

We numerically study the formation of gaps in circumbinary disks of comparable mass massive black hole binaries ($q \sim 1$). We vary the disk properties (mass, thermodynamics, etc.) and found that most massive and thicker disks are able to prevent the gap formation in them. We contrast our results against analytical models based on the non-axisymmetric perturbation enhanced in the disk, which successfully predicts the disks that opens a gap. We discuss the implications for the occurrence of opened and failed gaps in the final separations and possible merging of binary AGNs.

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A NUCLEAR MOLECULAR RING IN MRK1066 REVEALED BY PCA TOMOGRAPHY

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We used the PCA (Principal Component Analysis) tomography technique to analyze J and K band datacubes for the inner ≈ 350 pc radius of the Seyfert 2 galaxy Mrk 1066, obtained with the Gemini/NIFS (Near-Infrared Integral-Field Spectrograph) at a spatial resolution of ≈ 35 pc. The first eigenvector is dominated by emission from the AGN and host galaxy and corresponds to 95% of the variance of the data. The second eigenvector for the K band presents an anti-correlation between the blue and red wavelengths. In corresponding tomogram, it is observed that the nuclear emission is dominated by red part, and thus we interpret this eigenvector as being due the emission of the dusty torus. A rotating disk is observed in eigenspectrum 2 (in J band) and eigenspectrum 3 (in K band) and their respective tomograms. Correlations among line and radio emission are observed for the next eigenspectrum. Double line profiles are seen in the eigenvector 3 (for the J band) and 4 (K band), probably originated by the interaction of the radio jet with the line-emitting gas. The analysis of the fifth eigenspectrum for the K band and its tomogram shows that the H_2 emission concentrated in two spiral arms originated from a nuclear ring of molecular hydrogen (with radius of $\sim 0.2''$) surrounding the nucleus of the galaxy ring and extend to up to $1.5''$ from the nucleus to north-east and to southwest. This structure was not seen in the "traditional" analysis of the cube.

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PHYSICAL PROPERTIES OF FEII EMISSION IN ACTIVE GALACTIC NUCLEI

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Among the spectral lines emitted by the broad line region (BLR) in active galactic nuclei (AGN) the FeII emission is the most prominent one and therefore constitutes one of the most important contributors to the cooling of that region. In the near infrared (NIR) the FeII emission is intense but free of blending effects opening a window to a more consistent analysis of that emission. With the aim of studying the FeII in the range $0.8\text{--}1.2\ \mu\text{m}$ in a sample of 21 AGNs we utilize a semi-empirical template obtained from IZw1, which is considered the prototype of FeII active galaxy emitter. That particular template reproduces accurately the FeII in IZw1 and it is now applied, by the first time in other AGNs. In this work we made a analysis of the width and intensity of the FeII lines in order to derive the most probable location of the emitting region and to study the formation mechanisms of that ion, respectively. We compare the width of the individual FeII lines with that of other lines emitted in BLR. Our results show that the FWHM of iron systematically approaches to that of OI and CaII and is considerably smaller than that of Hydrogen, confirming previous assumptions that the gas responsible for the FeII emission is the outer portion of the BLR. We correlate the strength of the NIR and optical iron lines to derive the relative contribution of the different mechanisms that produces that emission. We found that in all cases the Ly α fluorescence plays an important role.

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THE ARCHITECTURE OF THE ACTIVE GALACTIC NUCLEUS OF NGC 1068

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NGC 1068 is the brightest and most studied AGN in the sky. Its study motivated the development of the Unified Model for AGN as the prototype of an obscured Seyfert 1 galaxy. The opportunity of studying such object, with IFU spectrographs in the near infrared, allow us to understand the details of how gas is being fed to the central black hole and how the gas is being ionized and ejected from the center. We re-analyzed data taken from the SINFONI (VLT) and NIFS (GEMINI North) public archives, in the HK bands with spatial resolution of 0,1 arc-sec (1,7 pc/spaxel). We concentrated our analysis on the molecular H₂ lines, the low ionization line [Fe II] and the high ionization line [Si VI]. The analysis shows very distinct behavior for the different lines. In particular we found a clear structure resembling a “glowing-hourglass” shape for the low velocity [Fe II] emission, while the high velocity emission fills the “hourglass”. The shape of this image suggests that the dusty torus and the ionization axis, possibly associated to the central accretion disk, are not co-planar. The primary wind is probably originated from this asymmetry while the secondary wind is likely to be originated from an H₂ emitting cloud, about 1” to the north of the AGN, impacted by the primary wind and ionized by the central source.

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THE ROLE OF AGN FEEDBACK IN THE EVOLUTION OF SEYFERT GALAXIES

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Adaptive optics integral-field observations of Seyfert Galaxies have recently revealed clear evidence of AGN-driven outflows of ionized gas. By resolving the inner 10–20 parsecs, we are successfully modeling the geometry and kinematics of the outflows in 3D. The model parameters are used to estimate mechanical feedback from the AGN and test unification models. The mass outflow rates are 2–3 orders of magnitude greater than the accretion rates, but they are comparable to the estimated inflow rates to the central 10–25 pc, suggesting that the outflows may remove a considerable amount of the infalling

gas before it reaches the accretion disk. The outflows seem to form two distinct groups which differ by outflow power variations with radio flux. While powerful outflows (with kinetic powers $> 1.0\%$ Lbol) are observed in objects with extended radio jets, in the other AGN – in which the outflow power is less than 0.1% Lbol – the radio jet is weak and compact.

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PROBING AGN ACCRETION THROUGH GRAVITATIONAL MICROLENSINGS OF QSOS

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Understanding QSO accretion is both at the frontier of new physics, and essential in understanding the driving force behind the great power of QSOS and their energetic feedback onto their galactic environments. However, the accretion disks are at micro-to-nano arcsecond scales, unresolvable from Earth. Gravitational microlensing of QSOS provides statistical information on the microarcsecond structure of the lensed QSO. By measuring the flux ratio in two of the lensed images and comparing to a lens models for the intervening galaxy, I intend to establish upper limits on the size of the emission region.

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CHARACTERIZING THE CONTINUUM IN NARROW LINE SEYFERT 1 GALAXIES

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Narrow Line Seyfert 1 (NLS1) active galactic nuclei (AGN) are a subclass of AGN with Seyfert 1 characteristics but without prominent broad lines. In this work we approach the determination of the non-stellar continuum using the spectral synthesis technique. We chose a sample of 130 NLS1 available in the Sloan Digital Sky Survey (SDSS). This sample comprehend all the objects of such class catalogued on the local universe ($z < 0.1$). With this method we determined (a) central black hole masses, (b) accretion rates, (c) electronic densities in the narrow line region. We found and analyzed possible relations between this parameters.