An IFU View of the Active Galactic Nuclei in MaNGA Galaxy Pairs

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The role of active galactic nuclei (AGNs) during galaxy interactions and how they influence the star formation in the system are still under debate. We use a sample of 1156 galaxies in galaxy pairs or mergers (hereafter 'pairs') from the MaNGA survey. This pair sample is selected by the velocity offset, projected separation, and morphology, and is further classified into four cases along the merger sequence based on morphological signatures. We then identify a total of 61 (5.5%) AGNs in pairs based on the emission-line diagnostics. No evolution of the AGN fraction is found, either along the merger sequence or compared to isolated galaxies (5.0%). We observe a higher fraction of passive galaxies in galaxy pairs, especially in the pre-merging cases, and associate the higher fraction to their environmental dependence. The isolated AGN and AGN in pairs show similar distributions in their global stellar mass, star formation rate (SFR), and central [O III] surface brightness. AGNs in pairs show radial profiles of increasing specific SFR and declining Dn4000 from center to outskirts, and no significant difference from the isolated AGNs. This is clearly different from star-forming galaxies (SFGs) in our pair sample, which show enhanced central star formation, as reported before. AGNs in pairs have lower Balmer decrements at outer regions, possibly indicating less dust attenuation. Our findings suggest that AGNs likely follow an inside-out quenching and the merger impact on the star formation in AGNs is less prominent than in SFGs.

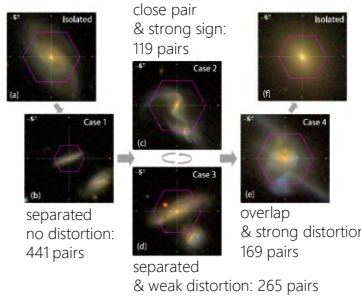
Interaction/Merger → SF, AGN

- SFについてはinteraction/mergerの影響を空間分解した研究が進んでいる (Thorp+2019, Pan+2019等) → 多くで中心で星形成促進
- AGNについては空間分解してinteraction/mergerのAGNを研究した例はない → MaNGAでgalaxy pairでのAGN fractionやその性質を議論

Sample & Merger Sequence Definition

- MaNGAから射影距離、視線速度差、目視確認でpairを選び出す → 994 pair, 1156銀河
- 右図のようにmergerのCase分け
- 比較は2317 isolated galaxies

Fig. 1



AGN分類とCaseによるAGN fraction

- [NII]-, [SII]-BPTに必要な輝線S/N>5 → WHANでRetiredでない → [NII]-, [SII]-BPTのいずれかでAGN
- Isolated vs pairやCaseでAGN fractionの違いなし Case1, 2にRA, Linelessが多いのはselection bias

Fig. 2

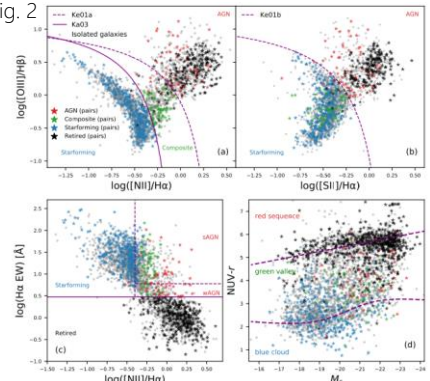


Fig. 3

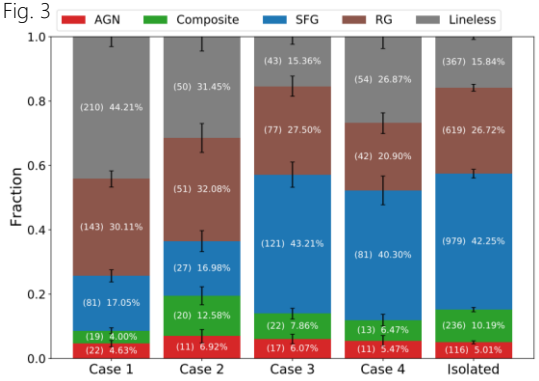
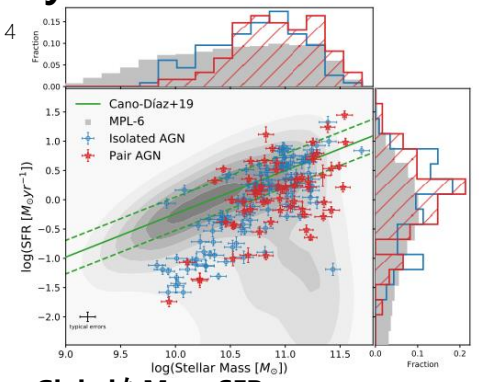


