Relativistic plasma as the source of variable optical continuum emission in broad-line radio galaxies

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The localization of the region of variable continuum emission, and hence of a broad-line region, is not well understood in radio-loud AGN because of complex structure of their nuclear regions. In radio galaxies, continuum emission from the relativistic jet can dominate at all energies, swamping emission originated in other central regions. A link between optical and radio emission is evidenced from the VLBI-optical monitoring of individual radio galaxies (3C 390.3 and 3C 120) covering the time period of 14 years. We found a correlation between the formation of new bright knots in the jet and the variable optical continuum emission in both radio galaxies. We interpret this correlation as evidence for the non-thermal optical flares being generated in the inner jet. Evidence for non-virial motions in the broad-line region and its implications in radio-loud AGN will be discussed.

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X-rays as a tool for disentangling nuclear activity from star formation processes

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The circum-nuclear regions of active galaxies hold fundamental information concerning the relationships existing among AGN and their hosts. Unfortunately, the simultaneous study of an AGN and its close environment is not straightforward, because, when the central source is directly observed, its extreme luminosity dominates the emission, suppressing the signals originated from neighboring regions. As a consequence, the best opportunity to investigate such environment comes from those cases where the strong continuum of the central engine is shielded by the intrinsic structure of the AGN and we are able to observe the host very close to the nucleus, as it happens in the case of type 2 objects. Optical spectroscopy shows that the circum-nuclear regions of active galaxies have signicantly different physical properties than those inferred for the same environment of the other systems. Indeed, while the spectral continuum close to the nucleus of a normal galaxy can be easily identied with that of an old, evolved stellar population, the stellar components of Seyfert 2 spectra show clear signatures of younger stars, with a systematically smaller continuum break at 4000 Å, indicating an excess of the spectral class A. The existence of hot stars in the nuclear environment leads us to conclude that a relatively recent star formation event must have occurred. On the other hand, the analysis of chemical abundances in the interstellar medium (ISM) found in these galaxies provides further suggestive indications. Several techniques, exploited to estimate the chemical composition of the Narrow Line Region (NLR), agree on the conclusion that heavy elements are more abundant in gas ionized by an AGN than in the nuclear regions of galaxies involved in ongoing star formation processes. The ISM of active galaxies, therefore, is evolved with respect to the case of star forming galaxies. Put together, all these hints place the circum-nuclear regions of active galaxies somewhere between the properties of normal galaxies, hosting an evolved stellar population, and those of galaxies where star formation occurred recently, as pointed out by the properties of their gaseous and stellar components. These results were veried on a large sample of spectra, covering the nuclear regions of galaxies with