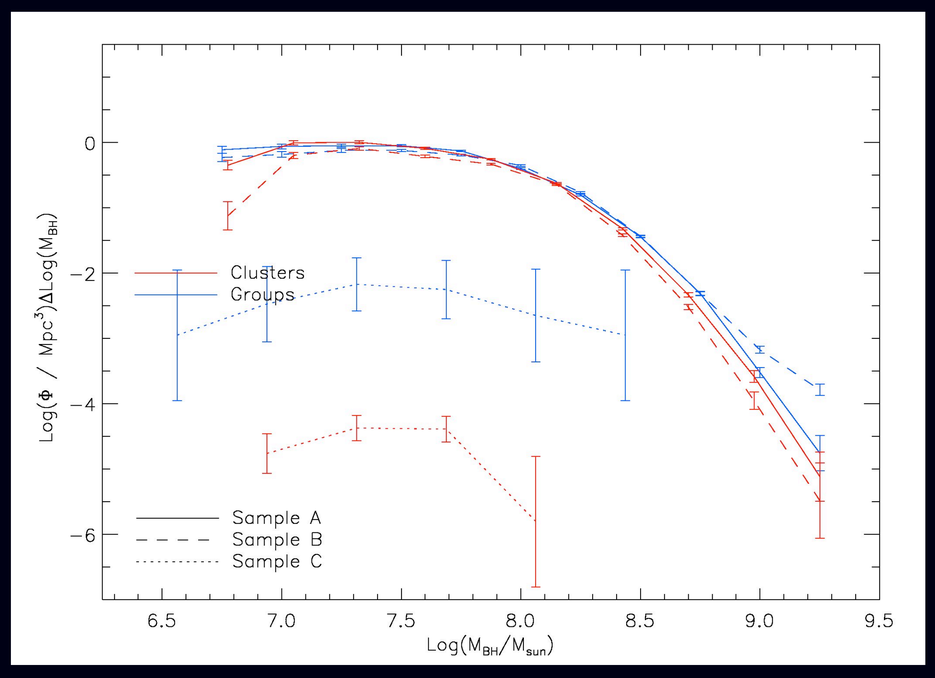

Figure 3
The SMBH mass function for groups (blue) and clusters (red) from sample A (solid line) and sample B (dashed line), where the black holes associated with the brightest group and cluster galaxies have been excluded. A Kolmogorov-Smirnov test confirms that the mass functions of galaxies in groups, clusters and the field are consistent with being drawn from the same underlying parent distribution.

The X-ray luminosity function of AGN

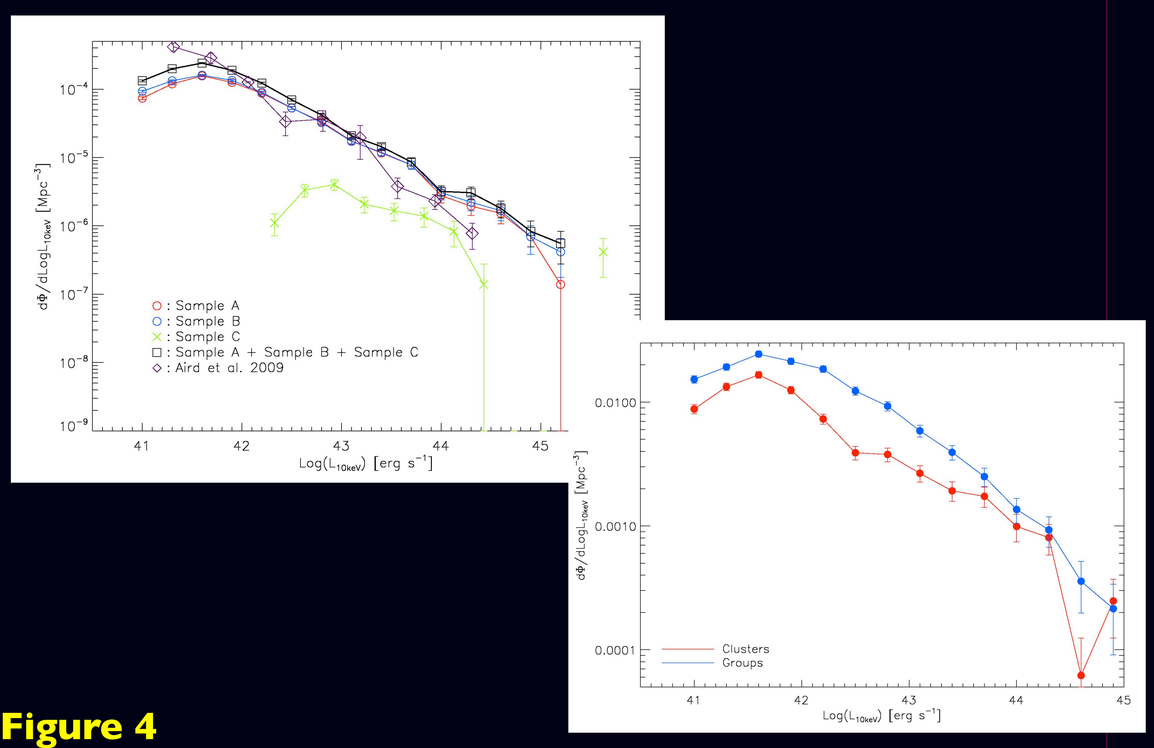

Figure 4
(a) The X-ray 2-10 keV luminosity function of AGN in galaxies belonging to Sample A (red), Sample B (blue), Sample C (green) and all (black). The X-ray luminosities are calculated from the optical properties of the AGN using the BH fundamental plane (Falcke et al. 2004). They are compared with the observed luminosity function (diamonds) of Aird et al (2010) from the Chandra deep Field and the AEGIS surveys. **(b)** XLF in groups (blue) and clusters (red).

For more information see:
http://www.sr.bham.ac.uk/~somak/bhpaper