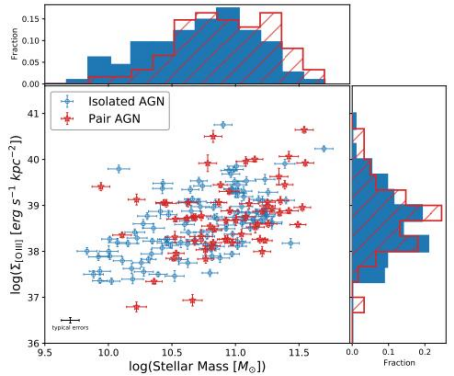
Fig. 4



GlobalなM* vs SFR

→ IsolatedもPairもMSとPassiveの間 可視BPTで選ばれるAGNのselection bias

Fig. 5

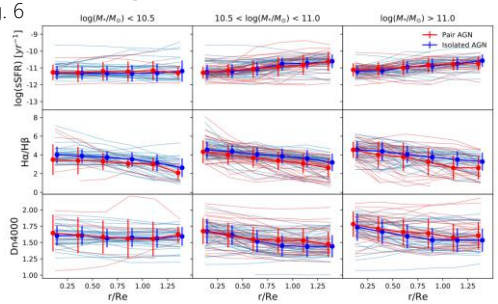


GlobalなM* vs Σ[OIII](中心部)

→ Isolated vs Pairでほぼ変わらず 今回のAGNはmoderateなluminosity

sSFR(AGN fraction補正したHα; Ji & Yan 2021), Hα/Hβ, Dn4000のradial profile

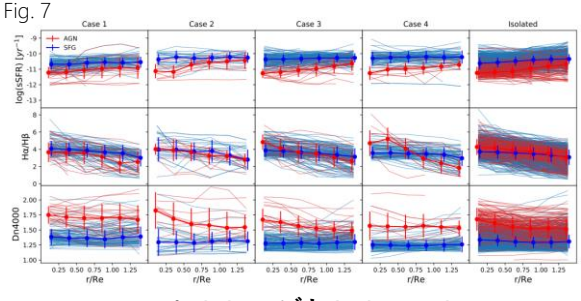
Fig. 6



GlobalなM*ごとPair vs Isolated

- Pair, Isolatedでの違いはほぼない
- sSFR(Dn4000)は低質量でflat, 中質量以上で中心で低い(高い) → inside-out quenching
- 中心でHα/Hβが高い

Fig. 7



PairのCaseごとSFG vs AGNs

- CaseによらずAGNでは違いがほぼ見えない
- Hα/HβがCase3, 4の時に中心で高いか？
- (感想)SFGもCaseによる変化がほぼ見えないのはやや不思議(⇔Pan+2019)

Fig. 8

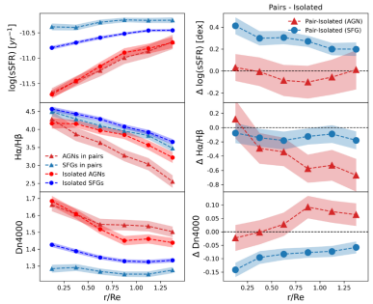
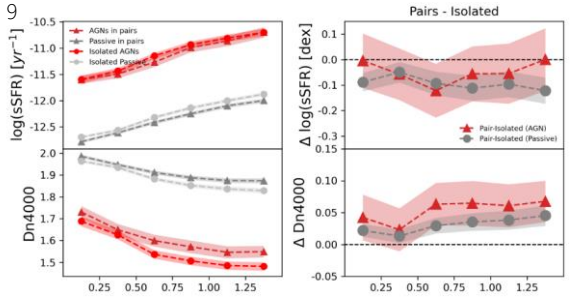


Fig. 9



Pair vs IsolatedをSFG, AGN, Passiveでみる

- SFGは中心の星形成促進が見えるが、AGNとPassiveは相互作用の影響が見えにくい
- 空間分解した比較でもAGNはSFGとPassiveの間に位置する