Supression of star formation in transitioning Compact Group galaxies

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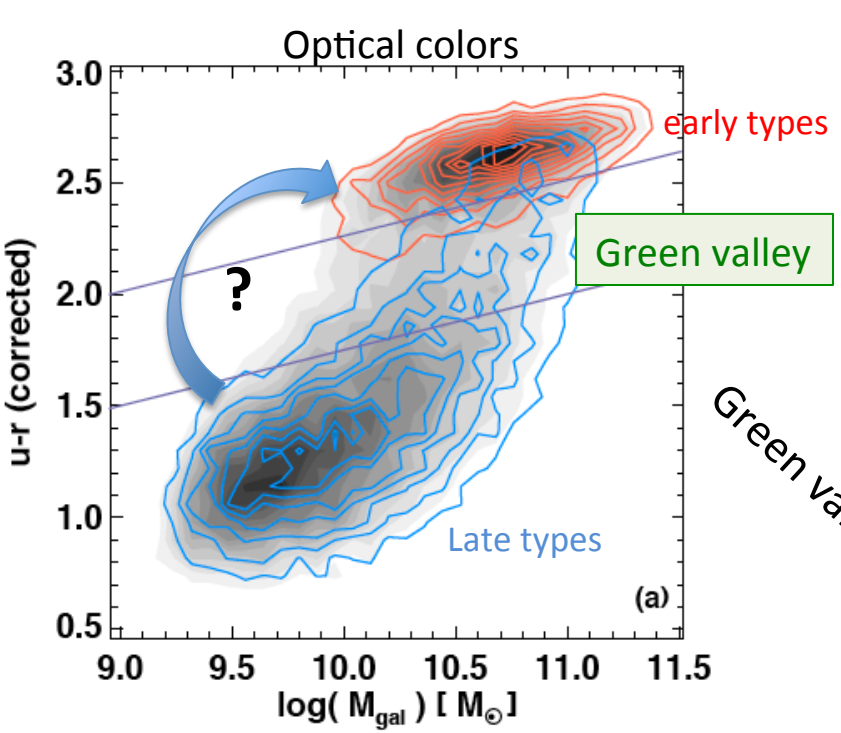
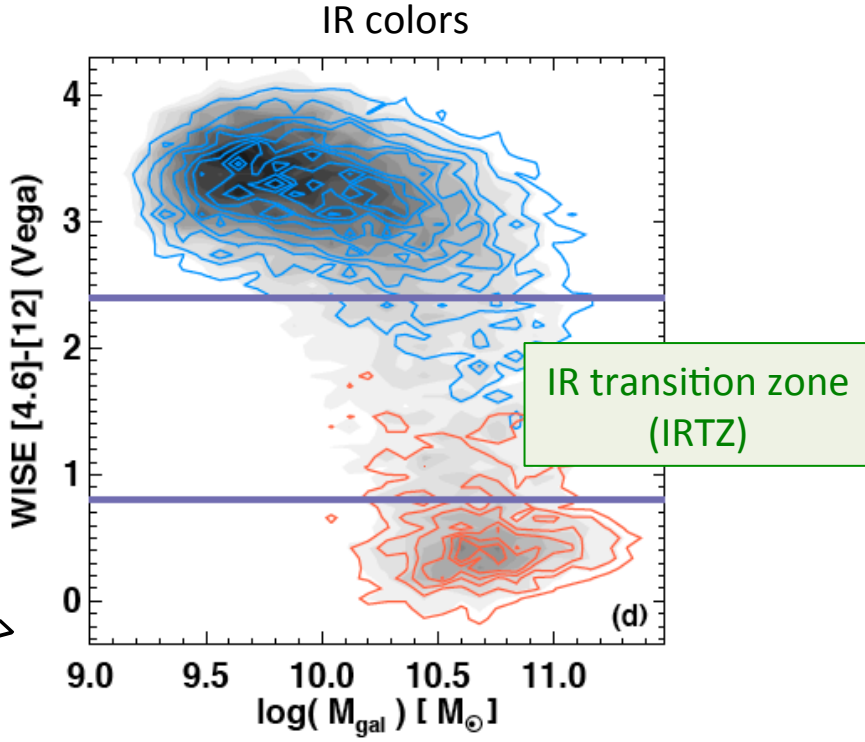
The basic question:

What causes galaxies to transition from actively star-forming to quiescent?



