A view of the narrow-line region in the infrared: active galactic nuclei with resolved fine-structure lines in the Spitzer archive

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(Submitted on 18 Jul 2011 (v1), last revised 20 Oct 2011 (this version, v2))

We queried the Spitzer archive for high-resolution observations with the Infrared Spectrograph of optically selected active galactic nuclei (AGN) for the purpose of identifying sources with resolved fine-structure lines that would enable studies of the narrow-line region (NLR) at mid-infrared wavelengths. By combining 298 Spitzer spectra with 6 Infrared Space Observatory spectra, we present kinematic information of the NLR for 81 z<=0.3 AGN. We used the [NeV], [OIV], [NeIII], and [SIV] lines, whose fluxes correlate well with each other, to probe gas photoionized by the AGN. We found that the widths of the lines are, on average, increasing with the ionization potential of the species that emit them. No correlation of the line width with the critical density of the corresponding transition was found. The velocity dispersion of the gas, sigma, is systematically higher than that of the stars, sigma_*, in the AGN host galaxy, and it scales with the mass of the central black hole, M_BH. Further correlations between the line widths and luminosities L, and between L and M_BH, are suggestive of a three dimensional plane connecting log(M_BH) to a linear combination of log(sigma) and log(L). Such a plane can be understood within the context of gas motions that are driven by AGN feedback mechanisms, or virialized gas motions with a power-law dependence of the NLR radius on the AGN luminosity. The M_BH estimates obtained for 35 type 2 AGN from this plane are consistent with those obtained from the M_BH-sigma_* relation.

Comments:	ApJ, revised to match the print version
Subjects:	**Cosmology and Extragalactic Astrophysics (astro-ph.CO)**
Journal reference:	2011, ApJ, 740, 94
DOI:	10.1088/0004-637X/740/2/94
Cite as:	**arXiv:1107.3397 [astro-ph.CO]**
	(or **arXiv:1107.3397v2 [astro-ph.CO]** for this version)

Submission history

From: Kalliopi Maria Dasyra [view email]
[v1] Mon, 18 Jul 2011 10:42:09 GMT (1235kb)
[v2] Thu, 20 Oct 2011 11:44:41 GMT (1251kb)

Which authors of this paper are endorsers?