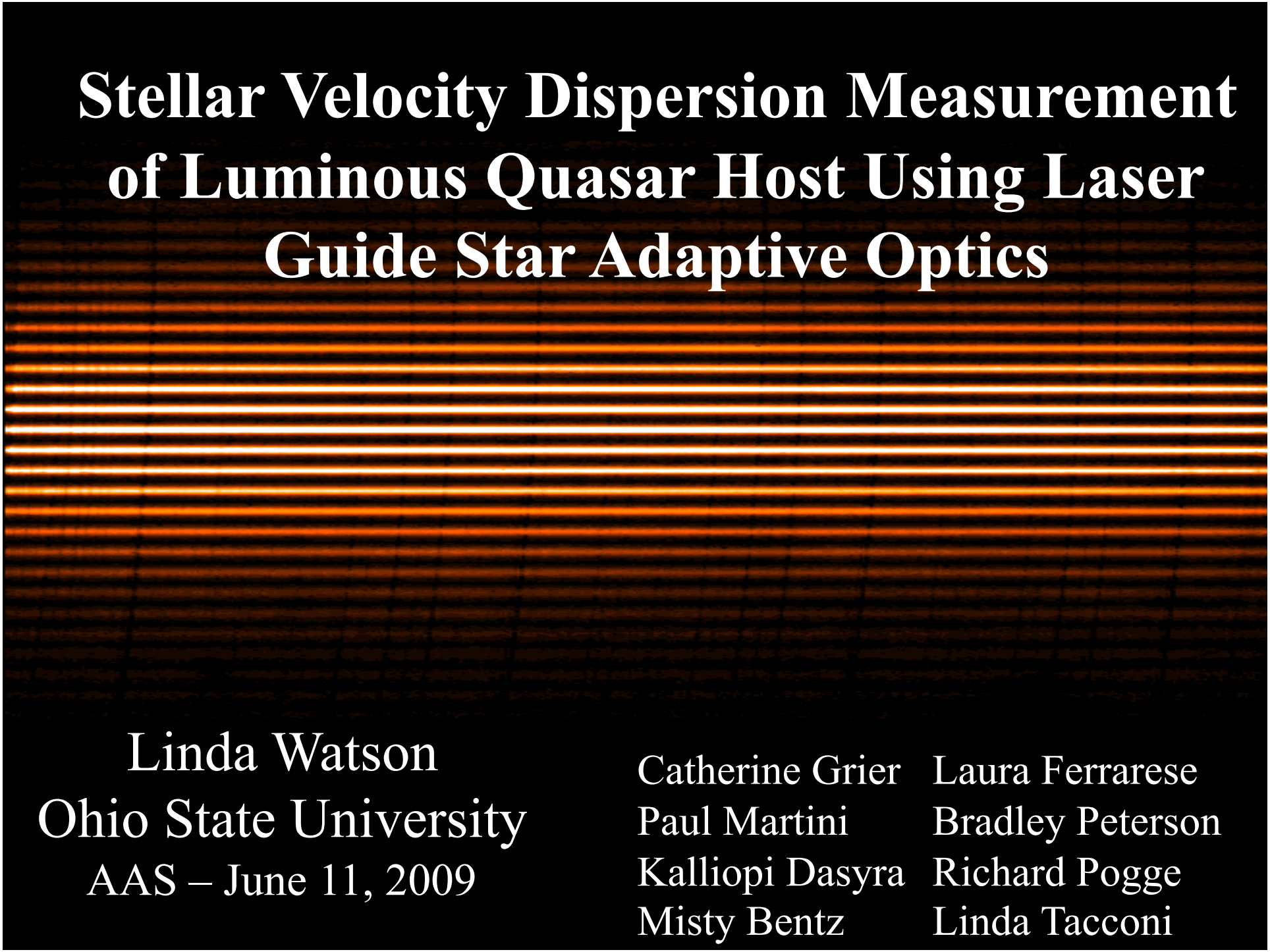
Stellar Velocity Dispersion Measurement of Luminous Quasar Host Using Laser Guide Star Adaptive Optics