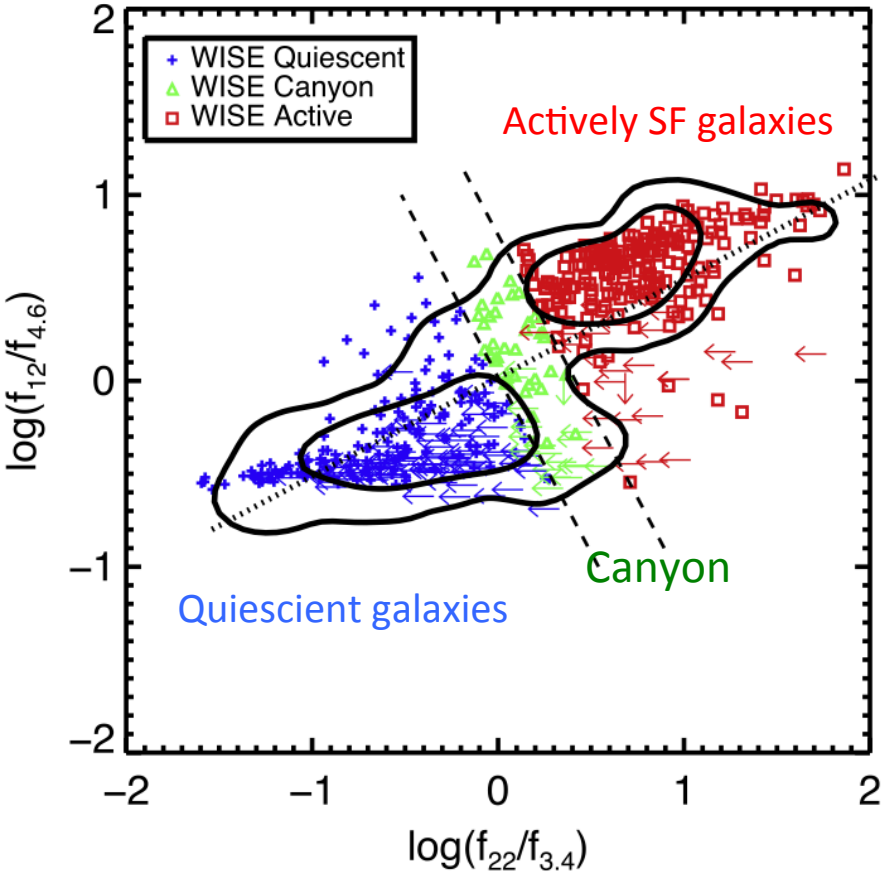
Green valley ≠ ITRZ



Galaxy sample selected from Galaxy Zoo (Alatalo+15).

Galaxy transition in Compact Groups

- Galaxies in Compact Groups are interesting systems to study galaxy transformation because interactions between galaxies and with the intragroup medium are frequent.
- A gap/canyon was found in their *Spitzer* IR colors between active and quiescent galaxies, indicating a fast transition between both phases (Johnson+07, Walker+10). A similar canyon can be defined with WISE data for a large sample (652 galaxies in 163 CGs, Zucker+16).



Classification of Compact Group Galaxies based on IR colors from WISE (Zucker+2016).

Galaxy transition in Compact Groups

We use this WISE sample to compare the

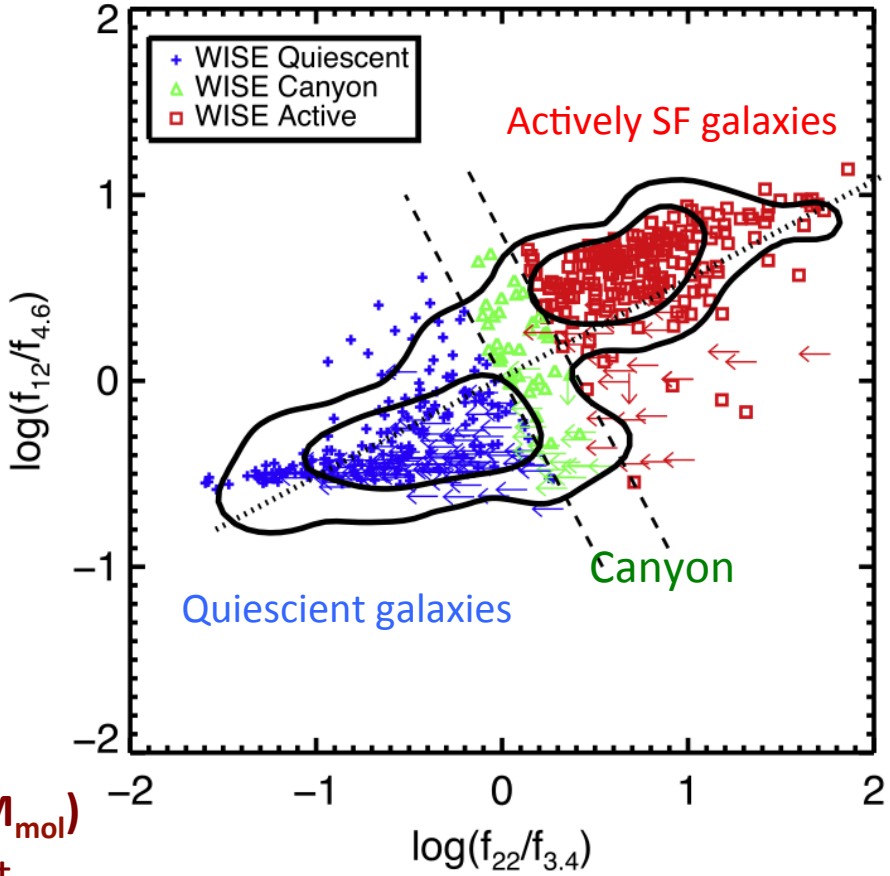
- Molecular gas mass (from CO from the literature)
- Star formation rate (SFR, from WISE 22 μm)
- Stellar mass (M_*,from WISE 3.4 and 4.6μm)

between active, quiescient and transitioning galaxies.

➔Are there differences in the

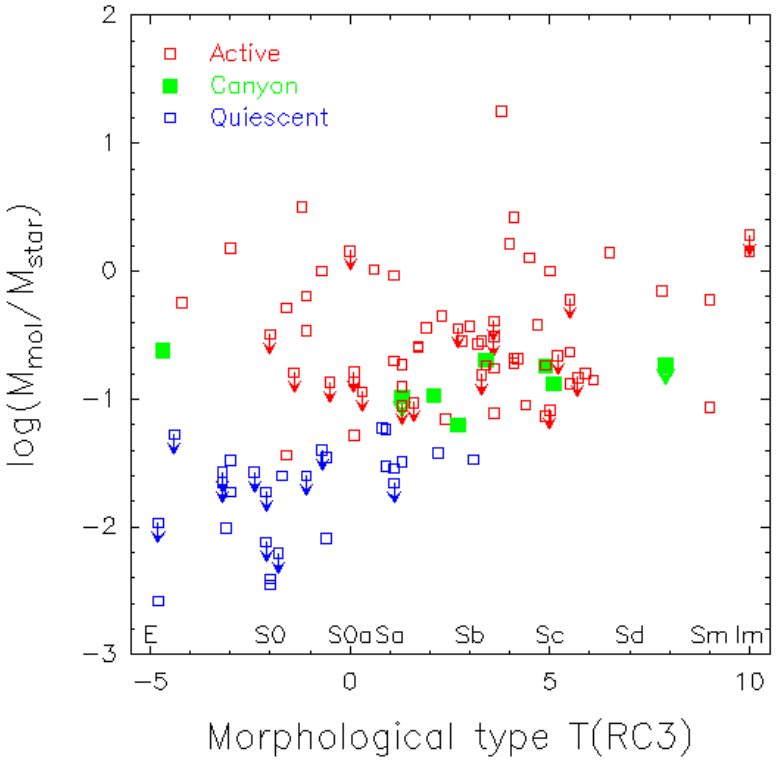
- **molecular gas fraction (M_{mol}/M_*)** and
- the **star formation efficieny (SFE=SFR/M_{mol})**

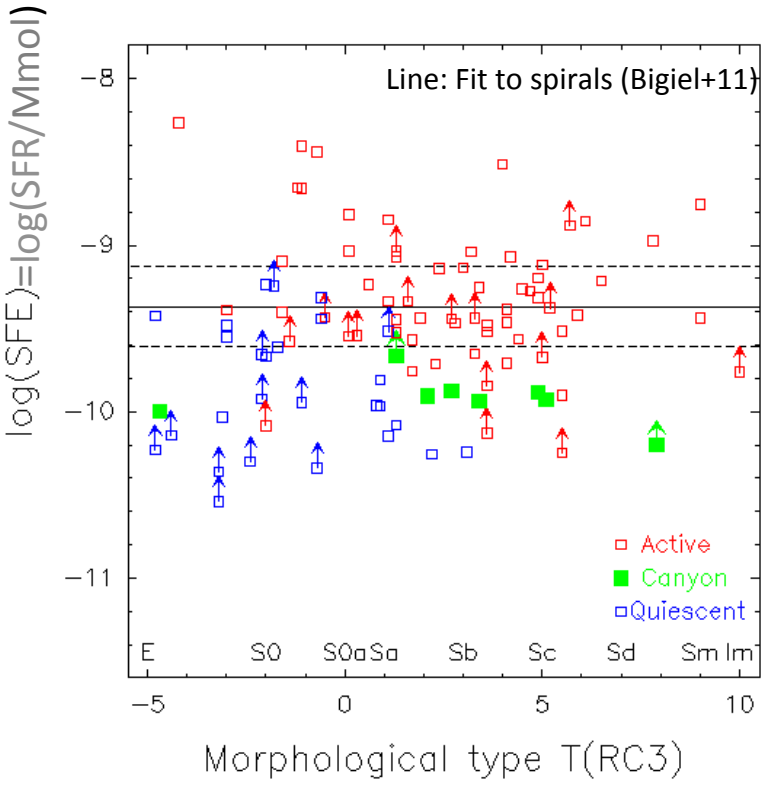
between transitioning, active and quiescent galaxies?



Classification of Compact Group Galaxies based on IR colors from WISE (Zucker+2016).

Molecular gas fraction and SFE in canyon galaxies

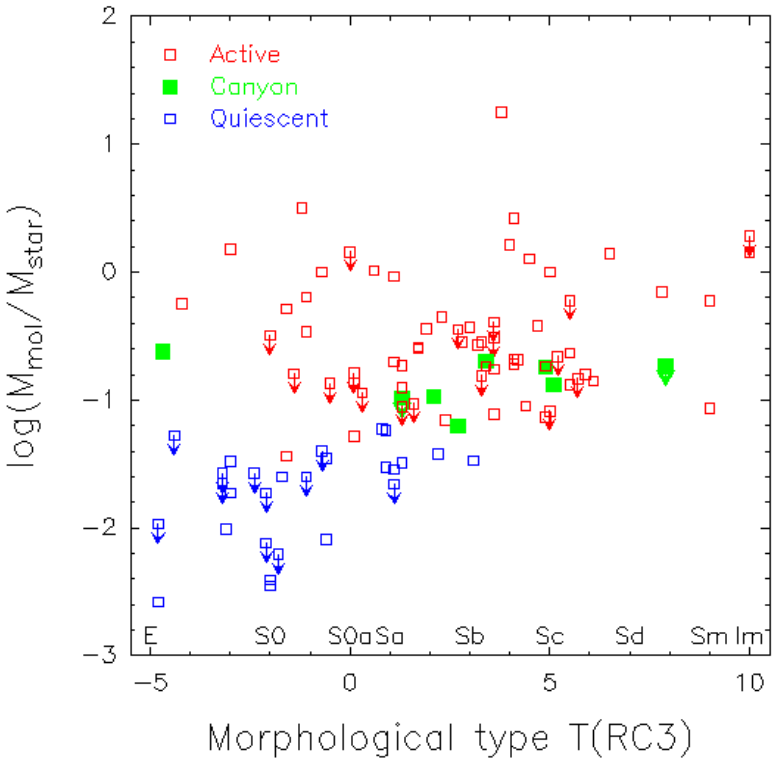


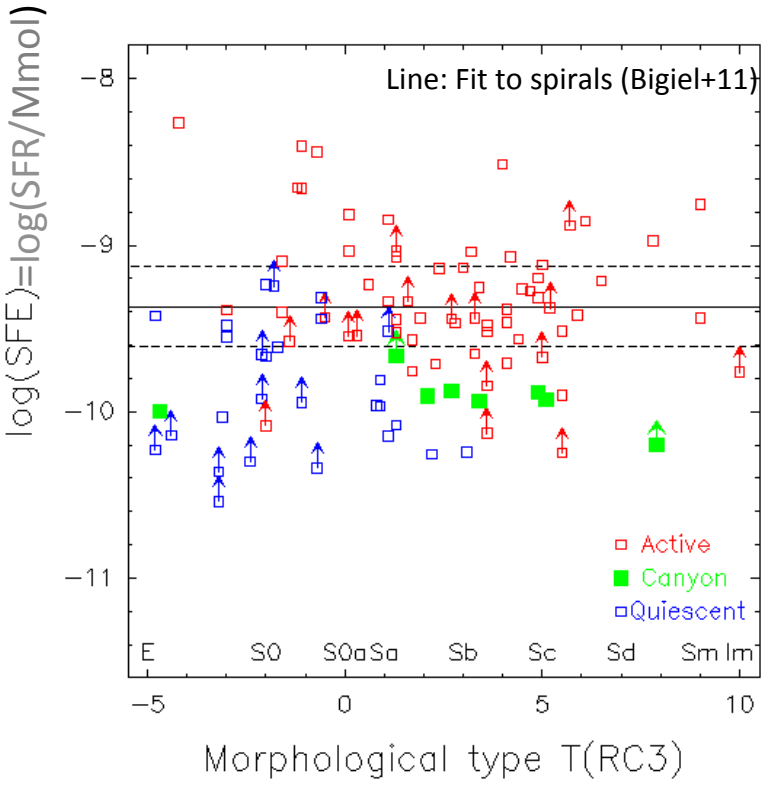


Class	<M_{mol}/M_{star}> (all)	<M_{mol}/M_{star}> (late-types)
Active	-0.61±0.07	-0.63±0.07
Canyon	-0.92±0.08	-0.96±0.08
Quiescent	-1.96±0.10	-1.45±0.05

Class	<SFE> (all)	<SFE> (late-types)
Active	-9.08±0.07	-9.18±0.07
Canyon	-9.89±0.4	-9.87±0.04
Quiescent	-9.67±0.07	-10.00±0.08

Molecular gas fraction and SFE in canyon galaxies



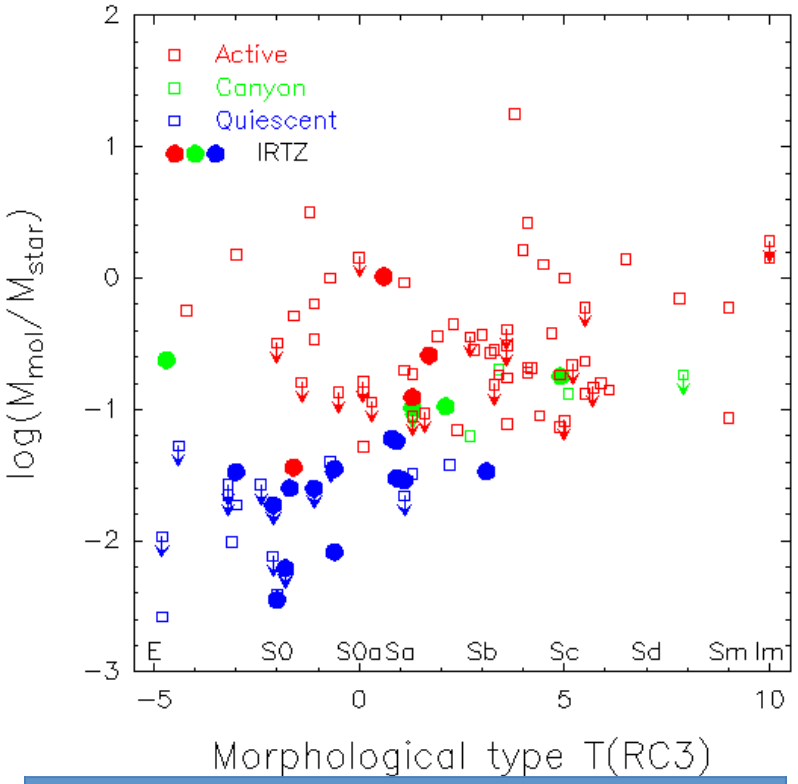


➔ The transition from active to quiescent seems to goes along with

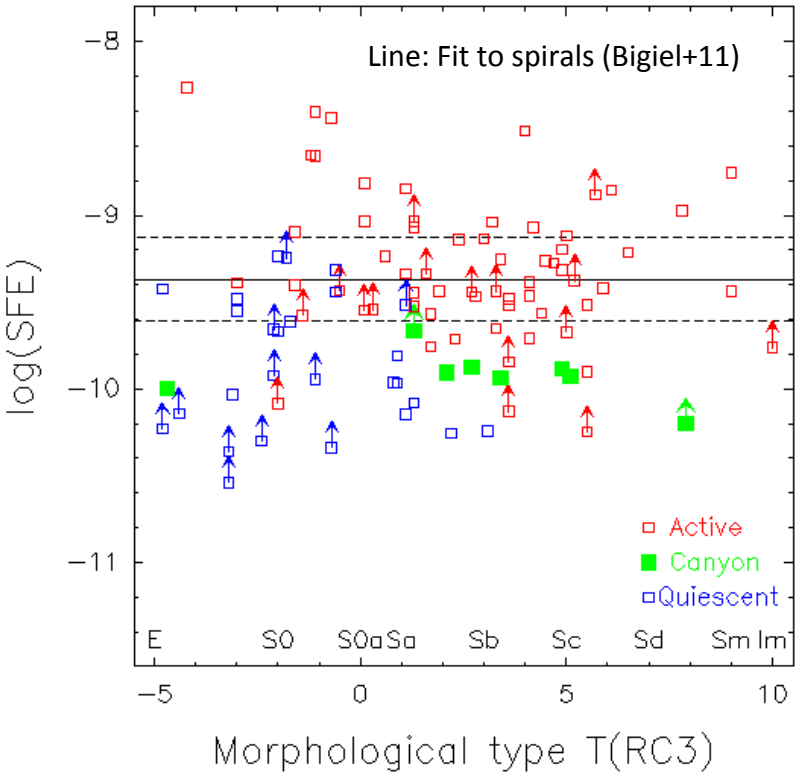
(i) a loss of molecular gas from galaxies and

(ii) the remaining molecular gas forms stars less efficiently

Molecular gas fraction and SFE in IRTZ galaxies

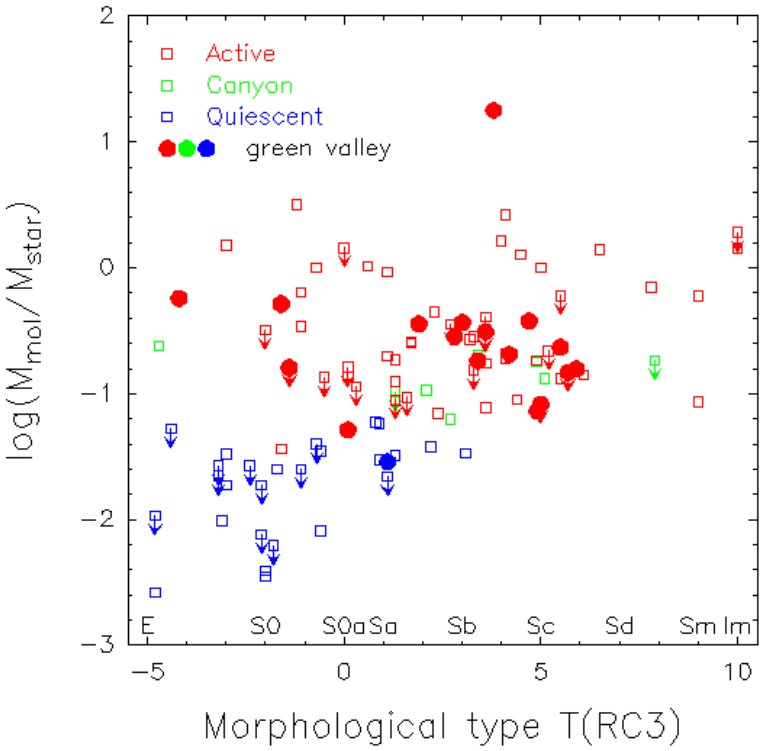


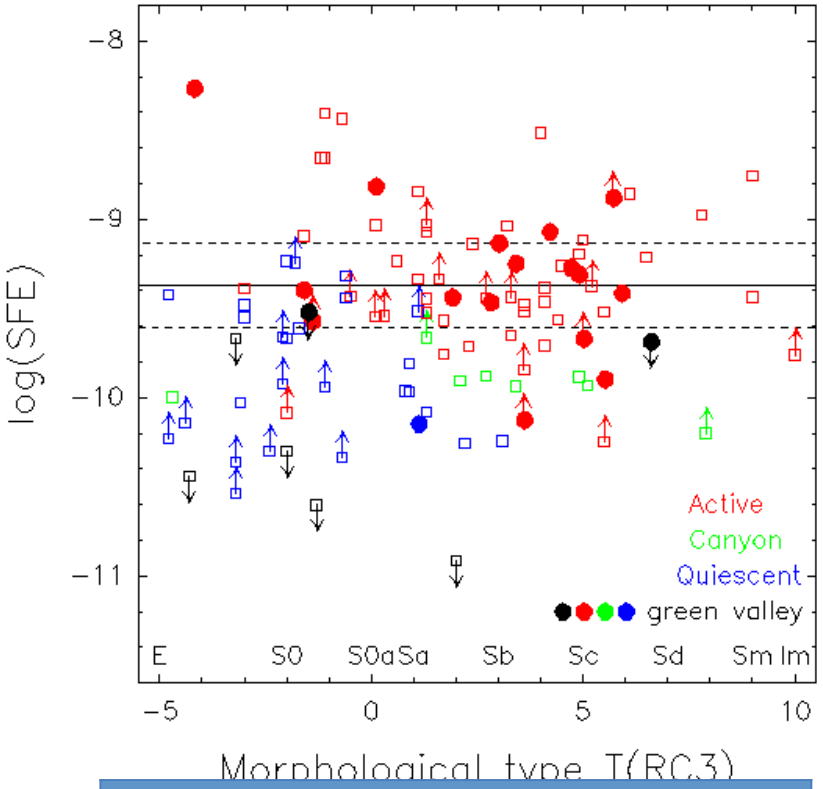
Class	<M_{mol}/M_{star}> (all)	<M_{mol}/M_{star}> (late-types)
Active	-0.61±0.07	-0.63±0.07
IRTZ	-1.50±0.14	-1.06±0.14
Quiescent	-1.96±0.10	-1.45±0.05



Class	<SFE> (all)	<SFE> (late-types)
Active	-9.08±0.07	-9.18±0.07
IRTZ	-9.62±0.08	-9.80±0.00
Quiescent	-9.67±0.07	-10.00±0.08

Molecular gas fraction and SFE in green valley galaxies





Class	<M_{mol}/M_{star}> (all)	<M_{mol}/M_{star}> (late-types)
Active	-0.61±0.07	-0.63±0.07
Green Valley	-0.71±0.15	-0.74±0.17
Quiescent	-1.96±0.10	-1.45±0.05

Class	<SFE> (all)	<SFE> (late-types)
Active	-9.08±0.07	-9.18±0.07
Green Valley	-9.18±0.122	-9.25±0.12
Quiescent	-9.67±0.07	-10.00±0.08

Conclusiones

We found that IR transitioning galaxies show a lack of molecular gas and a less efficient star formation compared to active galaxies.

A possible scenario:

- **Tidal interaction** might remove molecular gas (as seen dramatically in the HI)
- **Collisions** with **neighboring galaxies** or collision **with IGM** can **perturb the molecular gas** and make star formation less efficient.
- **Turbulent energy injection** might play an important role.