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ABSTRACT

We present our study on the spatially resolved $H\alpha$ and M_* relation for 536 star-forming and 424 quiescent galaxies taken from the MaNGA survey. We show that the star formation rate surface density (Σ_{SFR}), derived based on the $H\alpha$ emissions, is strongly correlated with the M_* surface density (Σ_*) on kpc scales for star-forming galaxies and can be directly connected to the global star-forming sequence. This suggests that the global main sequence may be a consequence of a more fundamental relation on small scales. On the other hand, our result suggests that $\sim 20\%$ of quiescent galaxies in our sample still have star formation activities in the outer region with lower SSFR than typical star-forming galaxies. Meanwhile, we also find a tight correlation between $\Sigma_{H\alpha}$ and Σ_* for LI(N)ER regions, named the resolved ‘LI(N)ER’ sequence, in quiescent galaxies, which is consistent with the scenario that LI(N)ER emissions are primarily powered by the hot, evolved stars as suggested in the literature.

銀河の星形成主系列 (SFMS) はHII領域スケールでの相関から成っているのか？

- SDSS-MaNGAサンプルから960個のisolated銀河を抽出、SF/LI(N)ERに分類。
- Stellar mass surface density, $H\alpha$ surface densityの相関を見る。

↓ Global Star-formation Main Sequence

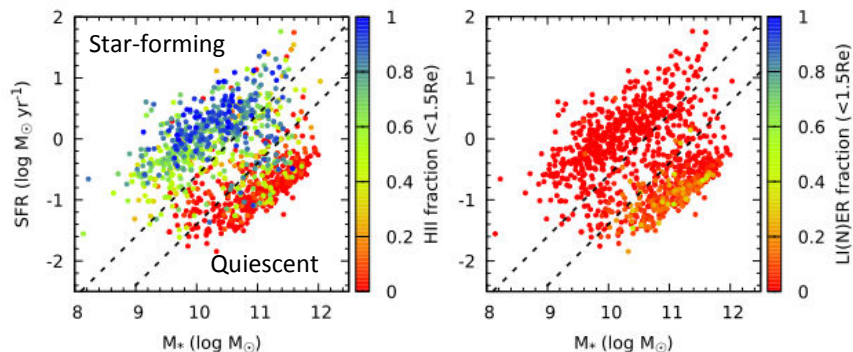


FIG. 1.— Global SFR- M_* relation with color-coded HII and LI(N)ER fractions. The black dashed-lines in both panels indicate two constant SSFRs; $-10.6 \log(\text{SFR } M_\odot^{-1})$ and $-11.4 \log(\text{SFR } M_\odot^{-1})$. See text for details.

星形成活動を示すQs銀河のHII領域は外側に存在。

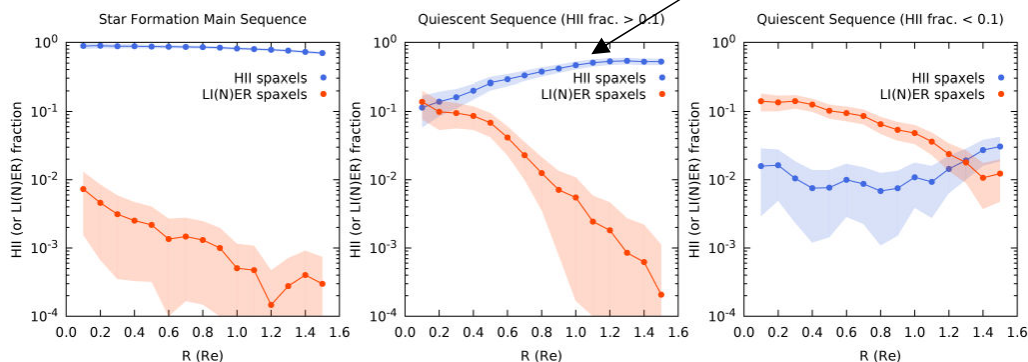


FIG. 3.— Radial distributions of HII and LI(N)ER fractions. Panels from left to right are for star-forming galaxies, quiescent galaxies with HII fractions greater than 0.1, and quiescent galaxies with HII fractions less than 0.1. See text for details.