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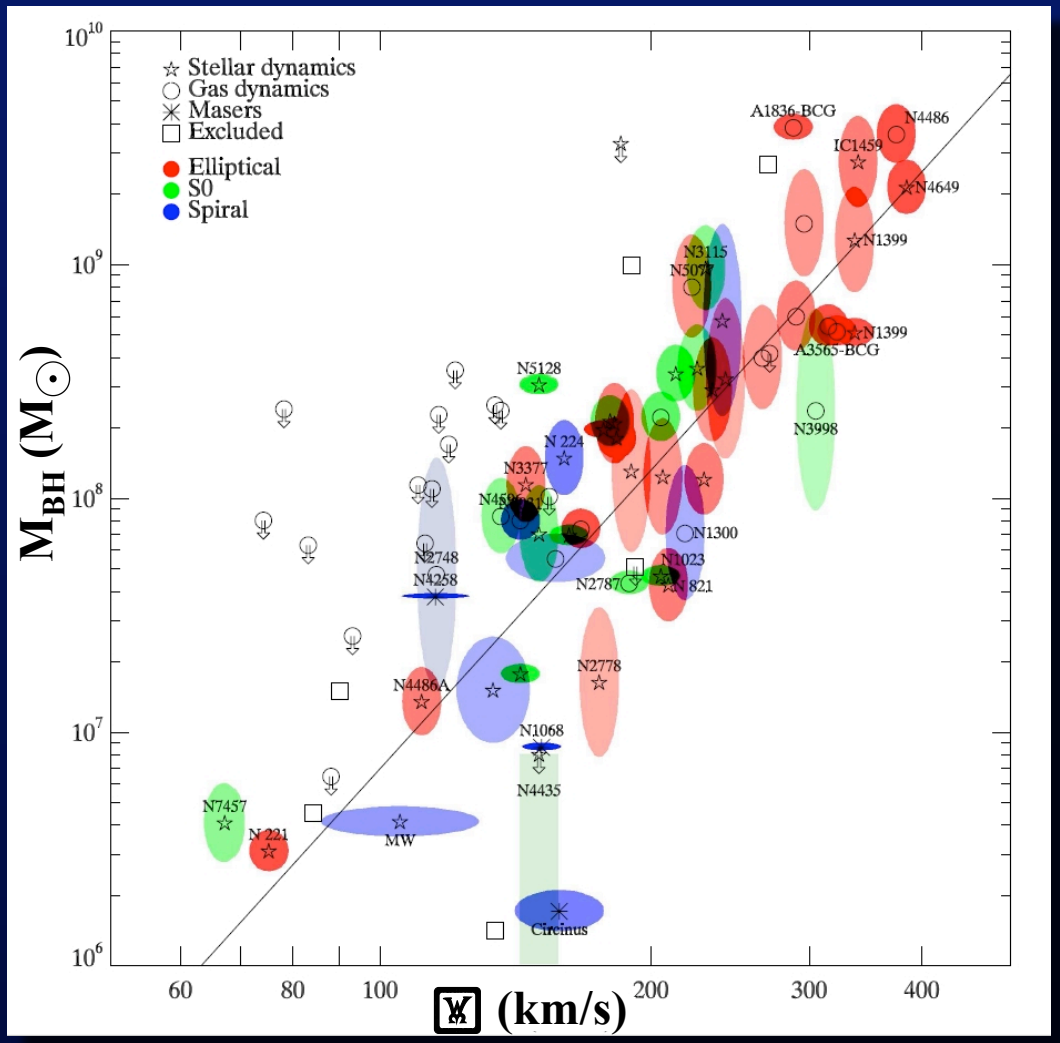
Motivation

- Determine location of high-luminosity (high-mass) quasars on M_{BH} - σ relation
- Determine whether AGN broad-line region geometry depends on luminosity



Gultekin et al. (2009)

