

The spin of AGN galaxies

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Using a sample of galaxies selected from the SDSS DR5, we compare the angular momentum λ distribution of AGN and non-AGN late-type galaxies. We find that AGNs show typically low λ values and associated dispersion when compared with non-AGN galaxies.

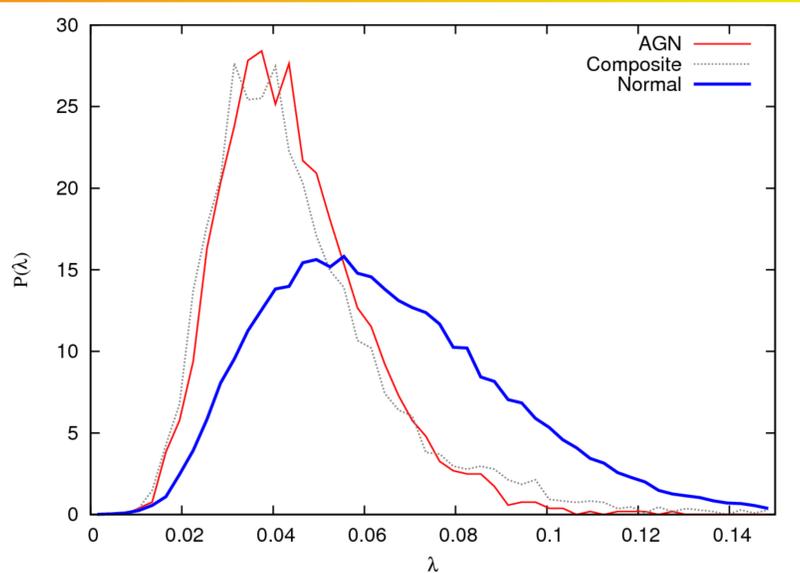
When we look at the spin distribution at fixed absolute magnitude, non-AGNs presents an anticorrelation with M_r , while AGNs present uniform values of λ at all magnitudes, a behaviour probably imposed by the fact that most late-type AGN galaxies present a narrow range in colour with a typical constant λ value. We also find that the fraction of AGN hosting galaxies dramatically increases for decreasing λ . For AGNs, the mass of the supermassive black holes in our sample tends to be higher for low spin galaxies, even at fixed luminosity, a result that could account, to a certain extent, for the spread on the luminosity - black hole mass relation.

• The spin parameter.

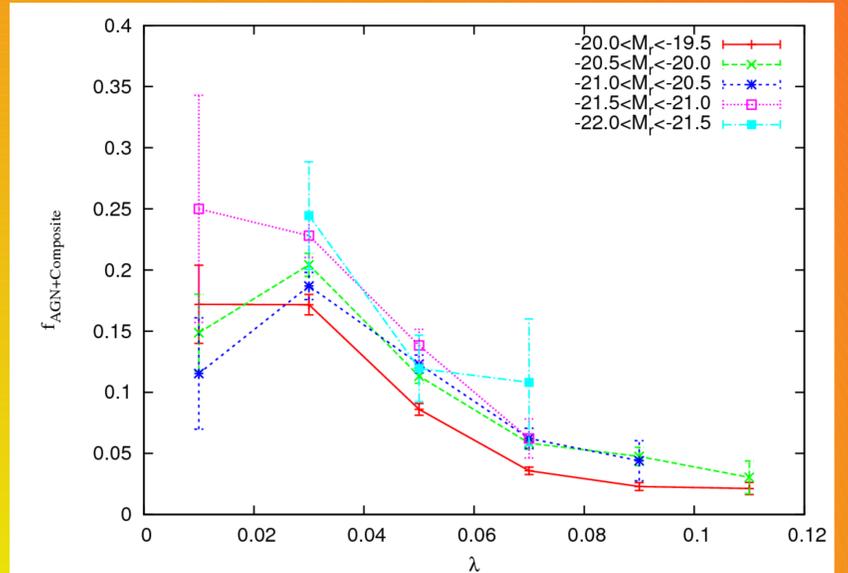
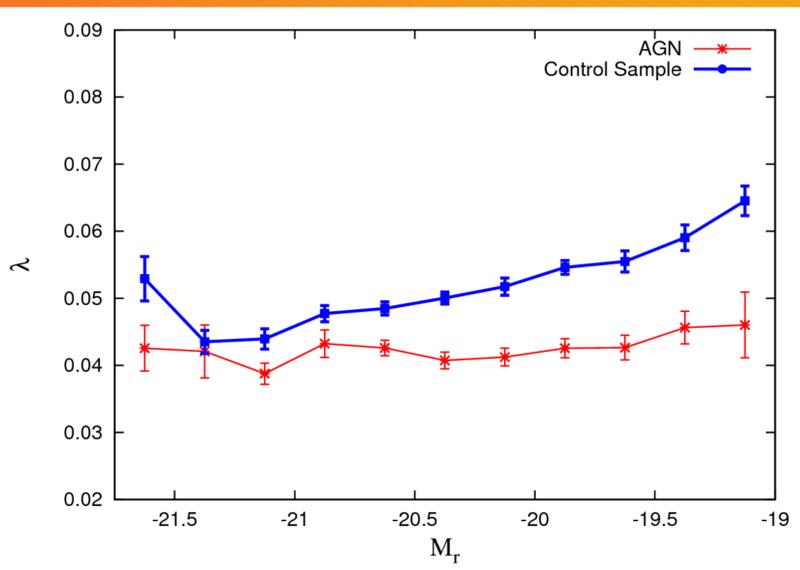
One of the most important parameters in theoretical studies of galaxy formation and evolution is the galactic spin, usually characterized by the λ parameter, defined by:

$$\lambda = L |E|^{1/2} / GM^{5/2},$$

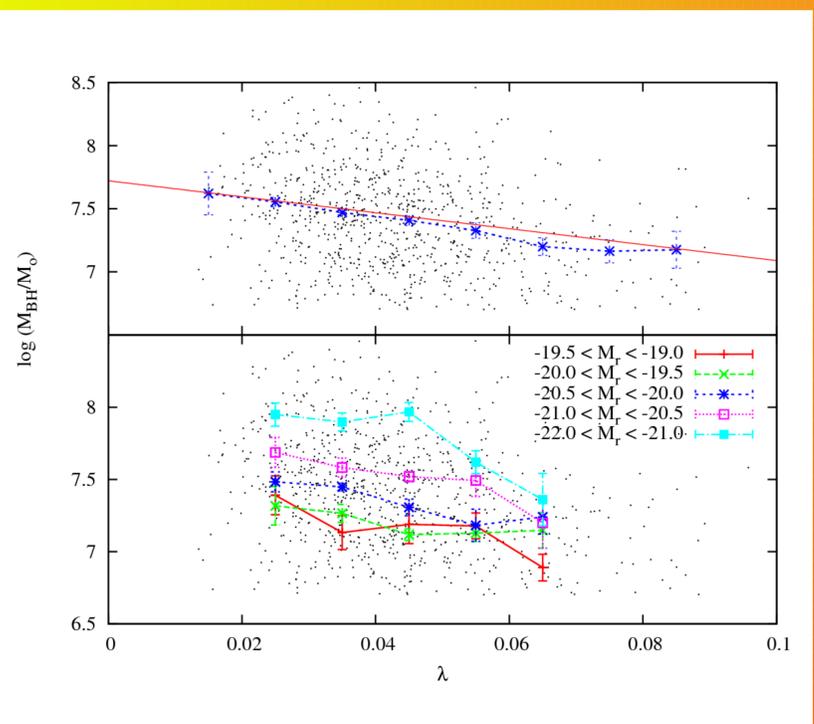
with L the angular momentum, E the total energy of the configuration and M the mass. This parameter gives an account of the degree of rotational support available on a system, and is strongly related with the morphology of the galaxies. In this study we obtain an estimate of this parameter [1] for a sample of observed galaxies [2] and study the influence of the spin on determining the nuclear activity of galaxies [3].



$P(\lambda)$ distributions of AGN, Composite and Normal late type galaxies. We can see a clear difference between the normal and the AGN population, the former showing typically higher spin values with a large dispersion compared with the latter, which is a more coherent population of low spin galaxies. Even more striking is the difference between the median λ value of AGN galaxies and the control sample as a function of M_r , showing at all M_r lower λ values.



Previous studies have shown how the AGN fraction tends to increase for increasing magnitude, here we show how the AGN fraction increases for decreasing λ value, even at fixed absolute magnitude.



For the AGN sample we found that the inferred mass of the SMBHs shows a weak dependence on the spin of the hosting galaxies, with increasing mass for decreasing spin, a logical result if we need the gas to collapse to be accreted to the central massive object. Given that the trend with the spin is present at all M_r bins, this could account, to a certain degree, for the dispersion in the well established M_{BH} -luminosity relation.

• References.

- [1] Hernandez X. & Cervantes-Sodi B., 2006, MNRAS, 368, 351
- [2] Choi Y.-Y., Woo J.-H. & Park C., 2009, ApJ, 699, 1679
- [3] Cervantes-Sodi et al. 2011, ApJ, 735, L25