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SOUTENANCE DE THÈSE

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CEA Saclay, Orme des Merisiers Bat 713, salle de séminaires Galilée

FORMATION D'ETOILES ET D'AMAS STELLAIRES DANS LES COLLISIONS DE GALAXIES

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Mergers are known to be essential in the formation of large-scale structures and to have a significant role in the history of galaxy formation and evolution. Besides a morphological transformation, mergers induce important bursts of star formation. These starburst are characterised by high Star Formation Efficiencies (SFEs) and Specific Star Formation Rates, i.e., high Star Formation Rates (SFR) per unit of gas mass and high SFR per unit of stellar mass, respectively, compared to spiral galaxies. At all redshifts, starburst galaxies are outliers of the sequence of star-forming galaxies defined by spiral galaxies.

We have investigated the origin of the starburst-mode of star formation, in three local interacting systems: Arp 245, Arp 105 and NGC 7252. We combined high-resolution JVLA observations of the 21-cm line, tracing the Hi diffuse gas, with UV GALEX observations, tracing the young star-forming regions. We probe the local physical conditions of the Inter-Stellar Medium (ISM) for independent star-forming regions and explore the atomic-to-dense gas transformation in different environments. The SFR/Hi ratio is found to be much higher in central regions, compared to outer regions, showing a higher dense gas fraction (or lower Hi gas fraction) in these regions. In the outer regions of the systems, i.e., the tidal tails, where the gas phase is mostly atomic, we find SFR/Hi ratios higher than in standard Hi-dominated environments, i.e., outer discs of spiral galaxies and dwarf galaxies. Thus, our analysis reveals that the outer regions of mergers are characterised by high SFEs, compared to the standard mode of star formation.

The observation of high dense gas fractions in interacting systems is consistent with the predictions of numerical simulations; it results from the increase of the gas turbulence during a merger. The merger is likely to affect the star-forming properties of the system at all spatial scales, from large scales, with a globally enhanced turbulence, to small scales, with possible modifications of the initial mass function. From a high-resolution numerical simulation of the major merger of two spiral galaxies, we analyse the effects of the galaxy interaction on the star forming properties of the ISM at the scale of star clusters. The increase of the gas turbulence is likely able to explain the formation of Super Star Clusters in the system.

Our investigation of the SFR-Hi relation in galaxy mergers will be complemented by high-resolution Hi data for additional systems, and pushed to yet smaller spatial scales.

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