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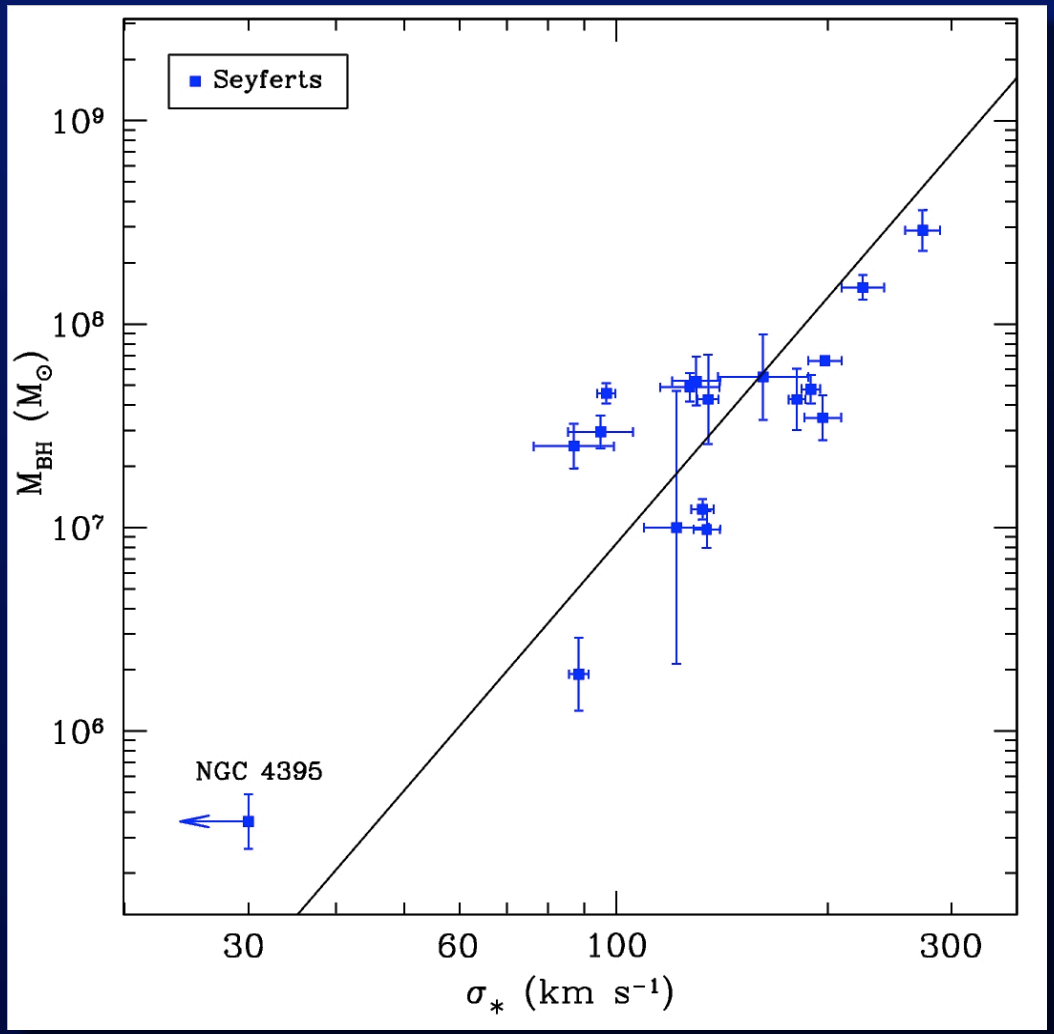


Onken et al. (2004), Nelson et al. (2004), Bentz et al. (2006), Denney et al. (2006)

AGN Black Hole Mass Estimates

- Most direct method to measure AGN black hole masses is through reverberation mapping:

$$M_{\rm BH} = f \frac{R_{\rm BLR}(\Delta V)^2}{G}$$

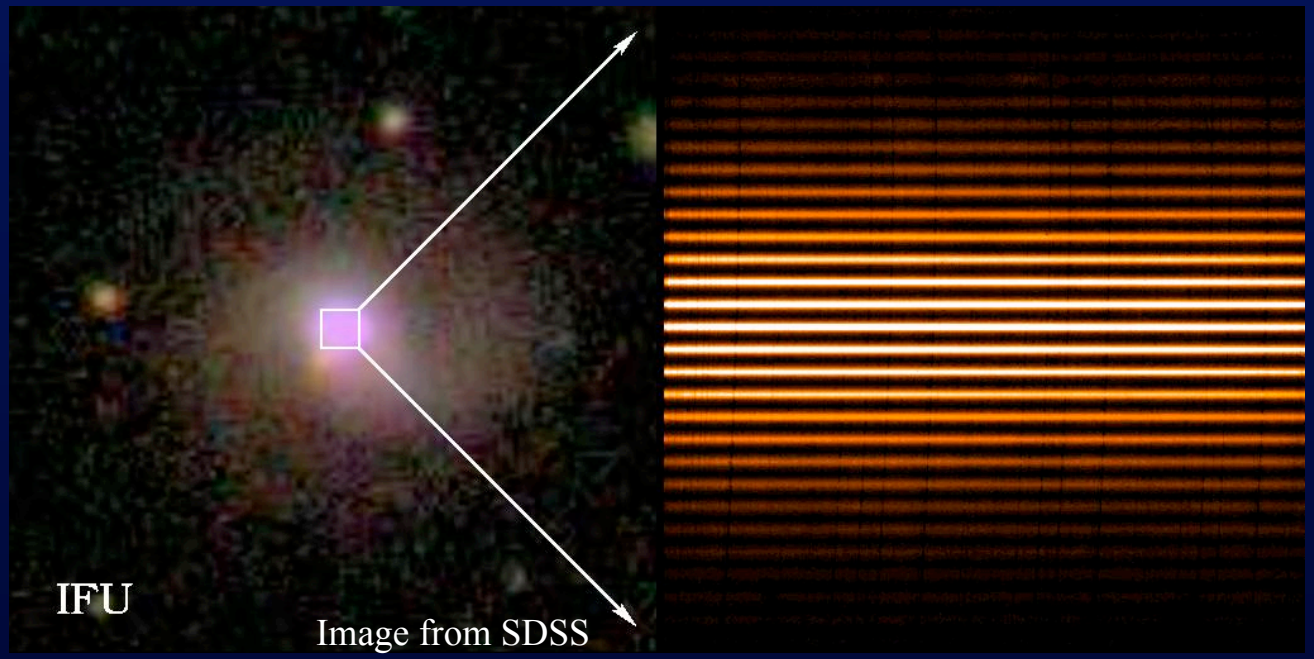
  - R_{BLR}: derived from time delay between continuum and emission line variations
  - ΔV: measure of the BLR velocity
  - Scale factor *f* accounts for unknown geometry of BLR

