Abstract

The main objective of this thesis is to study differences between radiative properties of the accretion flows in Radio Loud (RL) and Radio Quiet (RQ) AGN and their relation to jet production efficiency. RL AGN have on average larger back hole masses (M_{BH}) and lower Eddington ratios ($\lambda_E \equiv L_{Bol}/L_{Edd}$) than RQ AGN, so to avoid biases they are selected from similar ranges of these parameters.

In Paper I we studied the dependence of jet production efficiency on the outer boundary conditions of the accretion discs for RL and RQ quasars. The RL and RQ quasars were selected from the DR7 quasar catalogue, where we chose FRII quasars to represent the RL sample. We studied the variation of the covering factor (defined to be the fraction of the optical-UV radiation obscured by the circumnuclear dusty tori), with z, M_{BH} and λ_E between the RL and RQ samples. We found that those tori have on average similar geometrical thickness for both RL and RQ quasars and hence jet activity is not conditioned by actual properties of accretion flows at distances larger than the dust sublimation radius. We also found a lack of statistically significant dependence of the covering factors on the Eddington ratio down to values $\lambda_E < 0.03$ which excludes the possibility that dusty obscurers could be dominated by the winds being powered by radiation pressure exerted on dust.

In Paper II we studied the differences in X-ray properties of RL and RQ AGN. Our studies were based on the X-ray data from the *Swift*/BAT AGN catalogue. We compared and contrasted the hard X-ray spectral slope, X-ray loudness (defined as the ratio of the hard X-ray luminosities in the band 14-195 keV to the mid-IR luminosities at $\lambda = 12\mu$m), column densities, cut off energy and reflection parameter between the RL and RQ populations. We found that RL AGN are on average 2 times X-ray-louder than RQ AGN, but found their spectral slopes, reflection parameter and high energy cutoff to be very similar. These results suggest that both in RL AGN and RQ AGN samples, the X-ray emitting region can be associated with the hot, geometrically thick, central portion of the accretion flow, where production of hard X-rays is likely to be dominated by Comptonization of the optical/UV radiation of the 'cold' accretion disk by electrons heated by the magnetic reconnection. The more efficient X-ray production in RL AGN than in RQ AGN can be associated with having a larger magnetization of the innermost portions of the accretion flows and larger black-hole spins.

We built upon this work in Paper III where we expanded the sample by calculating M_{BH} for the objects that lacked it in literature and we collected multispectral data for the objects in our sample. We studied the X-ray loudness in the Type-1 and Type-2 samples and found that the X-ray production is isotropic in both RL and RQ AGN. The found isotropy implies that the X-ray coronas in both RQ and RL AGN cannot be too compact, otherwise their isotropic emission would be strongly affected by gravitational lensing. In addition, in our UV/mid-IR and Spectral Energy Distribution analysis we found that the integrated mid-IR luminosity reaches or even exceeds UV luminosities of Type 1 AGN, strongly implying that a significant fraction of UV radiation undergoes extinction and is reprocessed into IR radiation by the dust located within the ionization cone.

Results of all our studies seem to be consistent with the MAD (magnetically-arrested-disc) scenario, according to which powerful jets of RL AGN are powered by the rotating black holes immersed in magnetic fields confined on them by the ram pressure of the accretion flow.