

The EDGE-CALIFA survey: Molecular Gas and Star Formation Activity Across the Green Valley

Villanueva+2023, [arXiv: 2312.03995](https://arxiv.org/abs/2312.03995), ApJ accepted

Background

- In M^* -SFR plane: “blue cloud”, “red cloud”, and “green valley”
- Transition from blue to red (quenching)
- “Intrinsic mechanism” (\leftrightarrow environmental)
 - gas consumption
 - change of star-forming efficiency: Morphology
- ACA EDGE survey: Physical condition of the molecular gas in the different structural component

Data

- 60 galaxies from CALIFA survey DR3
- ALMA: high-resolution (5''-7'') CO(2-1)
- CALIFA: optical IFU
- Unbiased sample from blue to red

Global (integrated) relations

- MS galaxies have higher molecular gas mass (mol.-to-stellar mass fraction)
- Most ACA EDGE galaxies $\tau_{\text{dep}}=1$ Gyr, but not for all galaxies: red clouds have 3-6 times larger depletion time.

→ Transition mainly by mol. gas lost and additional SFE change.

Spatially resolved relations

Resolved star-formation main sequence

- Same range in Σ_{star} for MS and GV, but slightly lower Σ_{SFR} in GV
- Resolved Kennicutt-Schmidt relation
- Systematic decrease in both Σ_{SFR} and Σ_{mol} from MS to GV
 - Also, in a spatially resolved situation, a transition from MS to GV is primarily driven by gas removal

Impact of bulge on SFE

- SFE within the bulge is lower in GV than in MS galaxies
- For the bulge region, SFE also affects the SF activity
- ← Suppression by turbulence caused by a dense bulge

Part of Fig.10

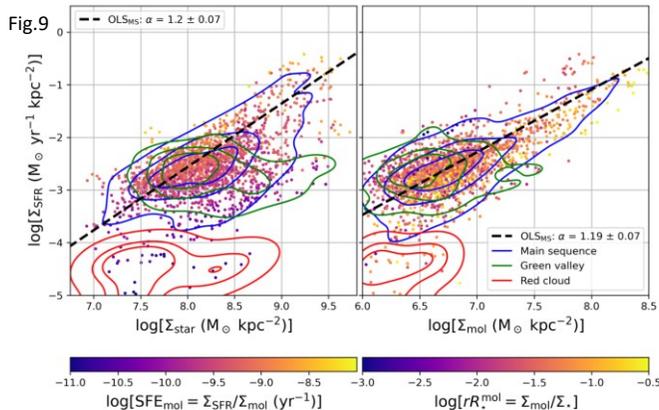
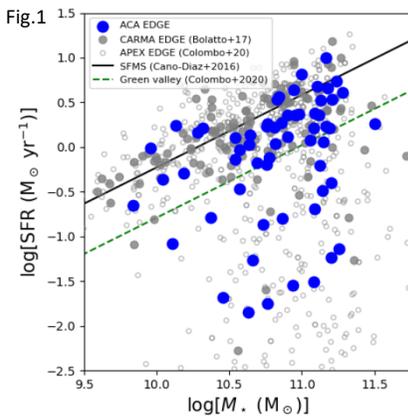
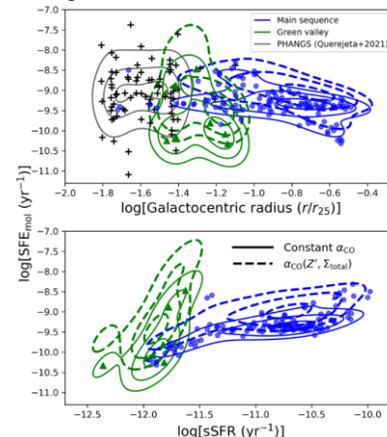
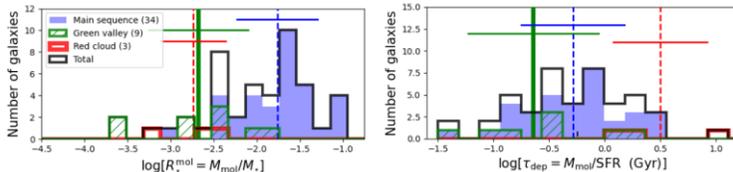
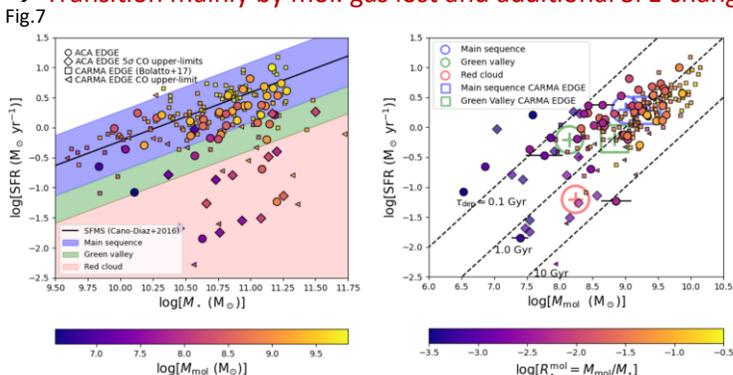
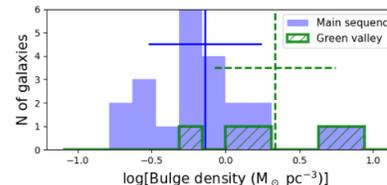


Fig.11



Radial profiles

- Inside-out increase of SFE, molecular gas fraction, and sSFR in GV galaxies out to $r=R_e$
- The quenching mechanism in GV galaxies is related to both gas removal and changes in SFE
- Using the variable $\alpha_{\text{CO}}(Z, \Sigma_{\text{total}})$ make the SFE difference smaller

Fig.12

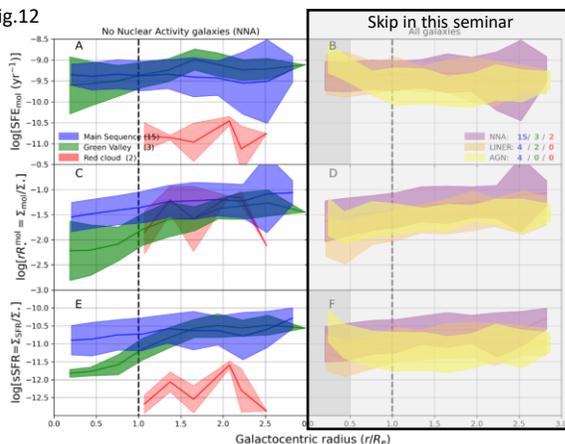


Fig.13

