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Gas dynamics and star formation in "isolated" and interacting galaxies using FP observations

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Abstract. We present scanning Fabry-Perot observations of different types of star-forming galaxies from apparently isolated LIRGs to equal mass interacting galaxies. We analyze the ionized gas kinematics, its relation with the morphology of each system and the location of SF regions for different systems.

Keywords. galaxies: interactions, galaxies: kinematics and dynamics, galaxies: evolution

1. Introduction

Studying how galaxies form and evolve over cosmic time teaches us about the dynamical processes present at different evolving times, as well as about the physics of star formation (SF) (e.g. Schreiber *et al.* 2015). Though in the present-day Universe, there is observational evidence of secular evolution, it is not yet clear what the relative roles of internal secular evolution and environmental effects are in the cosmological context (Bell *et al.* 2005). In the local Universe, high star-forming events such as those present in luminous infrared galaxies (LIRGs) are primarily triggered by galaxy-galaxy interactions or mergers (Larson *et al.* 2016). However, several authors show that roughly 50% of intermediate redshift LIRGs are disk galaxies without sign of recent interactions (Lotz *et al.* 2008). On the other hand, the kinematics and dynamics of a galaxy are also affected by encounters and interactions. Tidal features in interacting galaxies can give information on the stage of the encounter through kinematical effects on the baryonic matter. The correlation between enhanced star formation (SF) and external perturbations is not straightforward (e.g. Krabbe *et al.* 2017) and need a better understanding of the SF process along the evolution of any type of galaxy encounter. For the reasons mentioned above, it is important to study galaxy interactions from minor mergers to equal mass-ratio encounter aiming to link the kinematical perturbations each galaxy is experiencing and the SF processes triggered.

2. Observations

Observations were done at the 2.1 m telescope of the Observatorio Astronómico Nacional in San Pedro Mártir, Mexico (OAN-SPM) using the scanning Fabry-Perot interferometer PUMA (Rosado *et al.* 1995). PUMA is a focal reducer used to make direct

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Table 1. Instrumental Parameters.

Parameter	
Telescope	2.1 m (OAN-SPM)
Instrument	PUMA
Scanning F-P interferometer	ET-50 (Queensgate)
Interference order	330 at 6562.78 Å
Free spectral range (FSR)	19.95 Å (912.0 $km\ s^{-1}$)
Interferometer finesse ($\mathcal{F}$)	24
Number of scanning channels	48
Spectral sampling at Hα	0.42 Å (19.0 $km\ s^{-1}$)
Spectral resolution	R=6720/0.83

imagery and Fabry-Perot (FP) interferometry of extended emission sources. General instrumental specifications are presented in Table 1.

3. Preliminary results

We have studied CIG 993, a galaxy previously catalogued as "isolated". The kinematical study of this galaxy showed that we are actually witnessing a minor merger that is triggering a strong star-forming event (Cárdenas-Martínez & Fuentes-Carrera 2018). In the case of apparently isolated galaxies, infalling satellite galaxies seem to be enough to trigger strong star-forming events, as long as the main galaxy harbors large gas quantities. This could imply that small encounters can change the global characteristics of a galaxy without disturbing the main rotation disk motion or the morphology of the galaxy. In the case of equal-mass encounters, we studied two systems in the Arp's "Catalogue of Peculiar Galaxies" (Arp 1966). The induced SF seems to strongly depend on the dynamics of the encounter, the parameters of the encounter and the stage of the interaction (e.g. Fuentes-Carrera *et al.* 2019, Fuentes-Carrera *et al.* -in preparation). Our results point to different mechanisms producing similar responses in the star-forming history of galaxies depending on the nature of the encounter (galactic cannibalism vs. equal-mass encounters), the stage of the encounter, and the parameters of the interaction, such as the amount of gas, the dynamical configuration of both the encounter and each of the galaxies involved.

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