(sigma) in Shen et al (2008). The masses of all NSL1 are well below, but become more very close to, the predictions of the M-sigma relation before and after the correction.The effect of the correction is obvious, albeit small number statistics due to the limited sample.

4 THE LOCATION OF THE IMLR AND THE EVIDENCES FOR ITS EXISTENCE

4.1 Broad Line Region evolution

We assume that both of the two regions (VBLR and IMLR) are bounded by the central black hole's gravity. Then, we have

$$f_1^2\frac{V_{\rm VBLR}^2}{R_{\rm VBLR}}=\frac{GM_{\rm BH}}{R_{\rm VBLR}^2}, \qquad (4)$$

and

$$f_2^2\frac{V_{\rm IMLR}^2}{R_{\rm IMLR}}=\frac{GM_{\rm BH}}{R_{\rm IMLR}^2}. \qquad (5)$$

These two equations lead to

$$R_{\rm IMLR}=(\frac{f_1V_{\rm VBLR}}{f_2V_{\rm IMLR}})^2R_{\rm VBLR}=C_0(\frac{V_{\rm VBLR}}{V_{\rm IMLR}})^2R_{\rm VBLR}, \qquad (6)$$

where $\rm C_0=(\frac{f_1}{f_2})^2$. $\rm C_0$ is a constant which need to be determined by further studies. The radius measured from reverberation is taken as $R_{\rm VBLR}$. Therefore, we can calculate the radius of IMLR from the above equation. $R_{\rm IMLR}$ is proportional to $\rm C_0$. $\rm C_0=1$ is used for all the calculation below. $R_{\rm IMLR}$ is obtained from Hα and Hβ lines separately. Fig.4 is the evolution of $R_{\rm VBLR}$ and $R_{\rm IMLR}$ with luminosity. The radius of the IMLR increases slower than VBLR with luminosity and black hole mass increasing. The two emission regions have a trend to merge into one with larger higher luminosity and black hole mass. as $R_{\rm IMLR}\propto \rm L5100^{0.37\pm0.06}$ while $R_{\rm VBLR}\propto \rm L5100^{0.52\pm0.04}$.

4.2 The location of IMLR

The relation $R_{\rm IMLR}\propto \rm L5100^{0.37\pm0.06}$ is consistent with the receding velocity of torus based on infrared reverberation mapping (Suganuma et al. 2006) and the receding velocity of torus that we can calculate based on analysis of type I AGN fraction (Simpson 2005). Our other analysis also shows that the IMLR may have higher density, more dusty than the VBGC, and the IMGC show slightly Baldwin effect while the VBGC does not. The Baldwin effect can be explained as a flattened geometry. These results suggest that IMLR is the inner hot skin of torus. A simple scenario of the BLR (BLR=VBLR+IMLR) evolution can be constructed as shown in Fig.5. The inner spherical region is the VBLR (Very Broad Line Region). It expands to a larger radius with luminosity increase and perhaps also black hole mass increase. IMLR is the inner part of the torus, which can be sublimated by the central radiation and thus its radius also increases with luminosity increase. When the luminosity is high enough, the broad line region and torus become one single entity, but with different physical conditions. This scenario is consistent with the dust bound BLR hypothesis which also showed that the delay time of infrared emission is always longer than the delay time of emission lines of

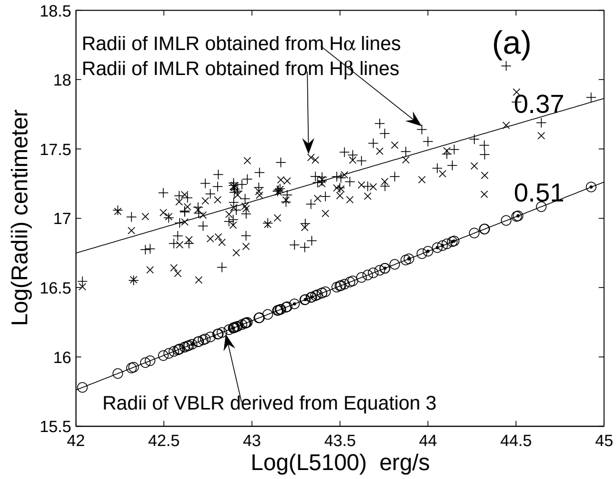

Figure 4. Correlation of the radii of IMLR and VBLR with luminosity. Circles are the VBLR radius, $\times$ represent IMLR radius derived from Hβ lines and $+$ from Hα lines. Circles filled with dots represent the objects missing the intermediate Gaussian component. The radius of the VBLR is obtained from the $R_{\rm BLR}$ ~L5100 (equation 2 not equation 3). These correlations supports a scenario of hierarchical evolution of AGNs.

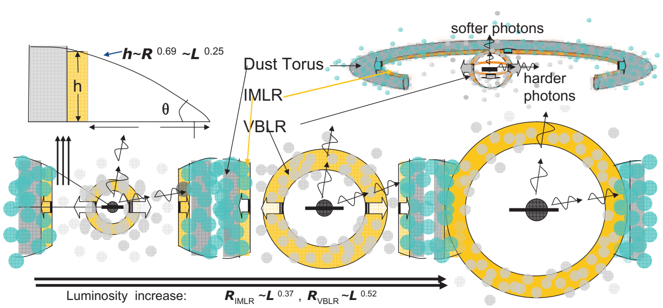

Figure 5. Cartoon of the Broad Line Region evolution. Continuum photons from the central region have slightly higher energies along the nearly edge-on direction. With black hole mass and luminosity increasing, both the VBLR and IMLR expand. The radius of VBLR increases faster, so the two regions have a trend to merge into one.

the corresponding AGN, but sometimes they are almost the same (Laor 2004; Elitzur 2006). Suganuma et al. (2006).

4.3 Evidence for the existence of IMLR

The first concrete evidence comes from the the study of the micro-lensing of the Broad Line Region in the lensed quasar J1131-1231 (Sluse et al. 2007, 2008). In this work they found evidence that the Hβ emission line (as well as Hα) is differentially microlensed, with the broadest component (FWHM 4000 km/s) being much more micro-lensed than the narrower component (FWHM 2000 km/s). Because the amplitude of micro-lensing depends on the size of the emitting region, this is a clear evidence that the broadest compo-