How Host Galaxy and Environment Relate to the Central 400pc of Local Seyfert Galaxies

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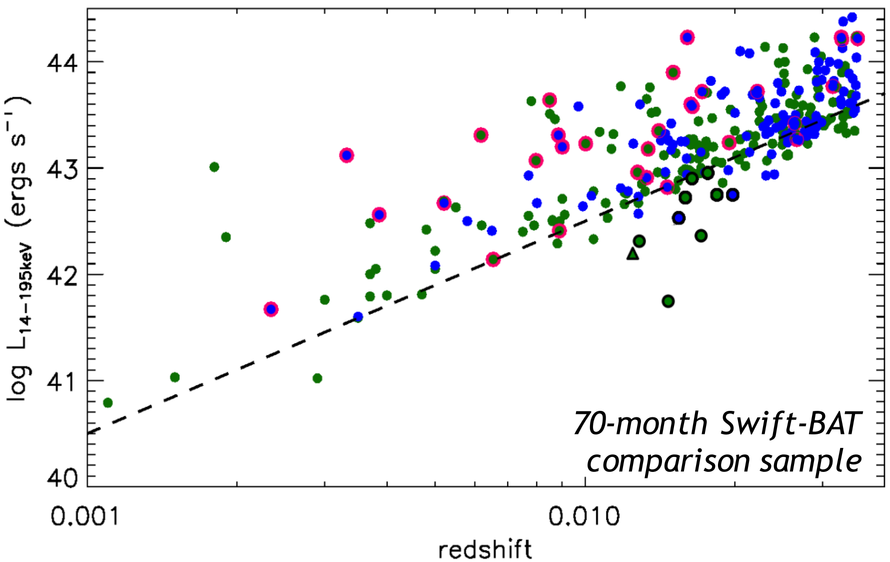
KONA Team

UAA Physics & Astronomy

KONA Sample

(Keck OSIRIS Nearby AGN)



Sample Criteria:

(i) AGN classification (optical

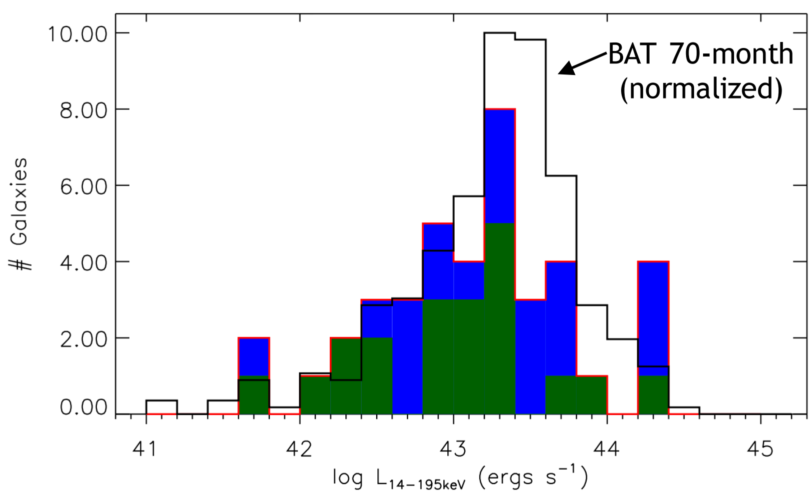
(ii) unresolved hard X- ray emission in the center of the galaxy

(iii) compact flat-spectrum radio source spatially coincident with the hard X-ray emission

(iv) exhibit high-ionization lines

Redshift > 0.035

Observable at Keck



40 Seyfert Galaxies

(20 Sey 1 + 20 Sey 2)

3 orders of magnitude in Xray & K-band luminosities

Median PSF 38 pc

Müller-Sánchez et al. 2018

Hicks et al. 2018 in prep

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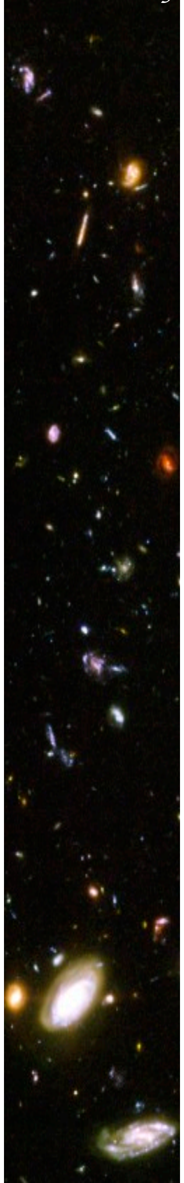
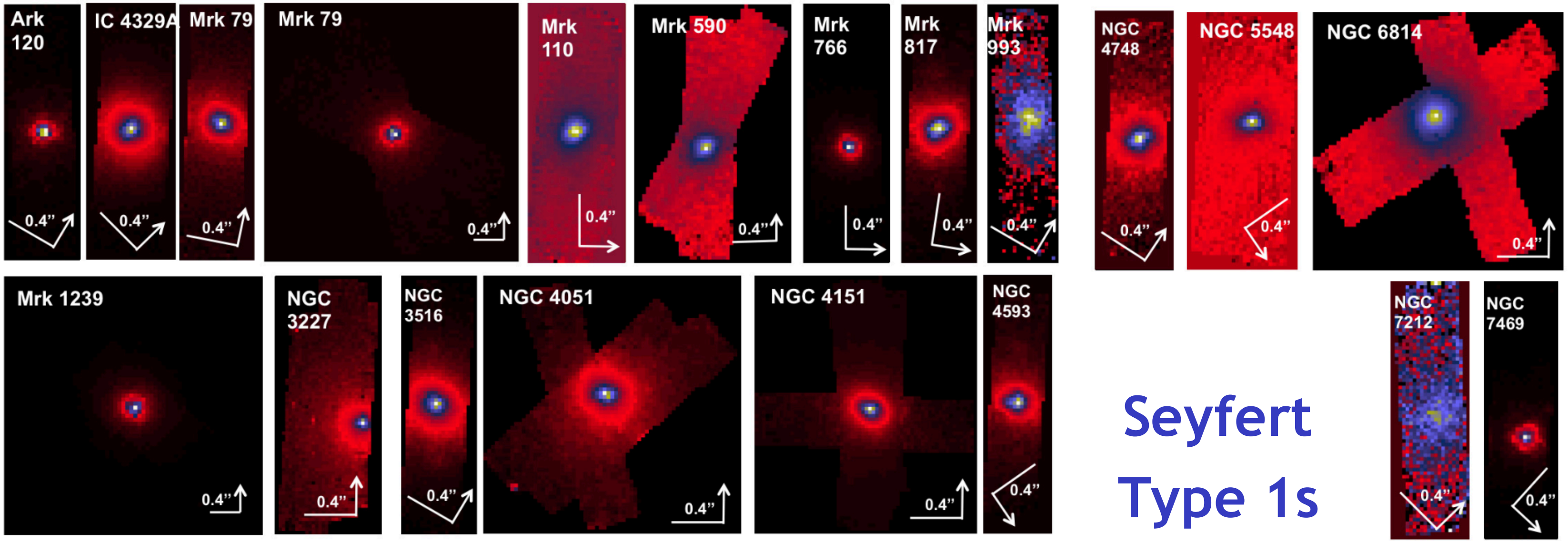
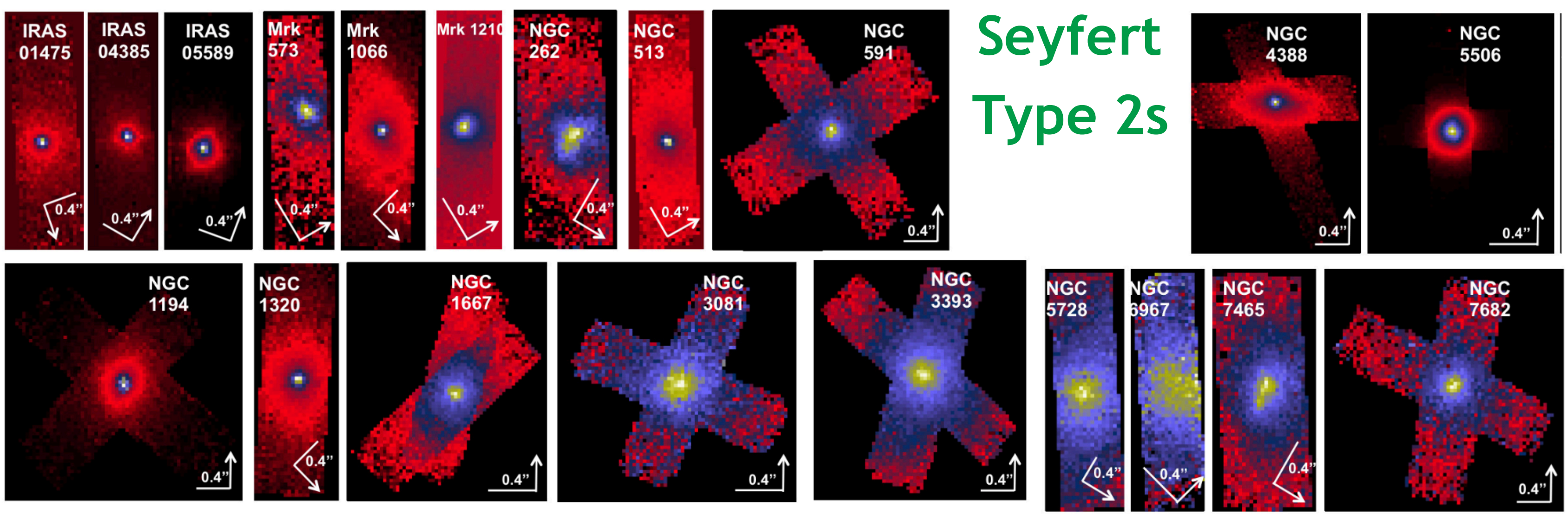