- We measured the bulge stellar velocity dispersion for the host of a luminous quasar: PG 1426+015

Gemini North Observations of PG 1426+015

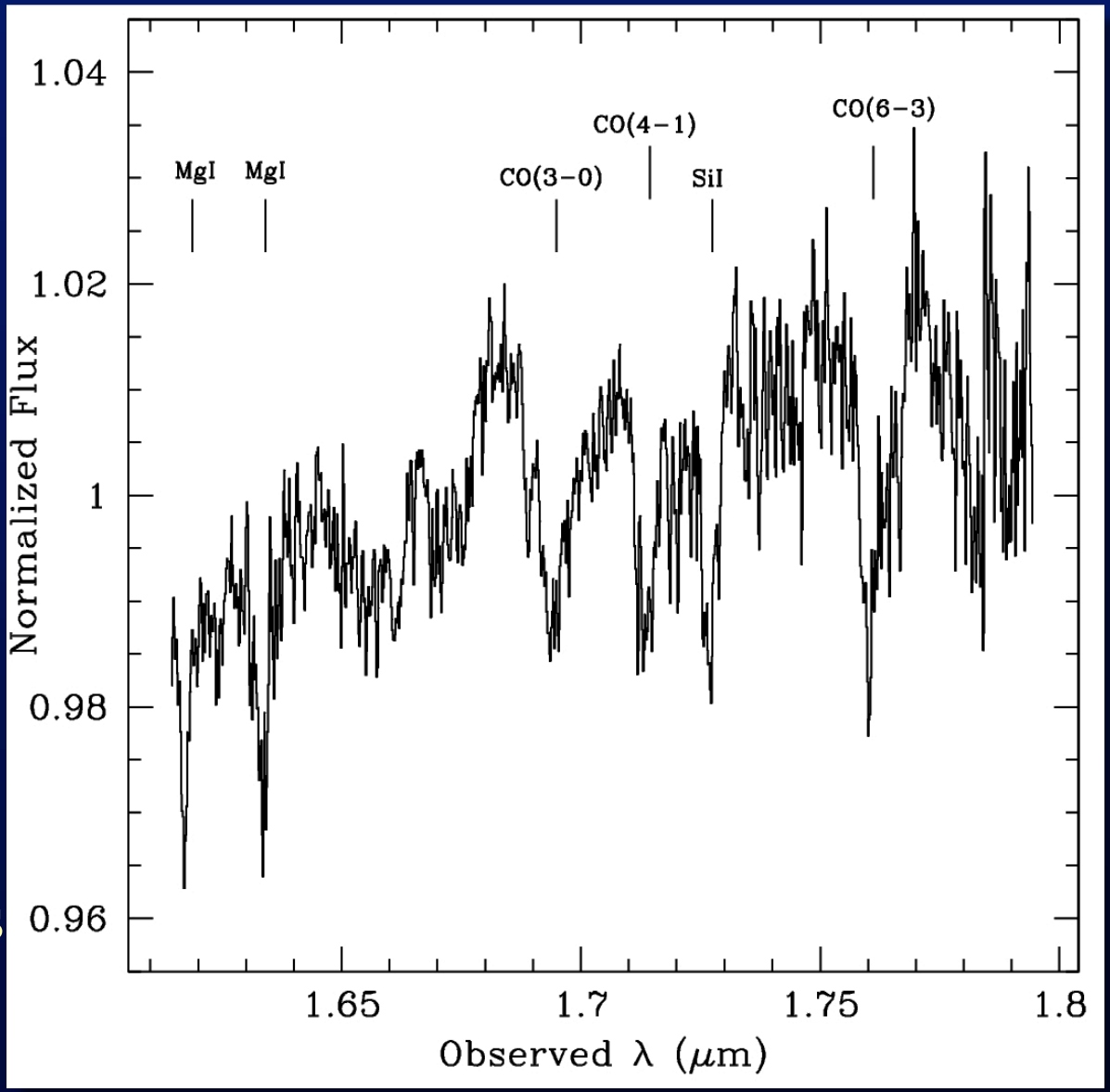
- Altair laser guide star adaptive optics (LGS AO) system
  - LGS AO concentrates quasar emission into central few pixels

