RevMexAA (Serie de Conferencias), **40**, 98–99 (2011)

CORRELATIONS BETWEEN RADIO EMISSION OF THE PARSEC-SCALE JET AND OPTICAL NUCLEAR EMISSION OF HOST AGN

J. Torrealba,[1] T. G. Arshakian,[2] V. Chavushyan,[1] and I. Cruz-González[3]

RESUMEN

Estudiamos las relaciones entre la emisión VLBA (Very Long Base Array) en radio a 15 GHz y la emisión nuclear óptica a 5100 Å, para una muestra de 233 AGN dominados por el core con jets relativistas. Para 181 cuasares, hay una correlación positiva significativa entre la luminosidad nuclear óptica y las luminosidades VLBA totales del los núcleos no resueltos (en escalas de mili-arcosegundos) de los jets a 15 GHz. La emisión del continuo óptico correlaciona con la emisión del jet a 15 GHz para 31 BL Lacs. Estas correlaciones confirman que la emisión en radio y en óptico están amplificadas y se originan en la parte más interna del jet a escalas de sub-parsecs en los cuasares, mientras que en los BL Lacs estas emisiones son generadas en el jet a escalas de parsecs. Estos resultados están de acuerdo con lo reportado previamente por Arshakian et al. (2010) para una muestra de 135 AGN.

ABSTRACT

We study the relation between the VLBA (Very Long Baseline Array) radio emission at 15 GHz and the optical nuclear emission at 5100 Å, for a sample of 233 core-dominated AGN with relativistic jets. For 181 quasars, there is a significant positive correlation between optical nuclear emission and total radio (VLBA) emission of unresolved cores (on milliarcsecond scales) of the jet at 15 GHz. Optical continuum emission correlates with radio emission of the jet for 31 BL Lacs. These correlations confirm that the radio and optical emission are beamed and originate at sub-parsec scales in the innermost part of the jet in quasars, while they are generated in the parsec-scale jet in BL Lacs. These results are in agreement with that reported earlier by Arshakian et al. (2010) for a sample of 135 AGN.

Key Words: galaxies: active — galaxies: jets — quasars: general — radio continuum: galaxies

1. INTRODUCTION

One approach to investigate the physical processes in active galactic nuclei (AGN) at scales not reachable by present-day telescopes is to study the correlation between radiative energy in different frequencies. Arshakian et al. (2010, hereafter A10) investigated the radio-optical correlation between the VLBA core emission at 15 GHz and the optical nuclear emission at 5100 Å for a statistically complete sample of 135 compact jets to test a single production mechanism for radio and optical continuum emission on scales of submilliarcseconds. The present study is an extension of that research with a sample of 250 compact extragalactic radio sources at 15 GHz compiled by Kovalev et al. (2005), which includes 135 compact AGN from the flux-density limited MOJAVE-1 sample (Lister et al. 2009). The sample comprises 188 quasars, 36 BL Lacs, 20 radio galaxies, and 6 sources with no optical identification. The majority of AGN in the sample have relativistic jets oriented to the line of sight and have an unprecedented resolution of 0.5 milliarcseconds at 15 GHz. Note that this sample is not complete by the limiting radio flux.

2. RADIO-OPTICAL CORRELATIONS: ANALYSIS AND SUMMARY

The total luminosity of the VLBA component ($L_{\rm VLBA}$), the unresolved core ($L_{\rm un}$) and the jet luminosity ($L_{\rm jet}$) at 15 GHz were estimated as described in A10 (§ 3). Optical nuclear luminosities at 5100 Å, (L_{5100}) corrected for stellar contribution (equation (10) in A10) were estimated for 233 AGN of our sample from an homogeneous calibration using the B-band in the standard Johnson's photometric system.

The partial Kendall's τ test (Akritas & Siebert 1996) is used to check the correlation between the radio luminosities of the unresolved core and the

[1]Instituto Nacional de Astrofísica, Óptica y Electrónica, Apdo. Postal 51 y 216, 72000 Puebla, Puebla, Mexico (cjanet, vahram@inaoep.mx).

[2]Max-Planck/Institut für Radioastronomie, Auf dem Hügel 69, 53121 Bonn, Germany (tigar@mpifr-bonn.mpg.de).

[3]Instituto de Astronomía, Universidad Nacional Autónoma de México, Apdo. Postal 70-264, 04510, México D.F., Mexico (irene@astroscu.unam.mx).