

# Keck OSIRIS AO LIRG Analysis (KOALA): Feedback in the Nuclei of Luminous Infrared Galaxies

Vivian U et al. 2018 arXiv : 1811.09281

## ABSTRACT

The role of feedback in triggering or quenching star formation and hence driving galaxy evolution can be directly studied with high resolution integral field observations. The manifestation of feedback in shocks is particularly important to examine in galaxy mergers, where violent interactions of gas takes place in the interstellar medium during the course of the galactic collision. As part of our effort to systematically study the local population of luminous infrared galaxies within the Great Observatories All-Sky LIRG Survey, we undertook the Keck OSIRIS AO LIRG Analysis observing campaign to study the gas dynamics in the inner kiloparsec regions of these systems at spatial scales of a few 10s of parsecs. With high-resolution near-infrared adaptive optics-assisted integral-field observations taken with OSIRIS on the Keck Telescopes, we employ near-infrared diagnostics such as  $\text{Br}\gamma$  and the ro-vibrationally excited  $\text{H}_2$  lines to quantify the nuclear star formation rate and identify feedback associated with shocked molecular gas seen in 21 nearby luminous infrared galaxies. Shocked molecular gas is preferentially found in the ultraluminous infrared systems, but may also be triggered at a lower-luminosity, earlier merging stage. On circumnuclear scales, AGN have a strong effect on heating the surrounding molecular gas, though their coupling is not simply driven by AGN strength but rather is complicated by orientation, dust shielding, density, and other factors. We find that the nuclear star formation correlates with merger class and diminishing projected nuclear separations. These trends are largely consistent with the picture of merger-induced starbursts within the center of galaxy mergers.

feedback  $\Rightarrow$  Metal, Star Formation

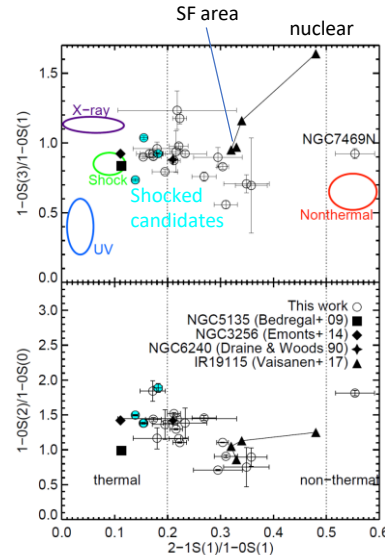
ionizing sourceを区別するため、AO-IFS w/ Keck OSIRISで  
NIR診断 ( $0''.035\text{-}0''.100/\text{spaxel} \sim 40\text{pc}/\text{spaxel}$ )

Mergerとの関連も見る

KOALA surveyの21天体(22 nuclei)

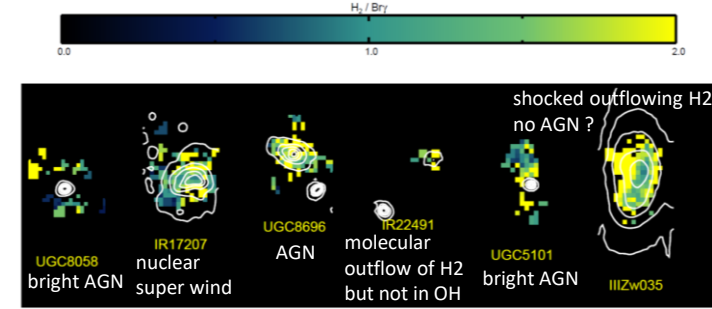
## $\text{H}_2$ thermally excited?

- $\text{H}_2$ が衝突励起ならば、 $\text{H}_2/\text{Br}\gamma$ がthermal, non-thermalの区別に使える
- 今回のサンプルはmixだが、thermal
- $\text{H}_2/\text{Br}\gamma > 2$ の強いショックガス候補はshockの領域の近くにある



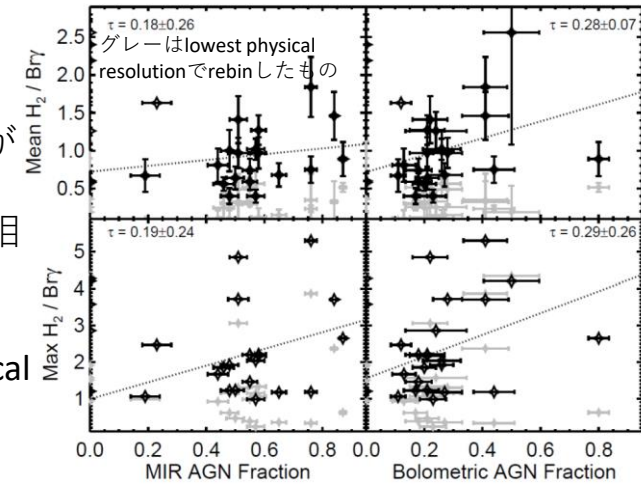
## $\text{H}_2/\text{Br}\gamma > 2$ の天体

- 5ULIRG, 1LIRG  $\Rightarrow$  ULIRGが多い  $\Rightarrow$  強いAGN, 強いstarburstを持つ mergerが進んだ systemで多い?



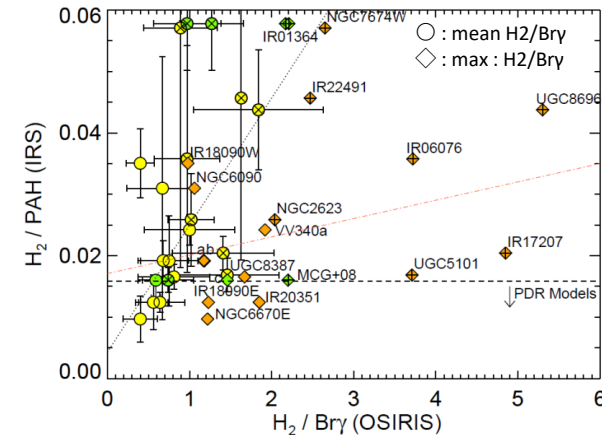
## AGNとの関わり

- AGN hostの半分は shocked  $\text{H}_2 \Rightarrow$  circumnuclearでAGNが効くのは自然。
- AGNと shocked gasの相関が弱い  $\Rightarrow$  他のプロセス C-C collision, mechanical perturbation



## MIR診断との比較

- 相関あり:  $\text{H}_2$ を介して
- maxのフィッティングが平坦で分散大  $\Rightarrow$  shocked regionを抜き出すには高分解能観測が必要 PDRでの上限より高い  $\Rightarrow$  その他のプロセス (shock)



nuclear regionに関わらず、  
銀河全体をSWIMSでは見れる。  
ディスクではどうなっているか?