- Near-Infrared Integral Field Spectrometer (NIFS)
  - IFU captures more host galaxy light than longslit spectrograph



Velocity Dispersion Measurement

- Velocity dispersion measured using Penalized Pixel Fitting method of Cappellari & Emsellem (2004)
- K5 III, M1 III, and M5 Ia templates
- σ = 217 σ 15 km/s



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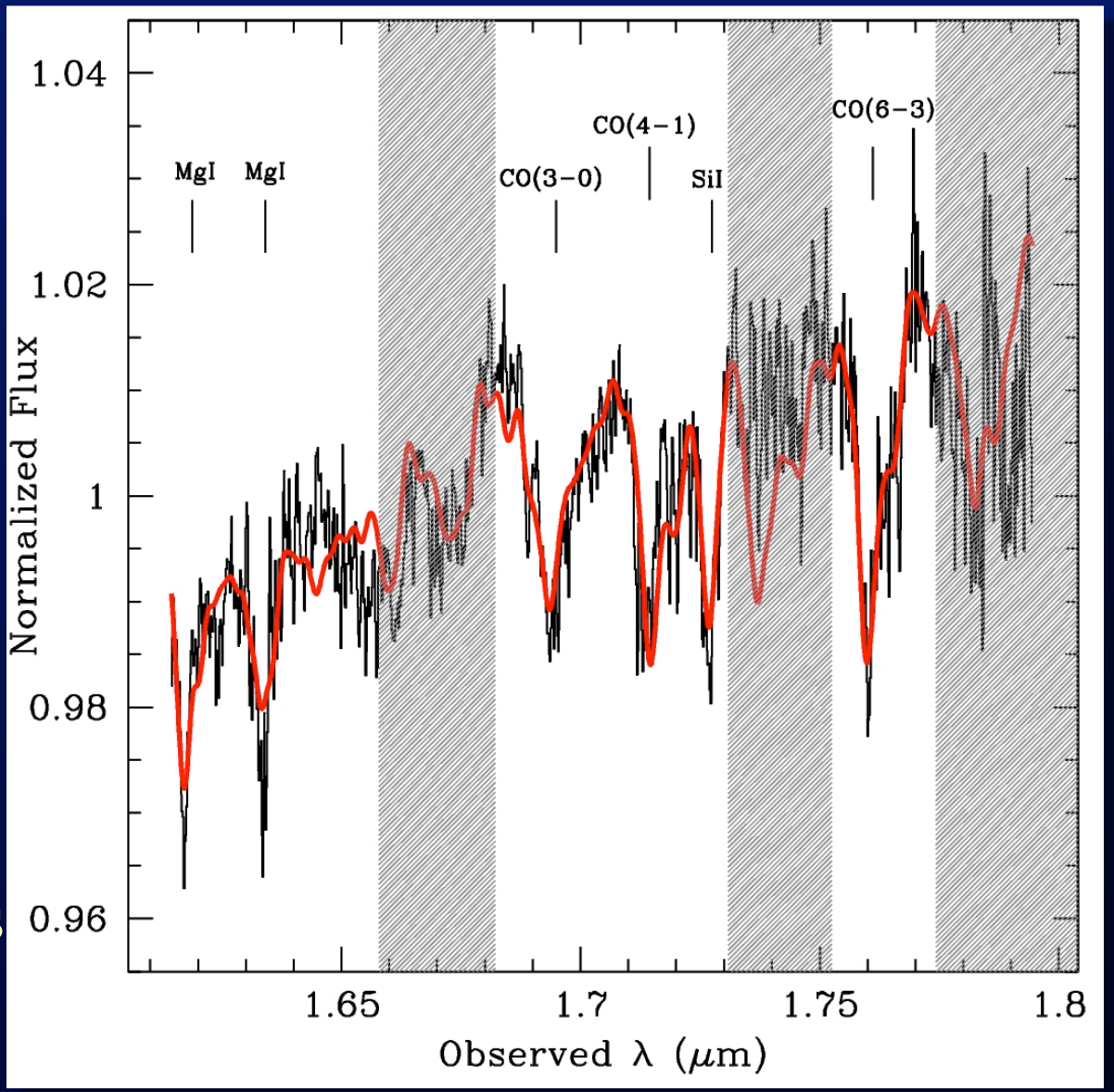
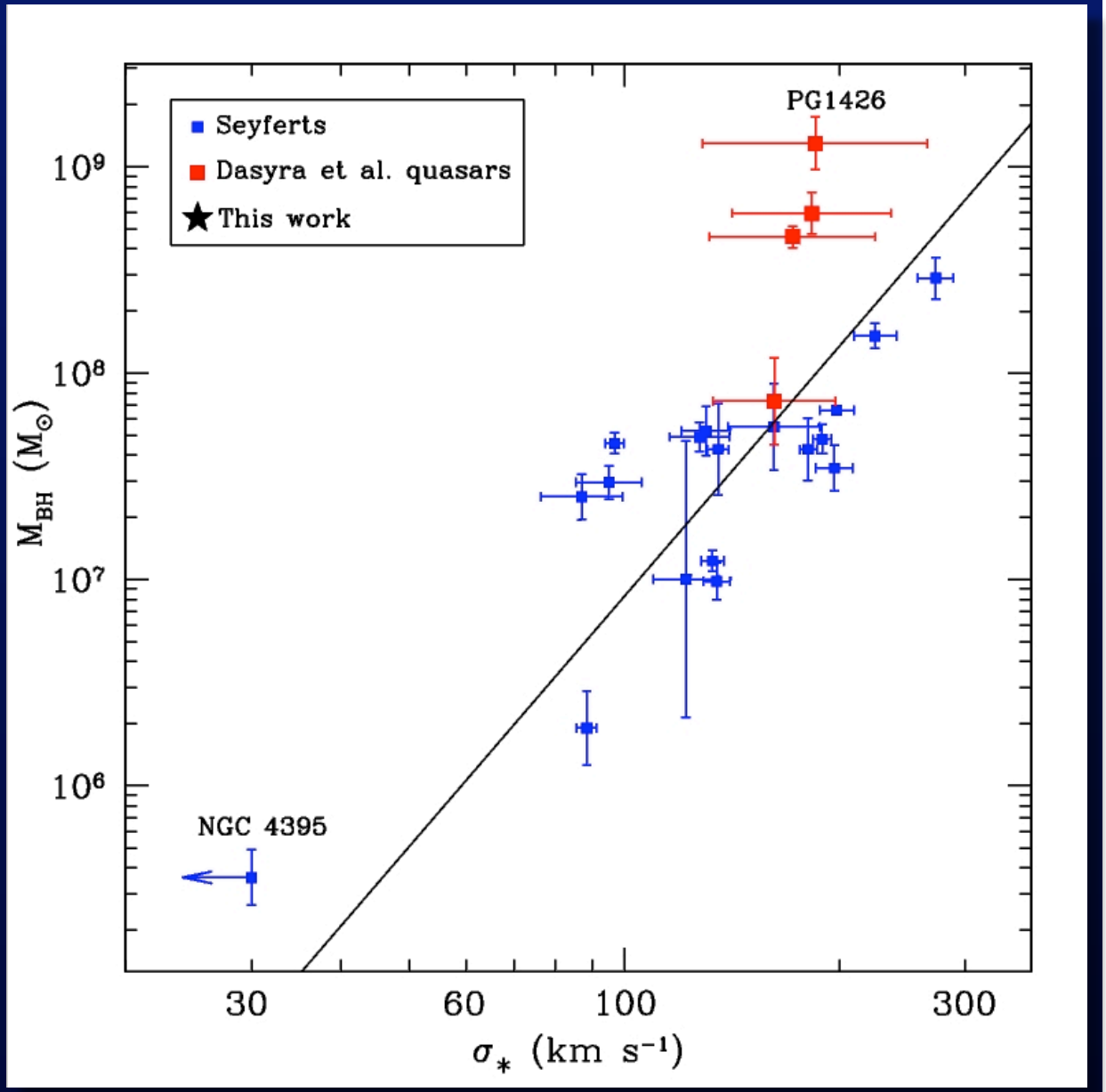