Resolved Star-formation Main Sequence

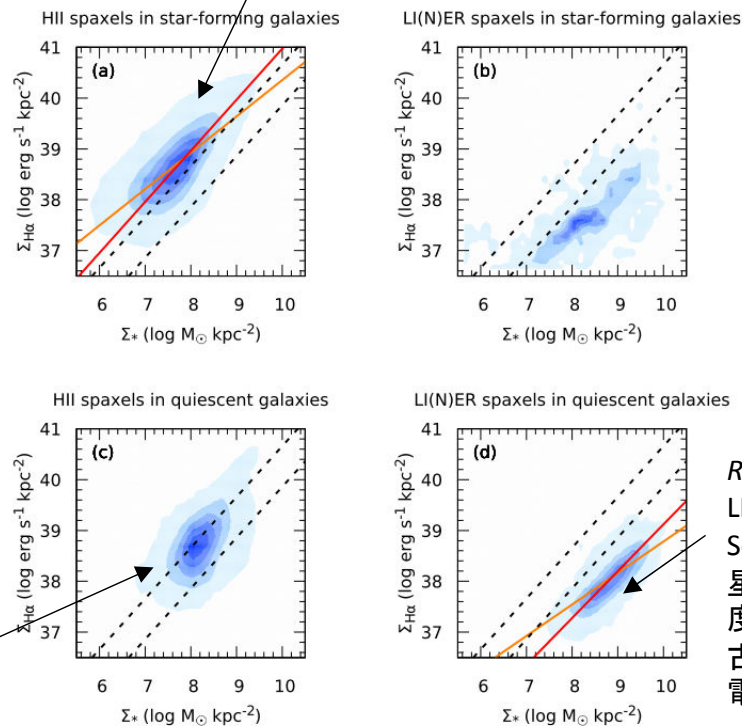


FIG. 2.— The $\Sigma_{H\alpha}$ - Σ_* relations for HII and LI(N)ER spaxels in star-forming and quiescent galaxies. The blue color scheme of the contour indicates 1%, 20%, 40%, 60%, and 80% of the peak density. The two black dashed-lines are identical to those in Figure 1. The orange and red solid lines indicate the best-fit lines using the OLS and ODR methods, respectively. See text for details.

Resolved LI(N)ER Sequence: 星質量三津度との相関 → 古い星による電離

正の相関を示すが、SFMSより-0.5dex下にずれている。Quenchingの現れ？

Global MSはResolved MSから(一定のsSFR上で)続いている。

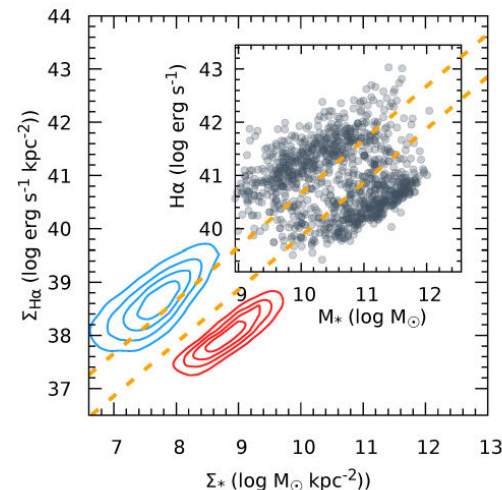


FIG. 4.— Resolved and global $H\alpha$ and M_* relation. In the main panel, the spatially resolved distribution is shown in contours. The blue and red contours indicate the distributions of the HII spaxels in the star-forming galaxies and the LI(N)ER spaxels in the quiescent galaxies, respectively. The contour levels are 20%, 40%, 60% and 80% of the peak density of the HII or LI(N)ER spaxels. The two orange dashed-lines are identical to the black dashed-lines in Figure 2. The global distribution is shown in grey circles in the axis-aligned sub-panel. See text for details.