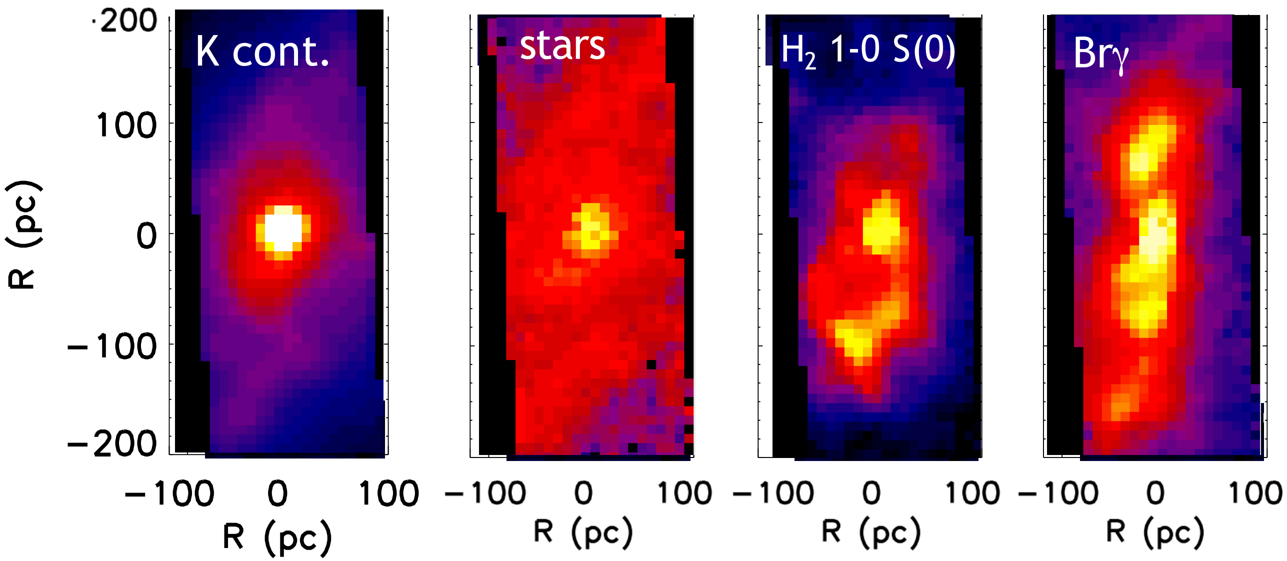
Seyfert Type 1s

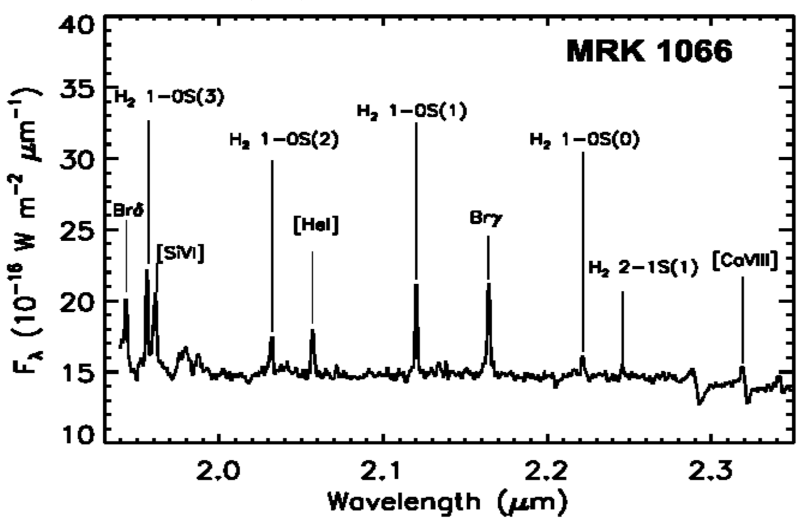
Normalized K-band Continuum



Seyfert Type 2s

Mapping of stars & molecular, ionized, and coronal gas

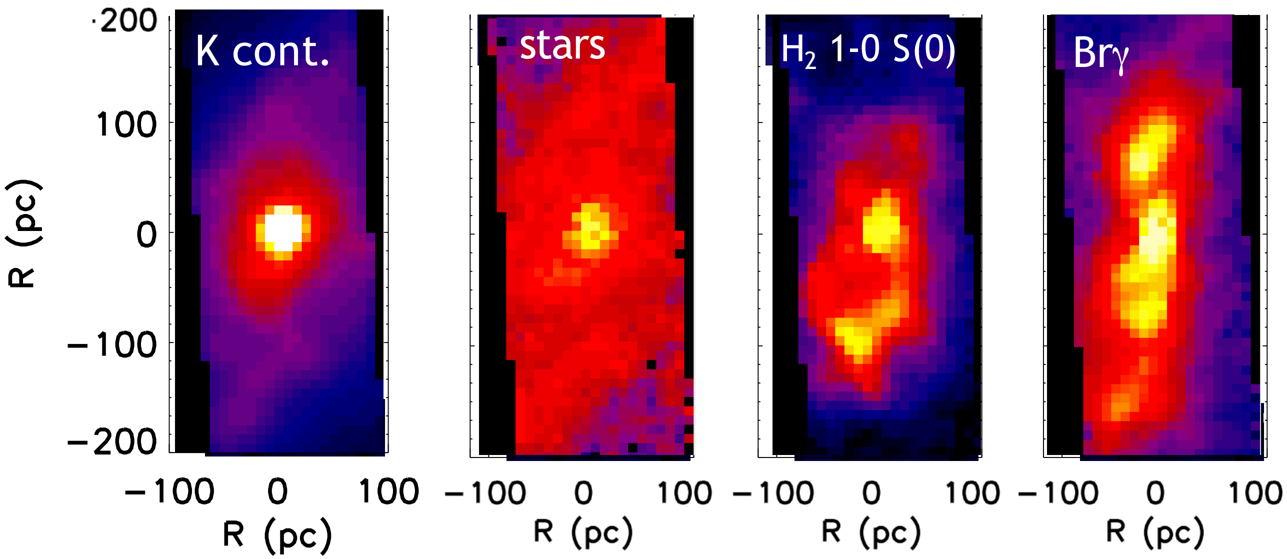




Example: Mrk 1066

← Integrated spectrum over central 0.”35

Mapping of stars & molecular, ionized, and coronal gas

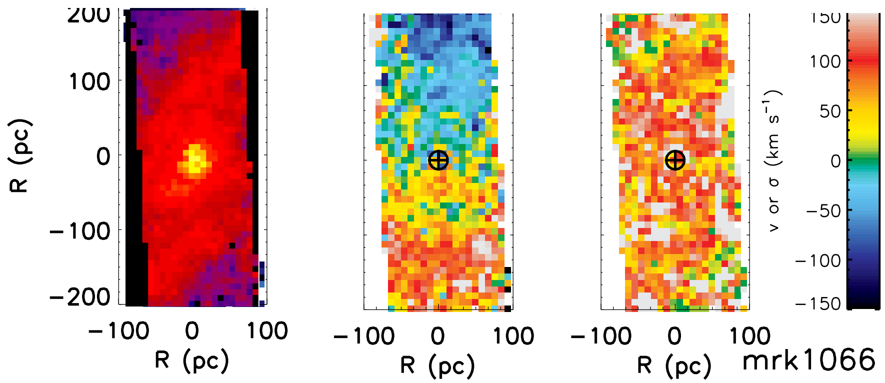


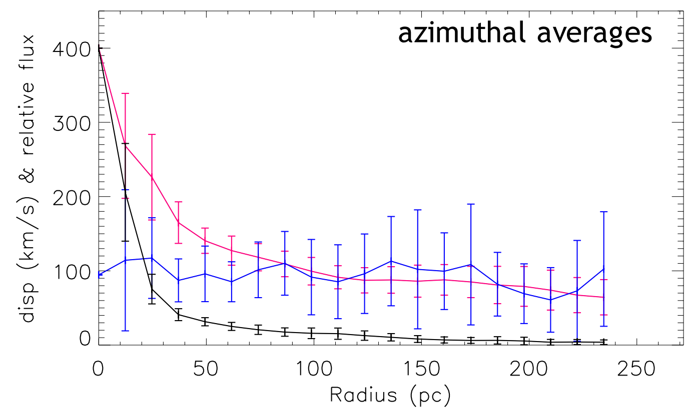
KONA key science questions:

- Inflows: What drives gas from hundred-parsec scales into the nucleus?
- Outflows: How do accreting black holes influence their host galaxies?
- Testing molecular torus and unification schemes
- Trends in nuclear properties with AGN and host galaxy properties

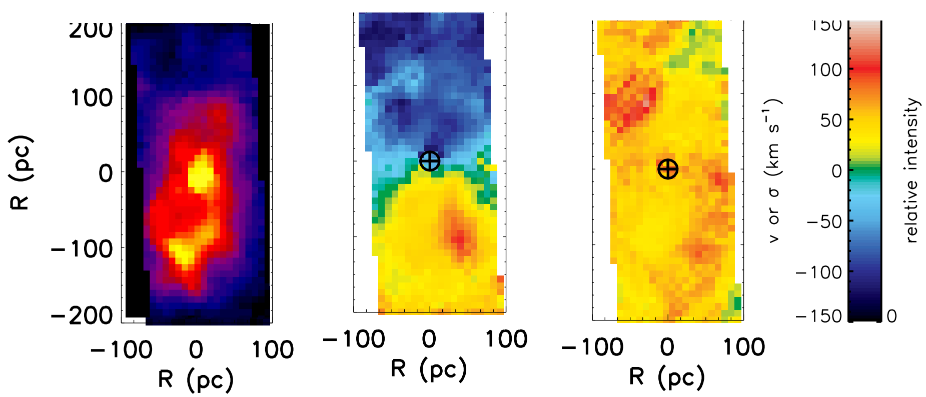
Measured Kinematics example: Mrk 1066

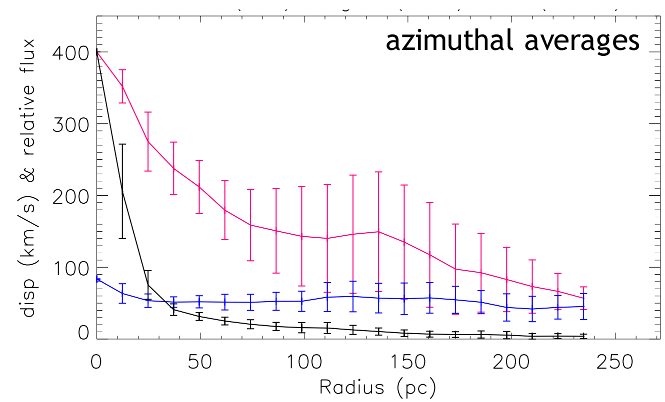
Stars measured by CO 2.3 bandheads





flux *velocity* *σ*





H_2 1-0 S(0) measured at 2.12μm

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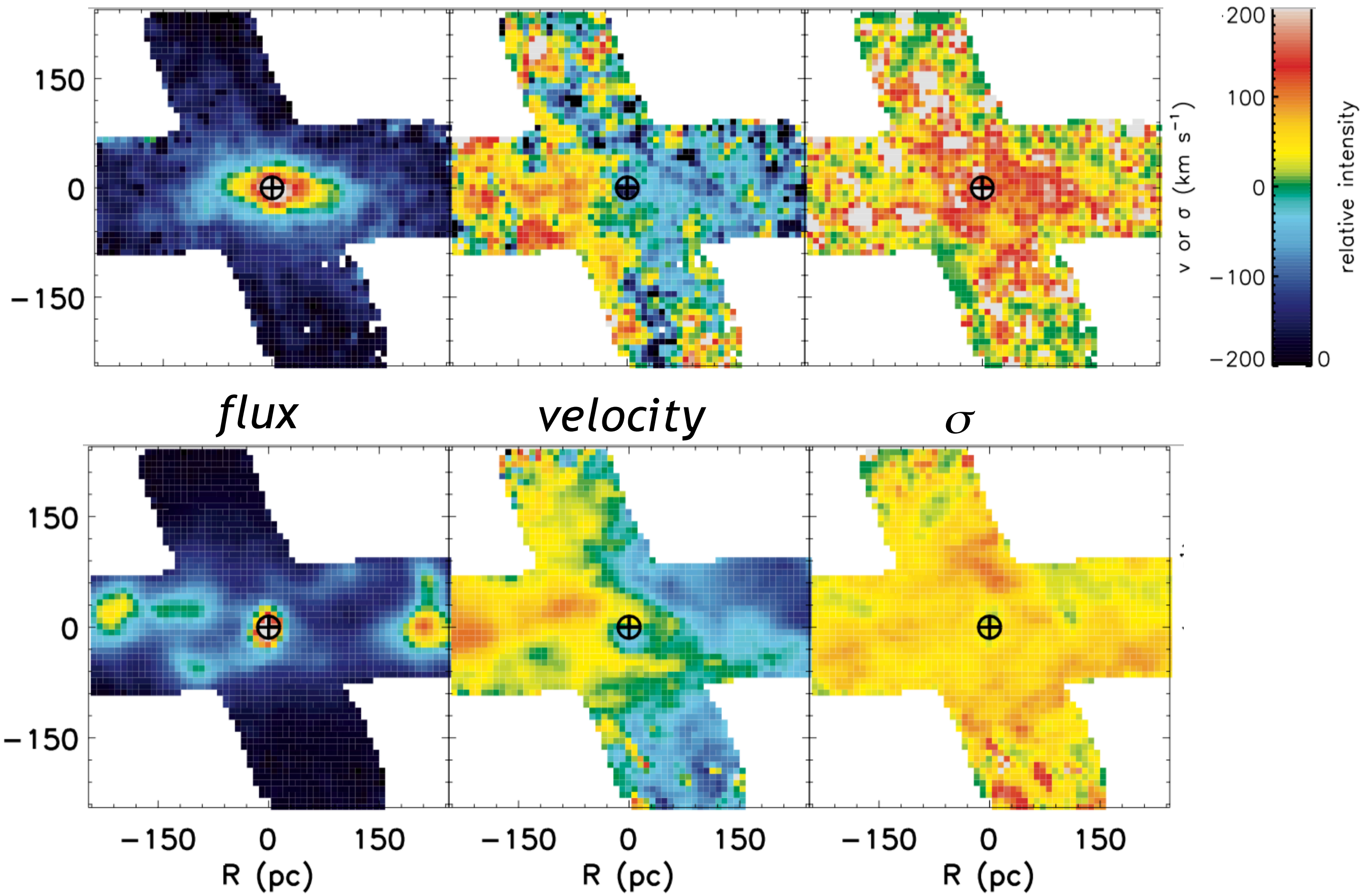
Measured Kinematics example: NGC 4388