PG 1426+015 on the M_{BH} - σ_* Relation

- PG 1426+015 lies above the M_{BH} - σ_* relation
- Possible reasons:
  - Scale factor, *f*, may be different for different populations
  - Selection bias
  - Small number statistics



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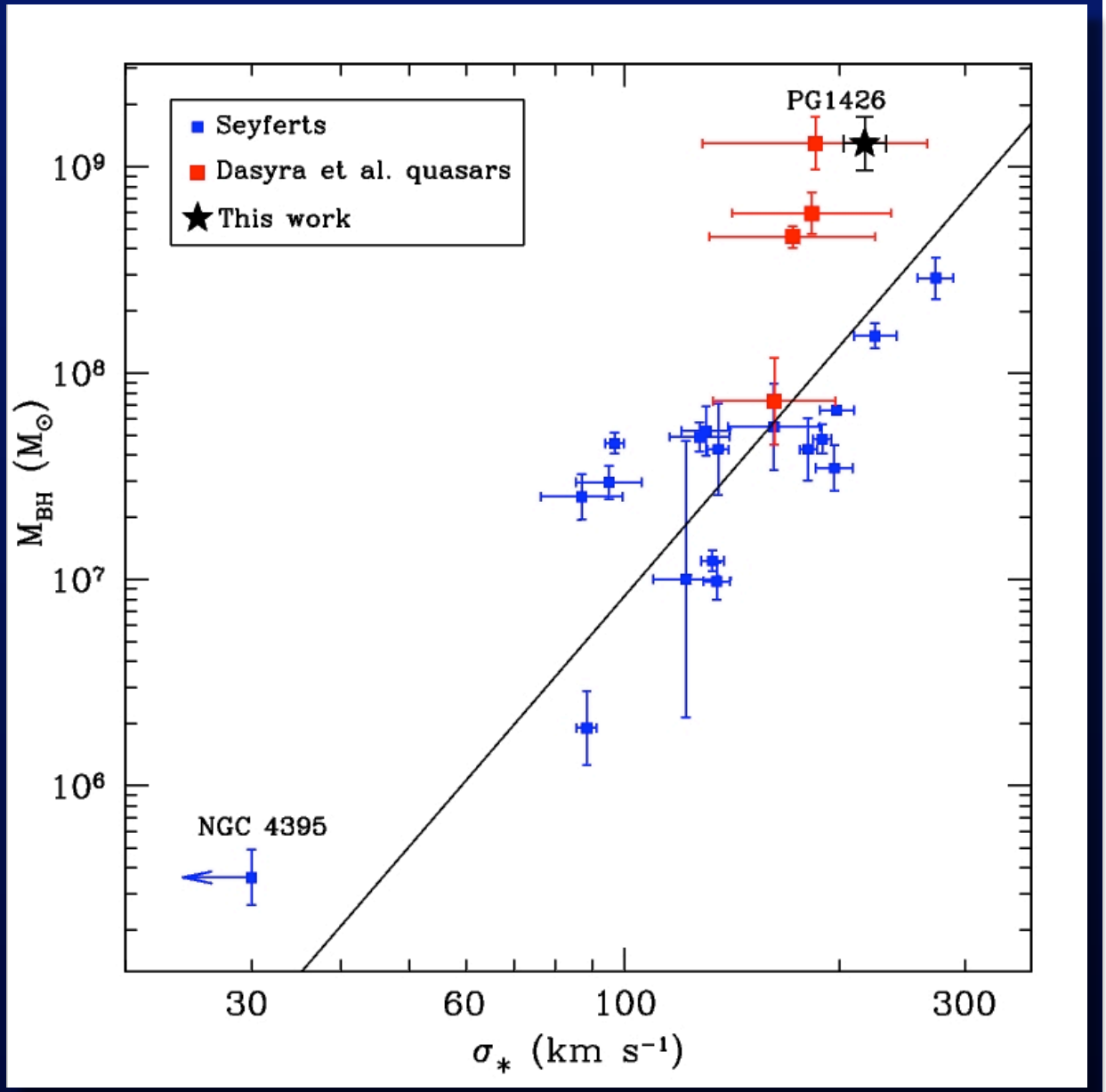

