A Photoionization Method for Estimating Black Hole Masses in Quasars

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$$M_{\rm BH} = \frac{3}{4G} f_{0.75} ({\rm FWHM})^2 r_{\rm BLR}$$

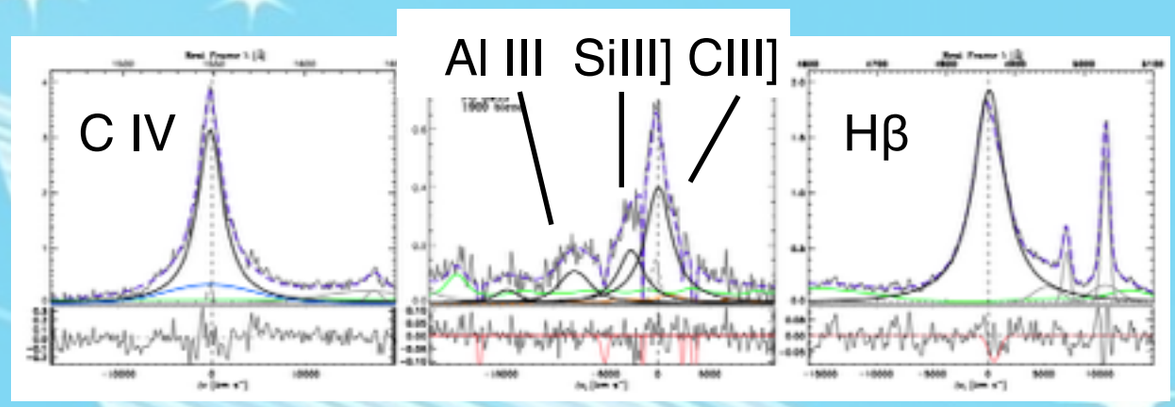
$$r_{BLR} = \left[\frac{\int_{\nu_0}^{+\infty} \frac{L_\nu}{h\nu} d\nu}{4\pi U n_{\rm H} c} \right]^{1/2}$$

1) **AlIIIλ1860/SiIII]λ1892** — sensitive to n_H
2) **CIVλ1549/SiIII]λ1892** — marker of ionization level
3) **SiIVλ1397/SiIII]λ1892** — sensitive to ionization (roughly independent of metallicity)

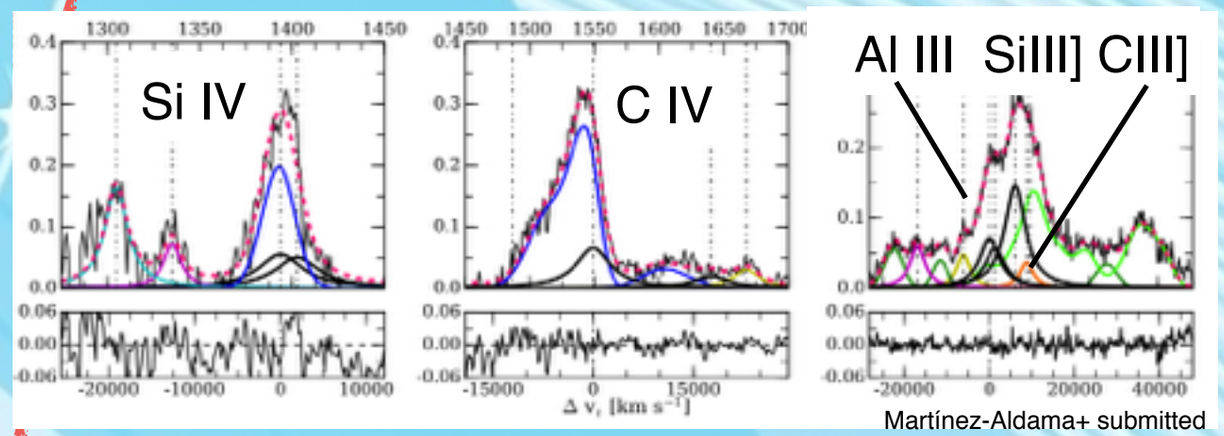
CLOUDY simulations (Ferland et al. 2013) at fixed n_H and U values in the ranges

$7.00 \leq \log n_H \leq 14.00$
$-4.50 \leq \log U \leq 00.00$

Metallicities: **1Z⊙, 5Z⊙ and 5Z⊙SiAl** (with an overabundance of Si and Al due to type II supernovae; Sani et al. 2010).



z ~ 0.2



z ~ 2.6