Stars measured by CO 2.3 bandheads

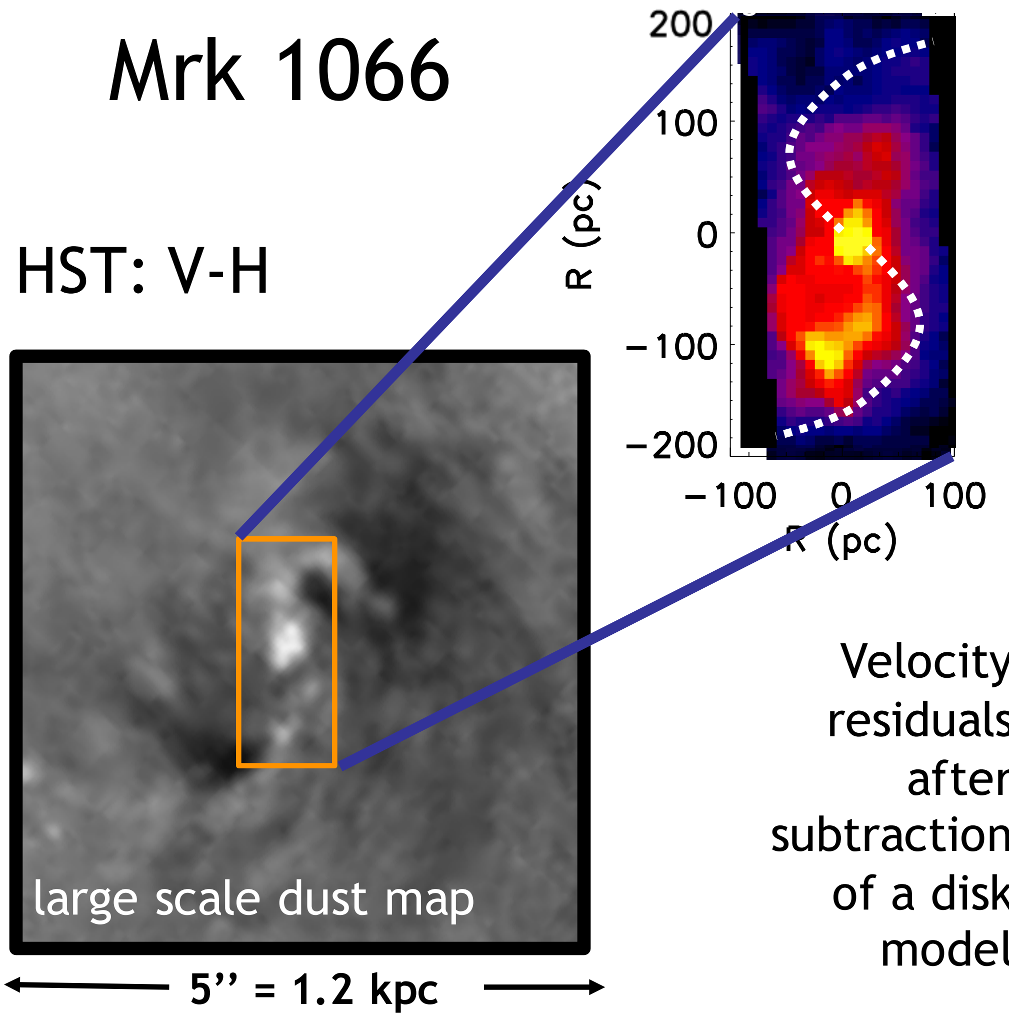


H_2 1-0 S(0) measured at 2.12μm

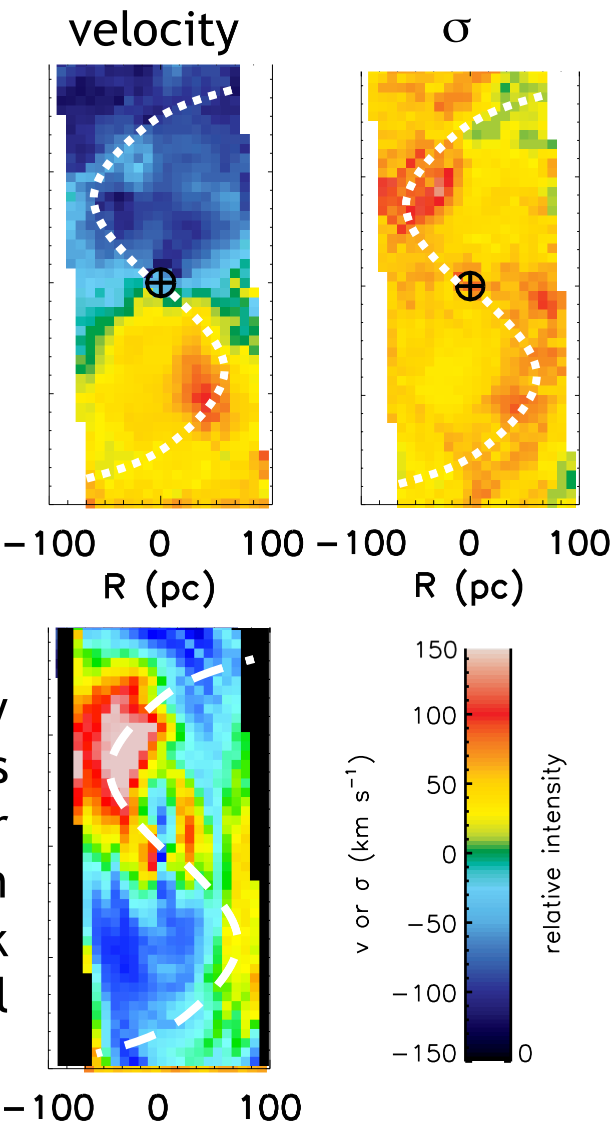
Larger Scale Dust Maps

Mrk 1066

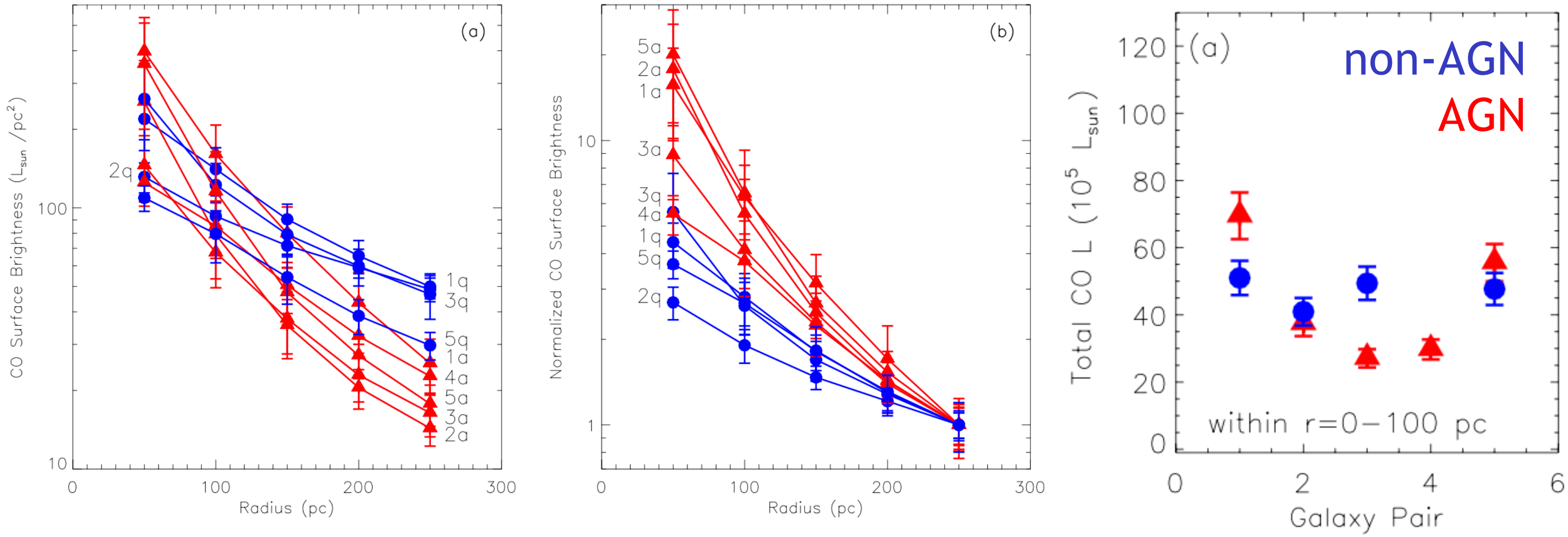
HST: V-H



Velocity residuals after subtraction of a disk model



Integrated properties



Hicks et al. 2013

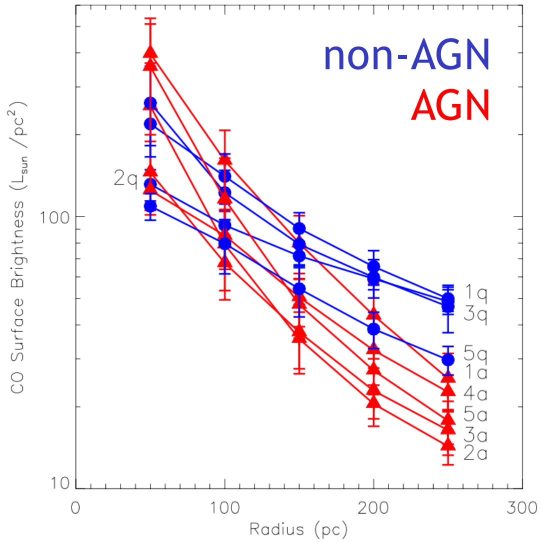
Seyferts, compared to quiescent galaxies, have:

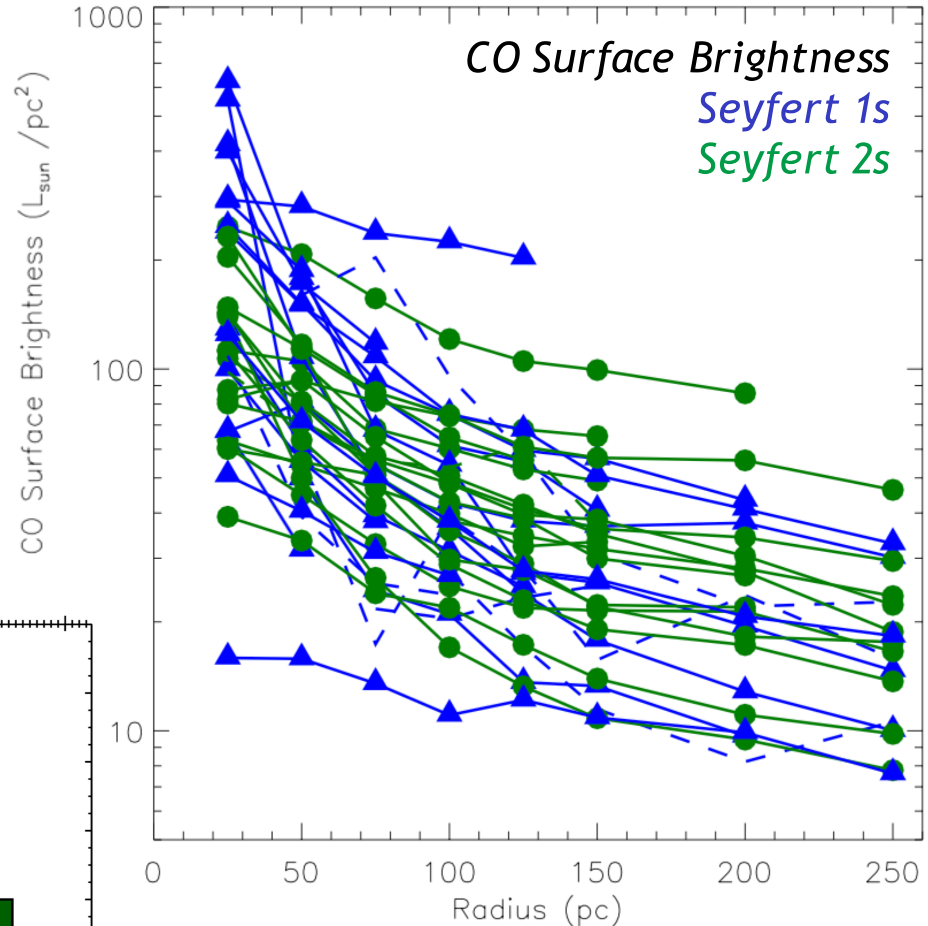
- more centrally concentrated nuclear stellar surface brightness
- lower stellar luminosities beyond a radius of 100 pc

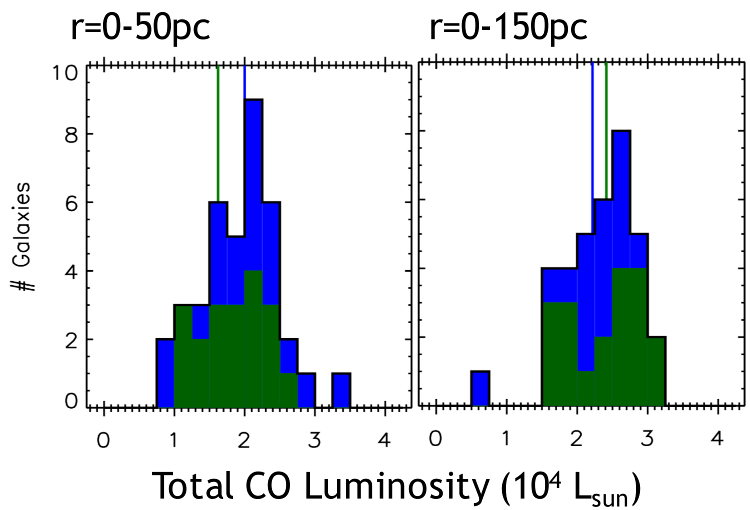
(see also Lin et al. 2017)

See also poster by Ric Davies presenting LLAMA results.

Integrated properties







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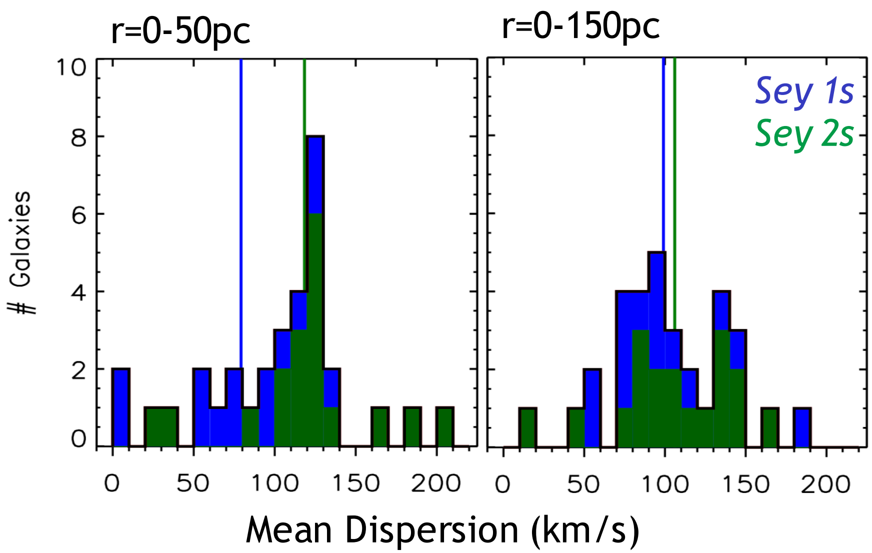
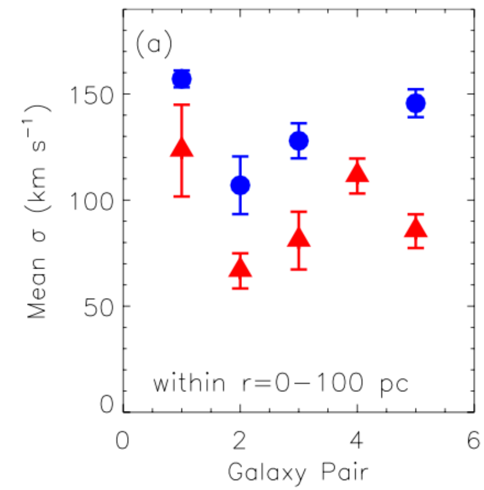
Integrated properties



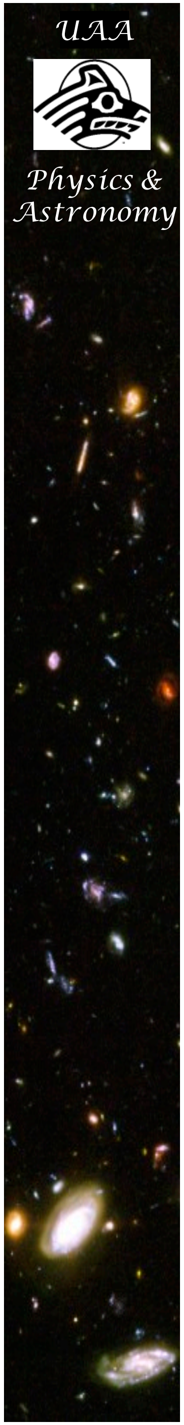


non-AGN
AGN

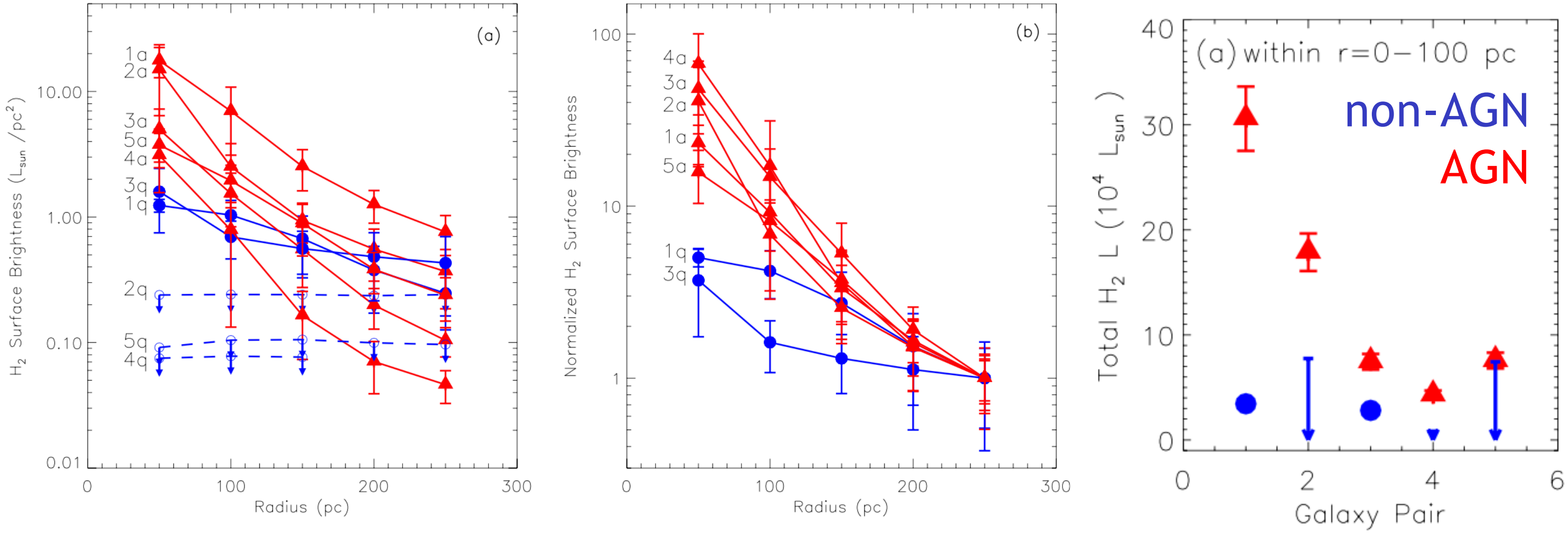
Hicks et al. 2013

Seyferts, compared to quiescent galaxies, have:

- lower stellar velocity dispersion within a radius of 200 pc



Integrated properties



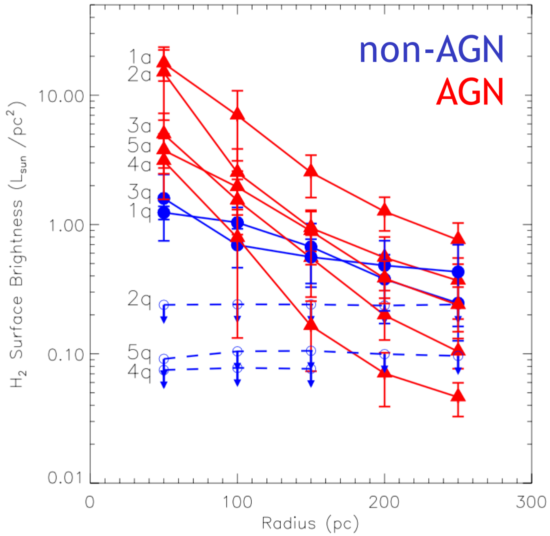
Hicks et al. 2013

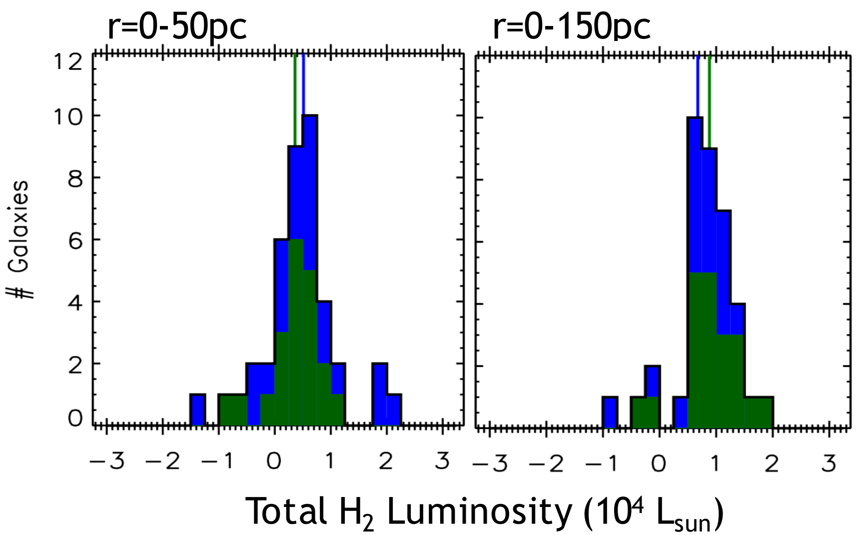
Seyferts, compared to quiescent galaxies, have:

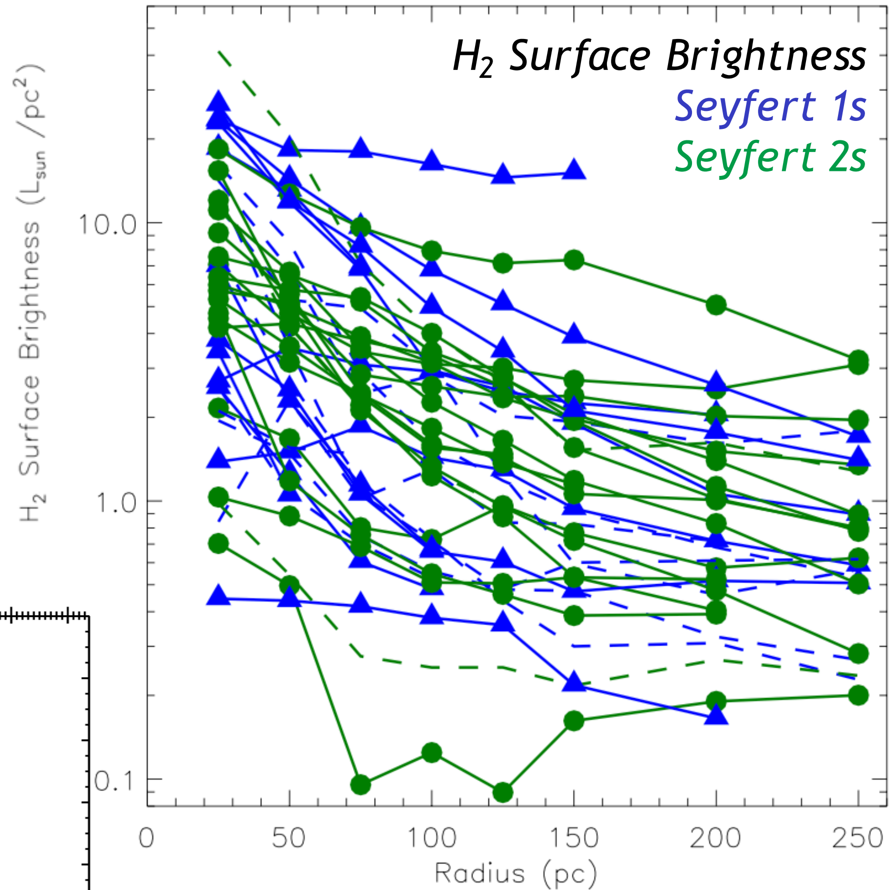
- elevated H_2 1-0 S(1) luminosity out to a radius of at least 250 pc
- more centrally concentrated H2 surface brightness profiles

See also poster by Ric Davies presenting LLAMA results.

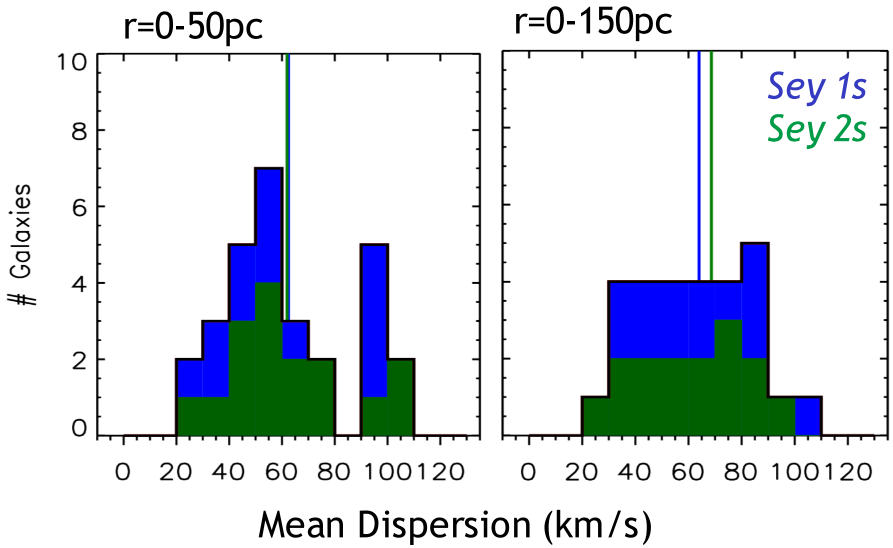
Integrated properties

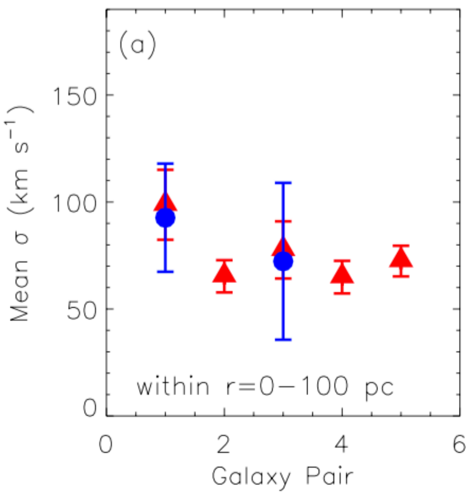






Integrated properties



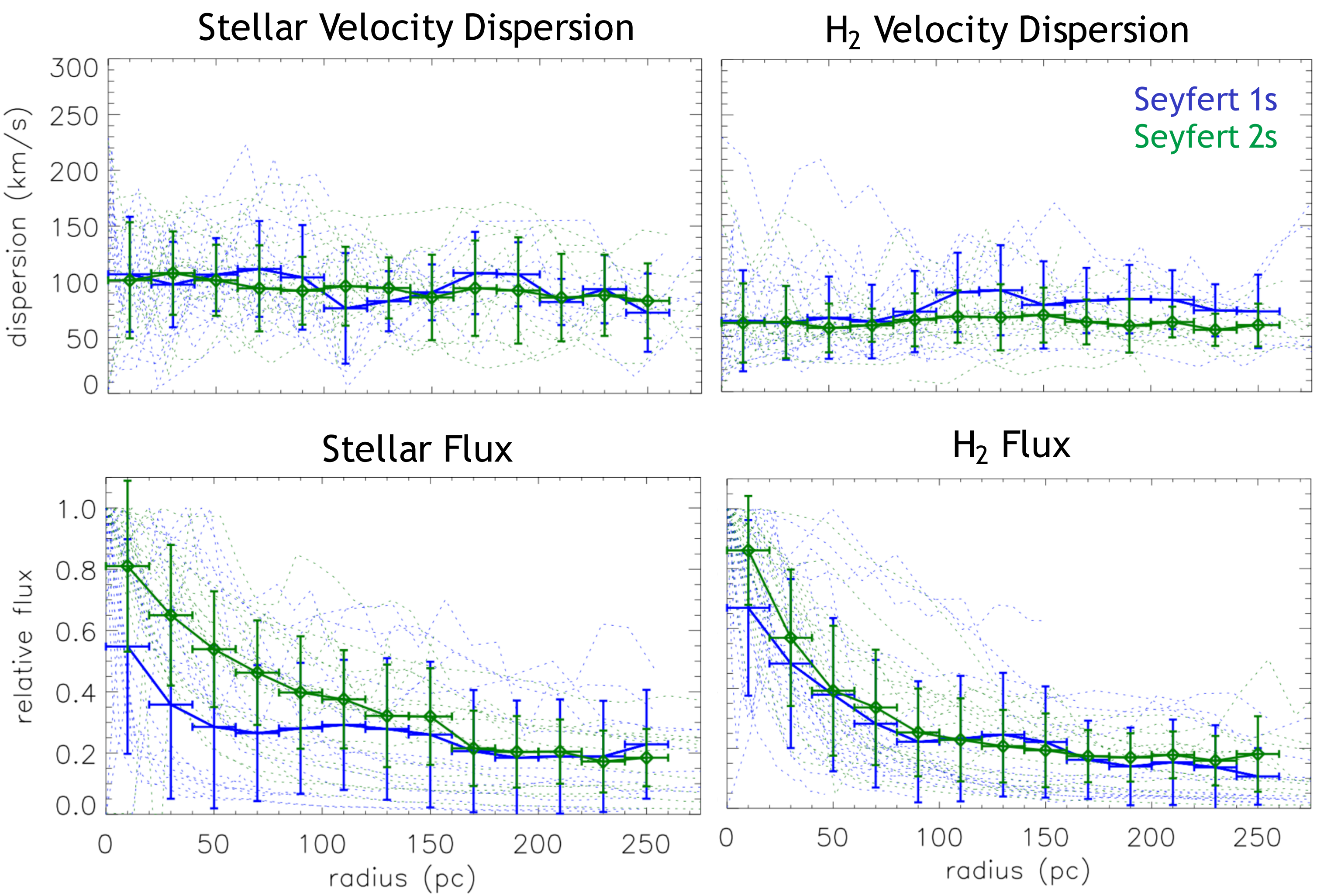


non-AGN
AGN

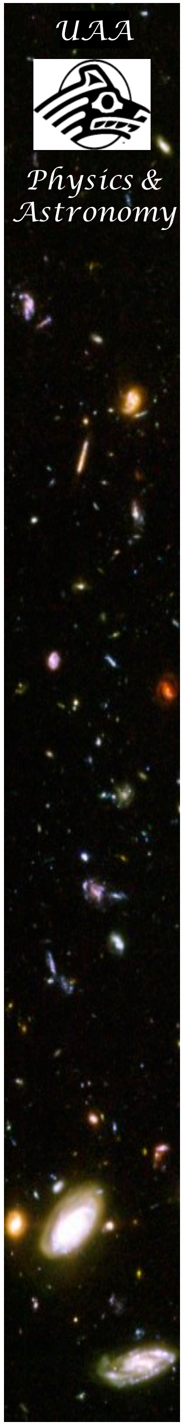
Hicks et al. 2013

See also poster by Ric Davies presenting LLAMA results.

Do Seyfert 1s & Seyfert 2s differ on these scales?

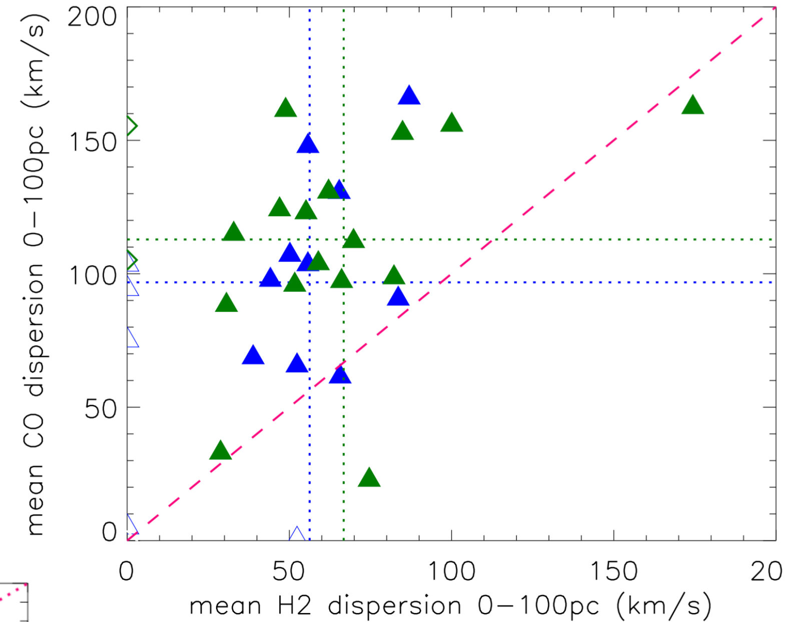


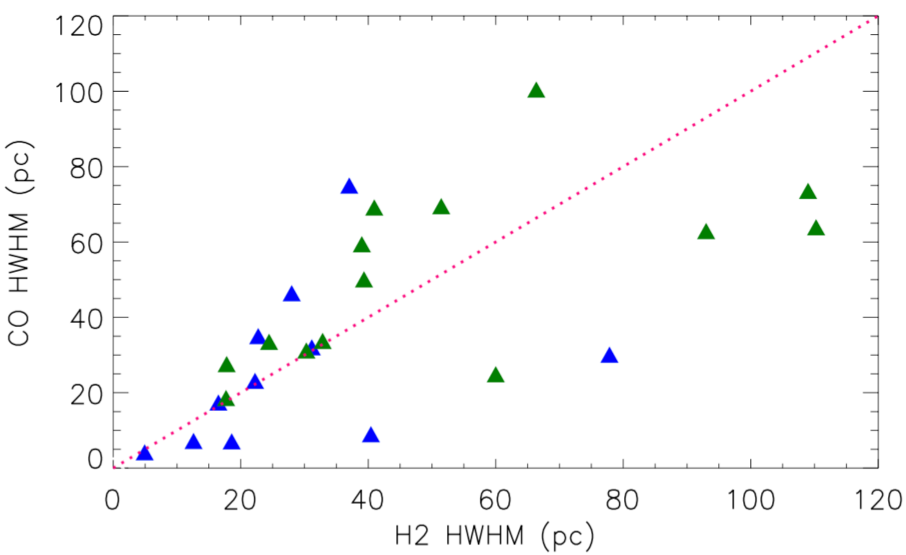
Azimuthal averages of velocity dispersion and flux distributions.



Kinematic analysis: H_2 and Stars

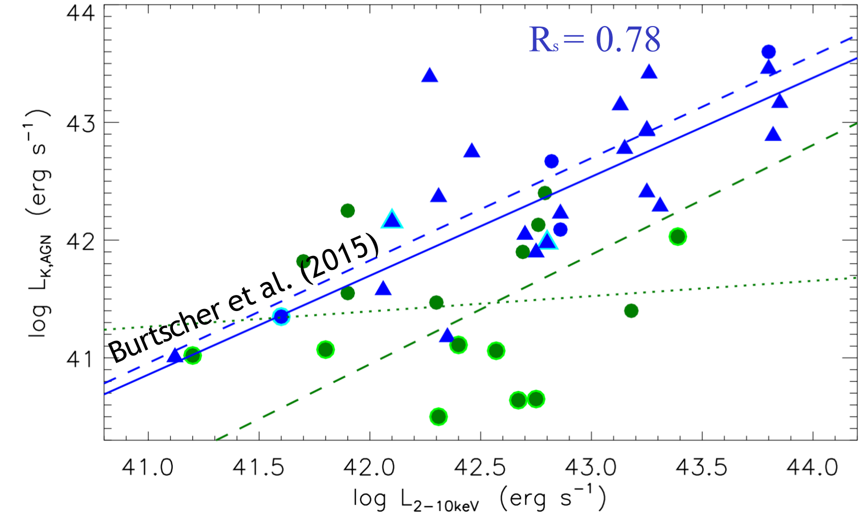
- Stellar dispersion is higher within the central 100 pc by a factor of ~2.
- HWHM of the stellar light distribution is comparable to that of the molecular gas (H_2).



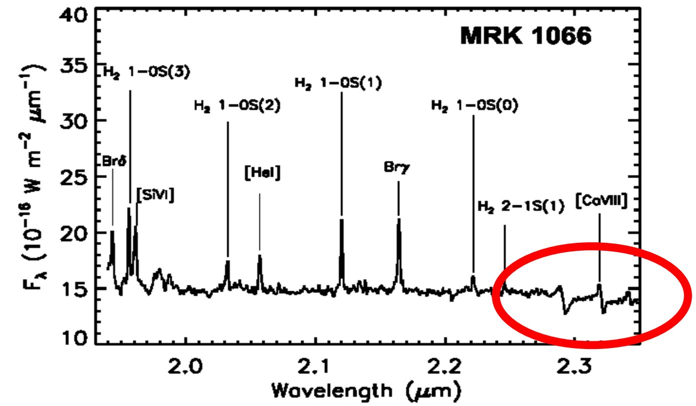


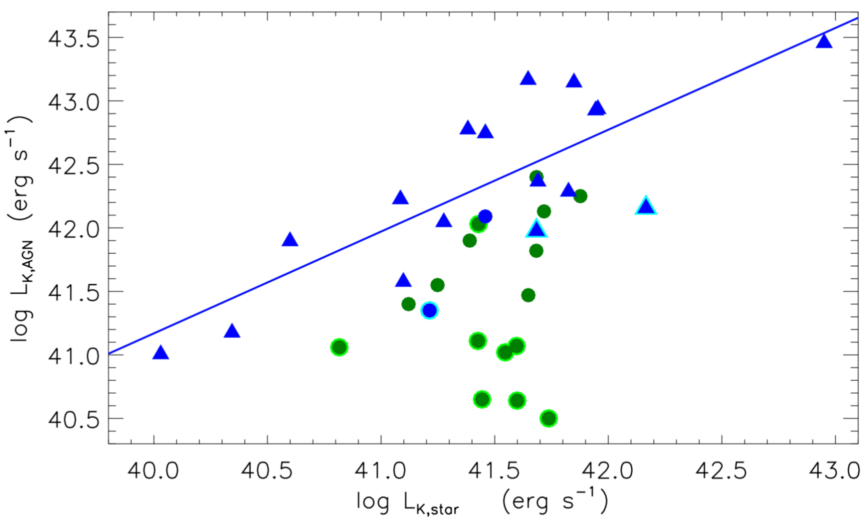
Narrow line Brγ: HWHM is comparable to that of H_2 and the velocity dispersion is, on average, about 40% higher.

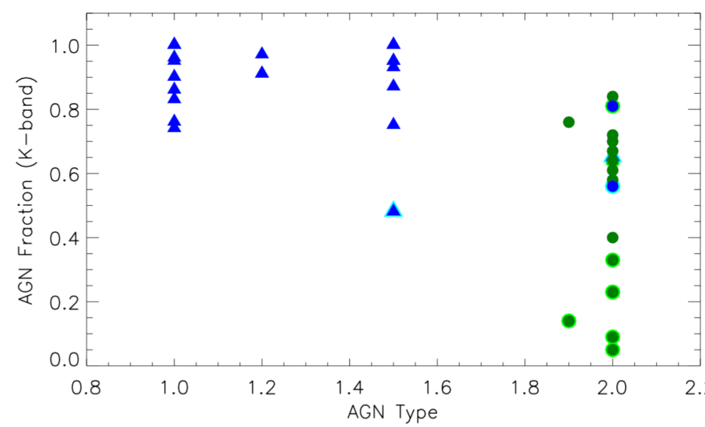
Integrated properties: K_{AGN}, K_{star}



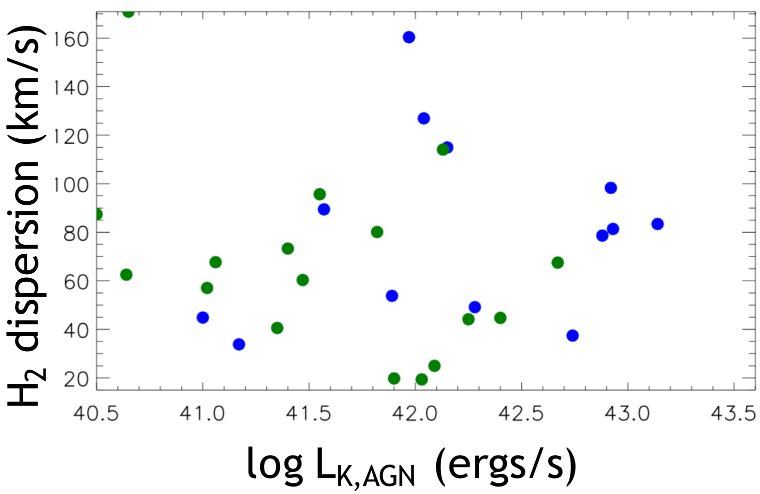
Dilution of CO bandheads attributed to AGN continuum emission.

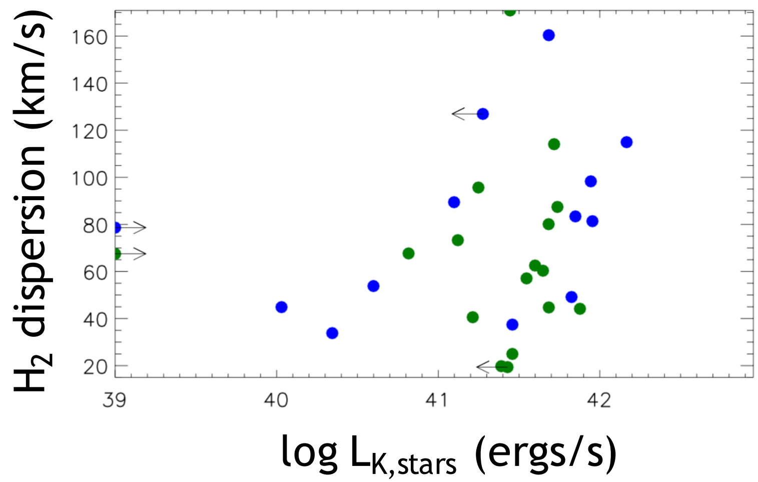






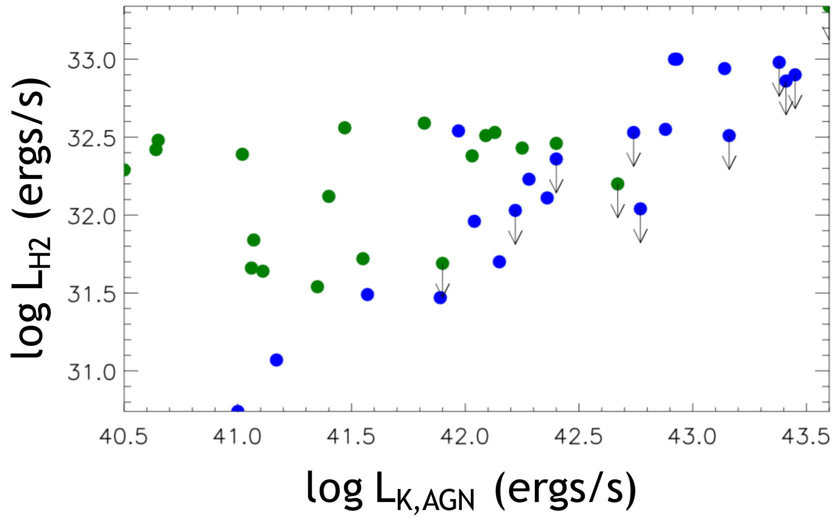
Integrated properties

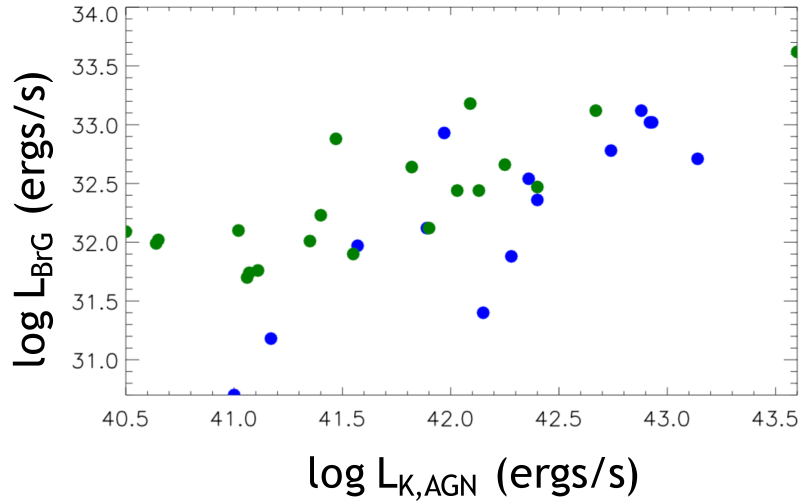




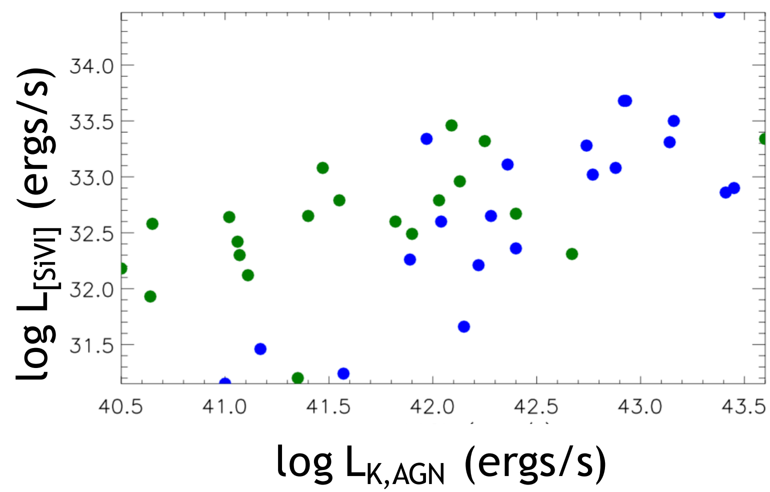
H_2 velocity dispersion has higher dependence on the stellar luminosity than it does the AGN luminosity.

Integrated properties

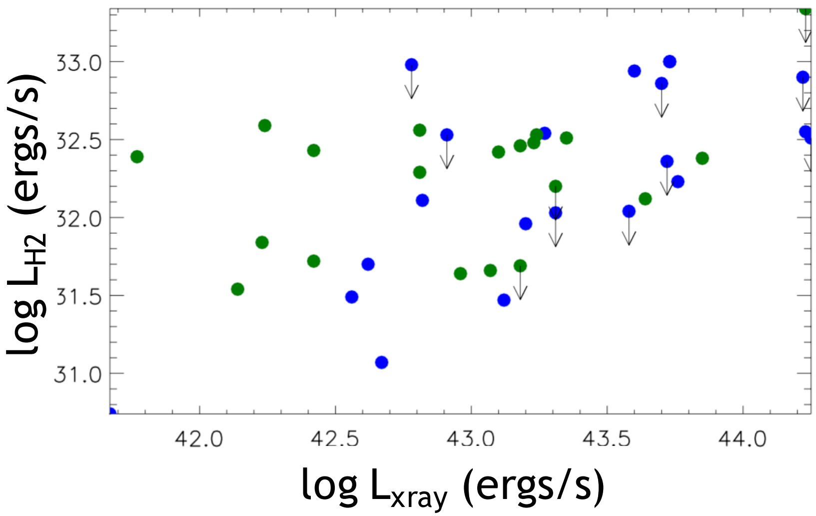


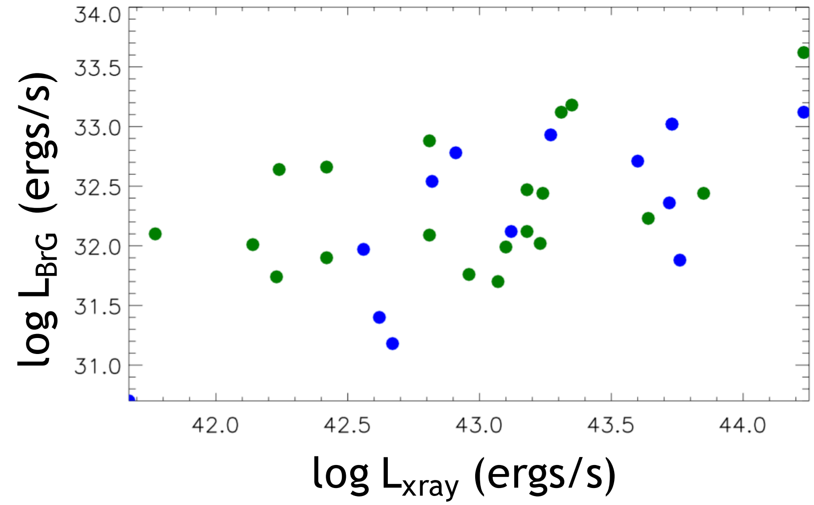


Luminosity of molecular, ionized, and coronal are correlated with AGN luminosity.



Integrated properties





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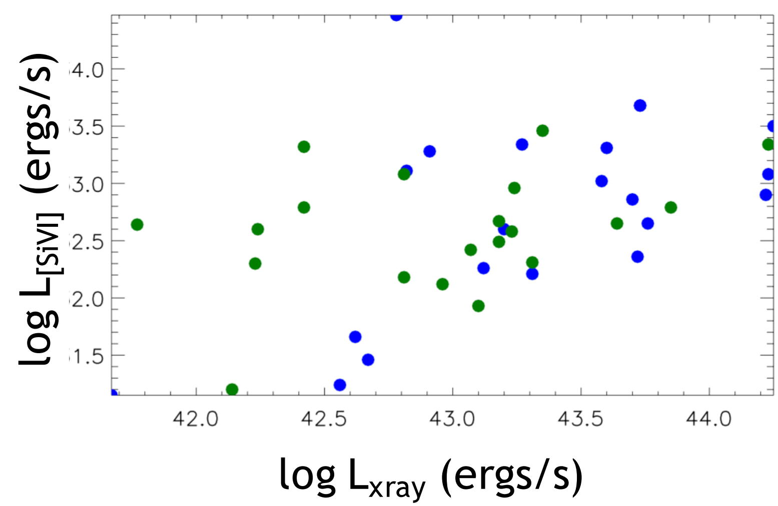
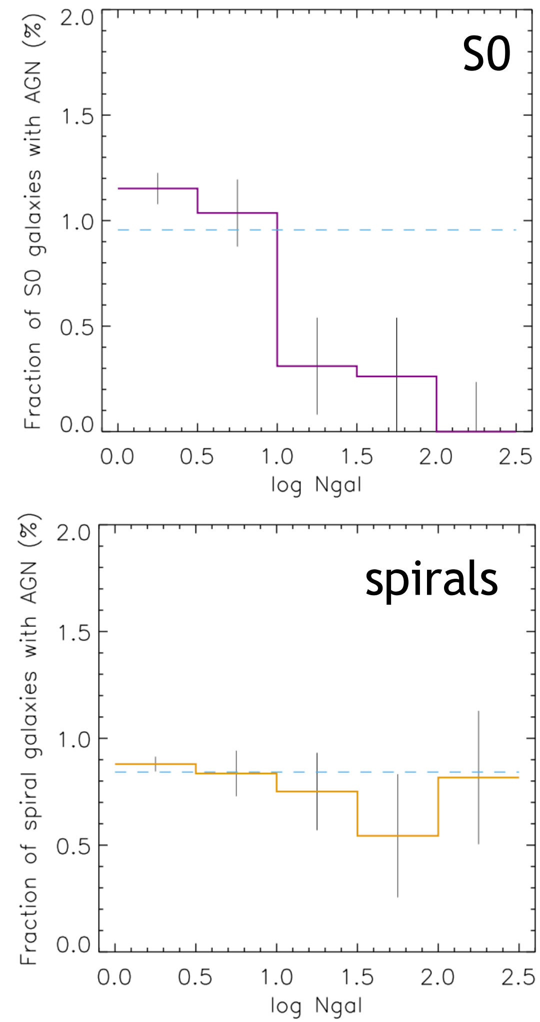


Fueling Modes, Host Galaxies, and Environment

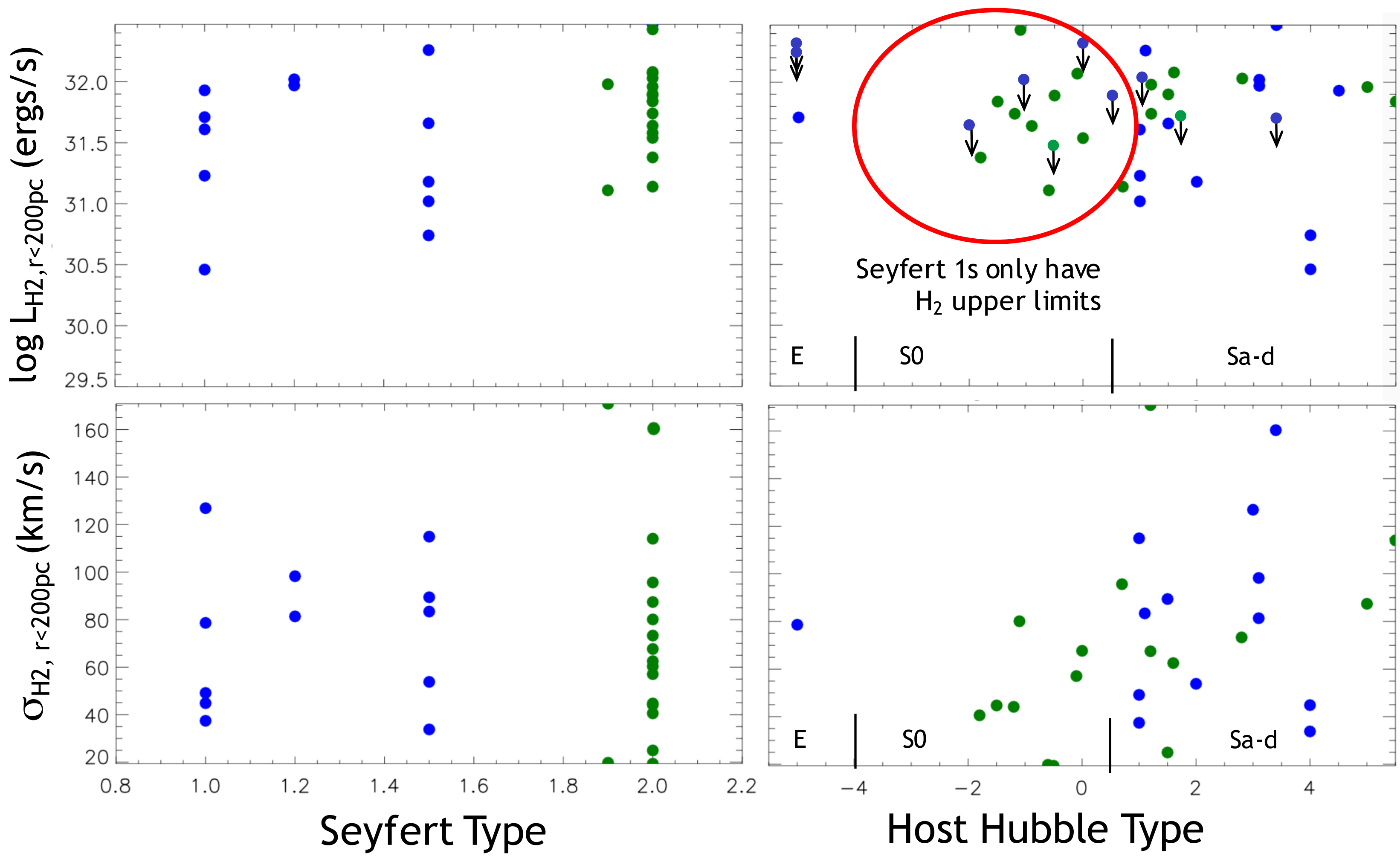
- Fraction of S0 host galaxies with AGN decreases strongly as a function of galaxy group size, which contrasts with the increasing fraction of galaxies of S0 type in denser environments.
  - Fueled via ***external accretion***, which is most efficient in small groups

- No evidence for an environmental dependence of AGN in spiral galaxies.
  - Fueling via ***secular evolution***

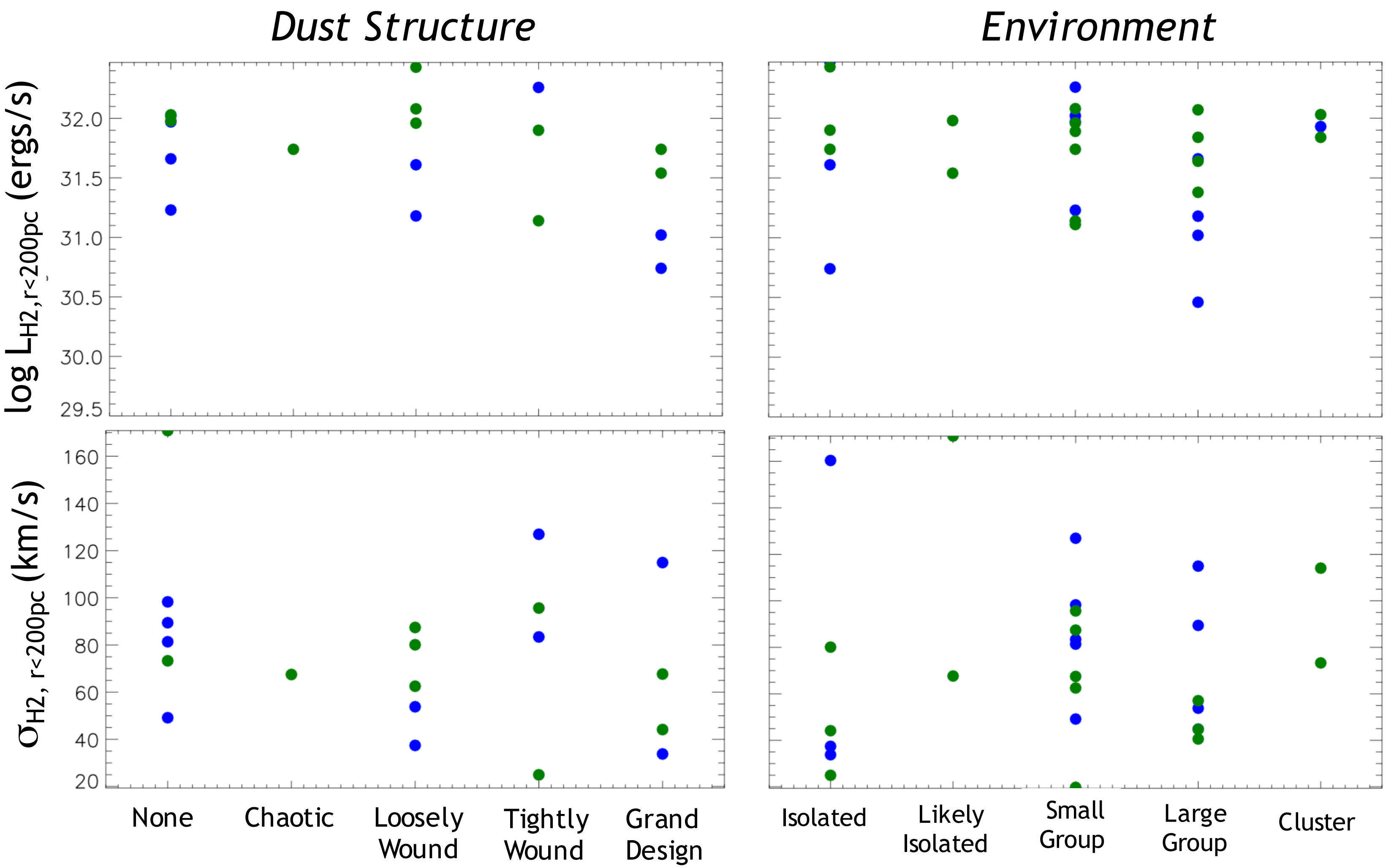
Davies et al. 2016

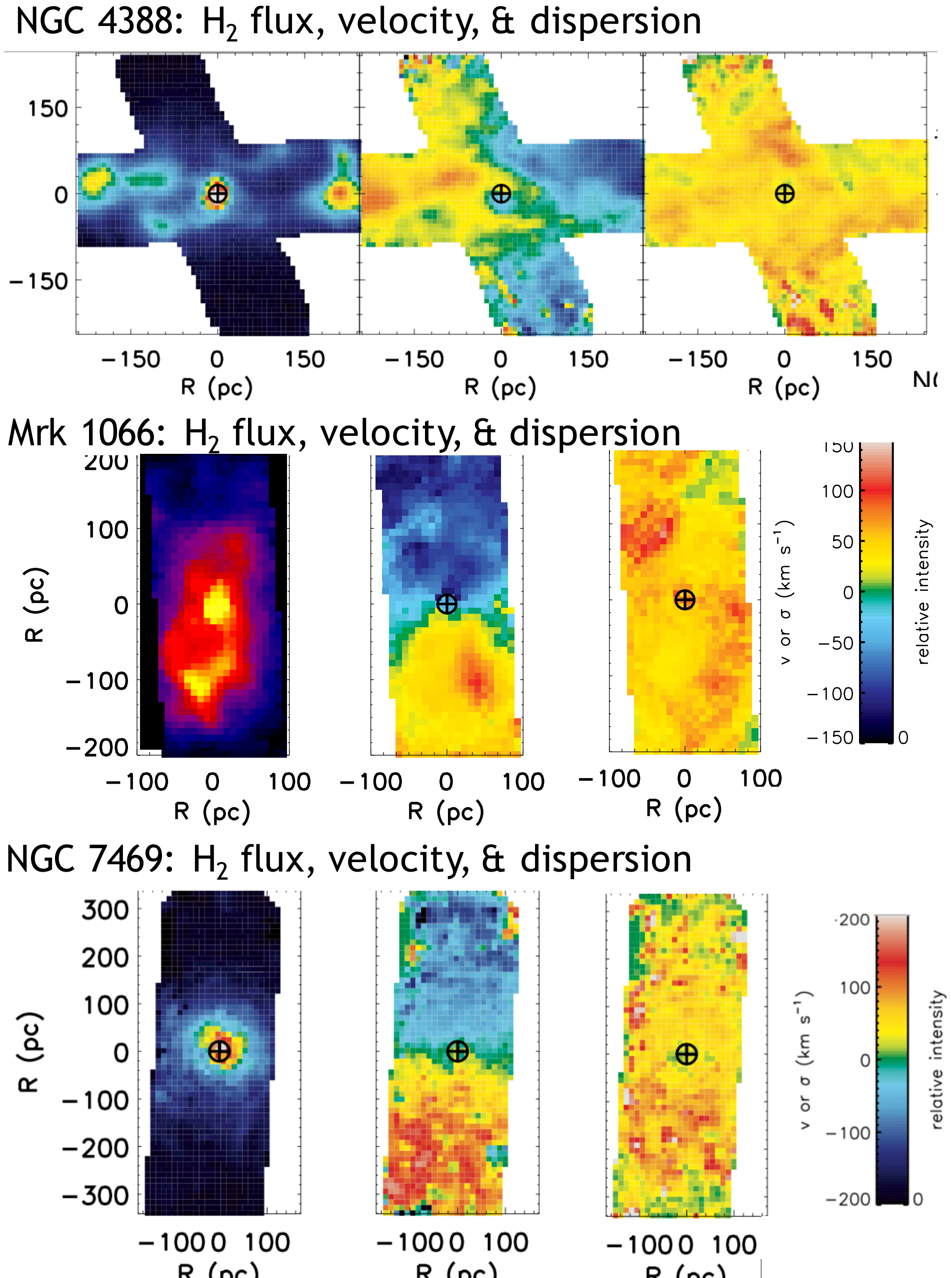


Trends with Host & Environment



Host Galaxy & Environment





KONA Survey

Detailed analysis of the kinematics is underway and will identify signatures of inflows and outflow.

Inflow rates will be estimated from modeling of the molecular hydrogen and primary inflow mechanism will be identified.

Outflow properties (e.g. rate, power) will also be determined via modeling of the Brγ and coronal lines.

Müller-Sánchez et al. 2018
Hicks et al. 2018 in prep