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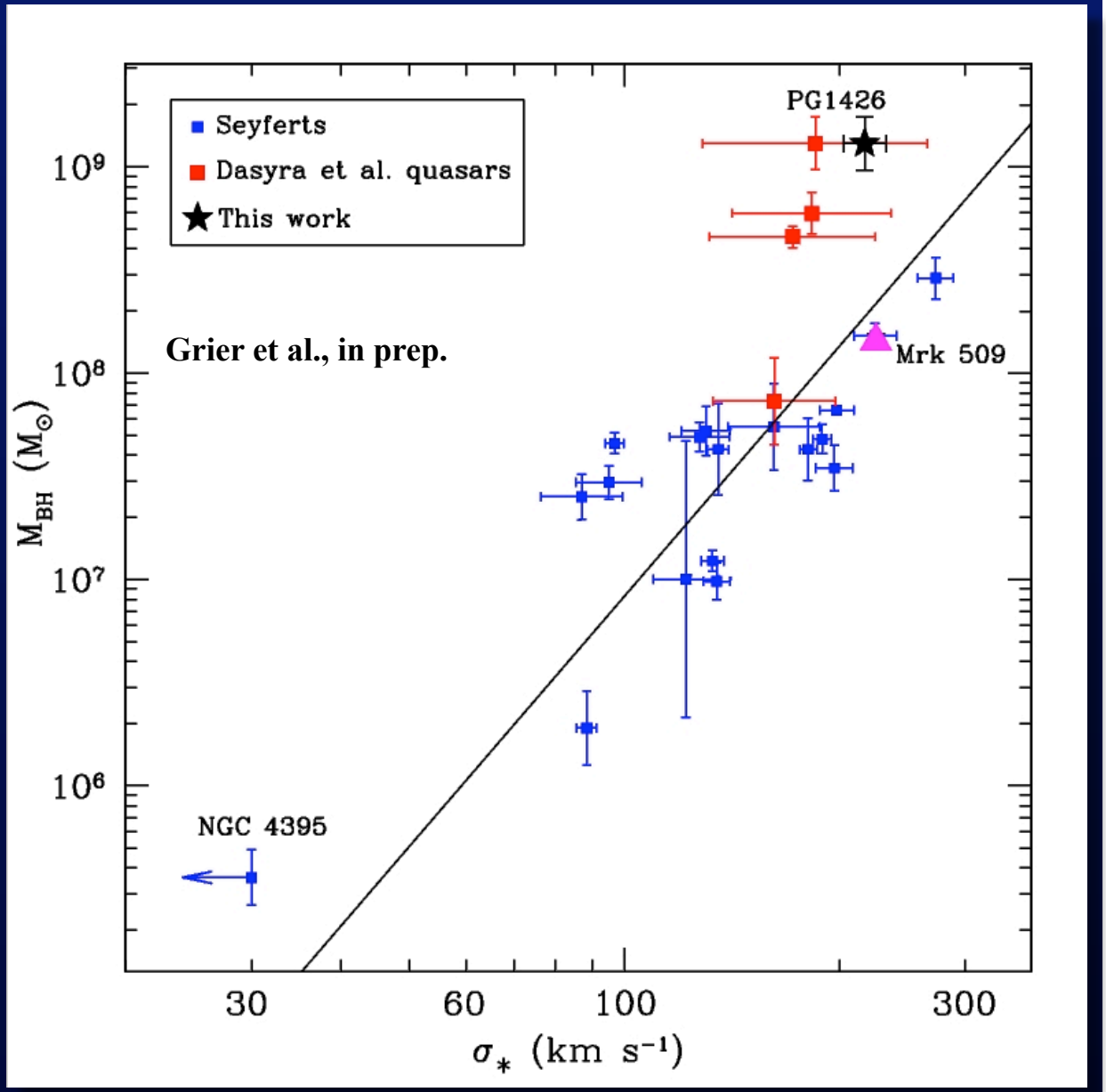

Conclusions

- Used the Gemini North Near-Infrared Integral Field Spectrometer (NIFS) and laser guide star adaptive optics to measure the stellar velocity dispersion in the host of a luminous quasar

- PG 1426+015 lies significantly above the quiescent galaxy M_{BH} - σ relation

- More observations will help to determine why high-mass quasars seem to lie above the M_{BH} - σ relation

Extras

- Lauer et al. (2007) selection bias: