

The SAMI Galaxy Survey: Disk-halo interactions in radio-selected star-forming galaxies

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ABSTRACT

In this paper, we compare the radio emission at 1.4 GHz with optical outflow signatures of edge-on galaxies. We report observations of six edge-on star-forming galaxies in the Sydney-AAO Multi-object Integral-field spectrograph (SAMI) Galaxy Survey with 1.4 GHz luminosities $> 1 \times 10^{21} \text{ W Hz}^{-1}$. Extended minor axis optical emission is detected with enhanced [NII]/H α line ratios and velocity dispersions consistent with galactic winds in three of six galaxies. These galaxies may host outflows driven by a combination of thermal and cosmic ray processes. We find that galaxies with the strongest wind signatures have extended radio morphologies. Our results form a baseline for understanding the driving mechanisms of galactic winds.

Key words: ISM: jets and outflows, ISM: cosmic rays, galaxies: evolution, galaxies: kinematics and dynamics

イントロ

- ✓ 星形成やAGNによる銀河風は重要なfeedback過程
- ✓ CRはガスをハローに押し出す
- ✓ Edge-on銀河 \Rightarrow disk-halo interaction
- ✓ 面分光により銀河風の起源の切り分けが可能(starburst/AGN)

サンプル

- 6個のedge-on銀河 (AGN \times)
- Star-forming, radio continuum
- Optical : SAMI-GAMA, radio : FIRST(1.4GHz)

Optical

- ✓ [SII]/Ha, [NII]/Haが外側ほど高
- ✓ [SII]/[NII]は小さくない \Rightarrow 光電離以外の要因も
- ✓ 輝線比から電離源を推定 \Rightarrow galaxy 1,2,3でshock excitation
- ✓ 対称性から銀河風の影響を推定 \Rightarrow galaxy 1,2,3で強いinteraction
- ✓ 各銀河のDn(4000)とH δ Aをプロット \Rightarrow galaxy 1,2,3はbursty star formation history

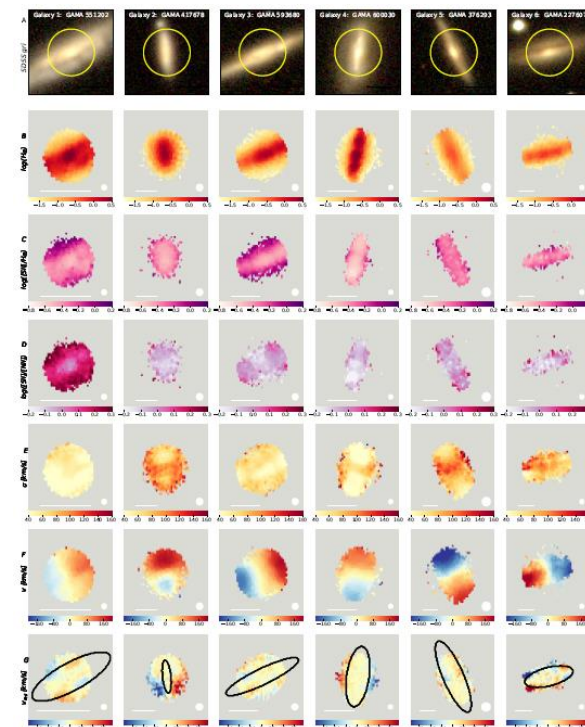
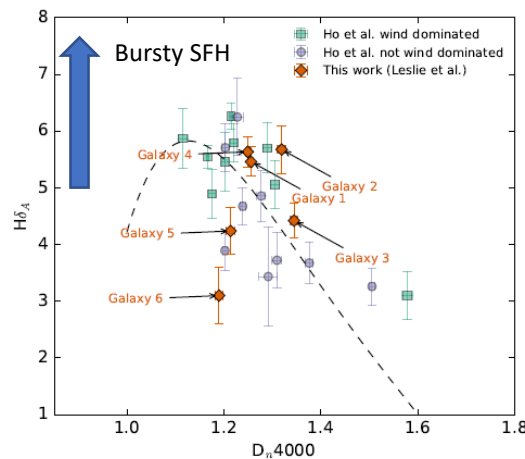


Table 4. Evidence for wind activity

	GAMA ID	Line ratios	Kinematics	SFH	Radio size
1	551202	✓	✓	✓	✓
2	417678	✓	✓	✓	✓
3	593680	✓	✓	✓	✓
4	600030	×	×	✓	×
5	376293	×	×	×	×
6	227607	×	-	×	×

Radio

- ✓ Galaxy 1,2,3で短軸方向に広がり
- ✓ 電波放射は $>10\text{Myr}$ の星形成をトレース \Rightarrow 超新星による電波やCRの輸送のタイムスケールとコンシステント

Discussion

- ✓ 3個の銀河でShockによって励起されたと思われる高い輝線比
- ✓ 電波観測により、bursty SFによるwindが示唆
- ✓ SFとCR, outflowに相関?
- ✓ 銀河風を強く示唆する銀河は広がった電波領域をもつ
- ✓ さらなる高分解能の観測が必要