Studying the spatially resolved Schmidt-Kennicutt law in interacting galaxies: the case of Arp 158

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Recent studies have shown that star formation in mergers does not seem to follow the same Schmidt-Kennicutt (KS) relation as in spiral disks, presenting a higher star formation rate (SFR) for a given gas column density. In this paper we study why and how different models of star formation arise. To do so we examine the process of star formation in the interacting system Arp 158 and its tidal debris. We perform an analysis of the properties of specific regions of interest in Arp 158 using observations tracing the atomic and the molecular gas, star formation, the stellar populations as well as optical spectroscopy to determine their exact nature. We also fit their spectral energy distribution with an evolutionary synthesis code. Finally, we compare star formation in these objects to star formation in the disks of spiral galaxies and mergers. Abundant molecular gas is found throughout the system and the tidal tails appear to have many young stars compared to their old stellar content. One of the nuclei is dominated by a starburst whereas the other is an active nucleus. We estimate the SFR throughout the system and find that most regions follow closely the KS relation seen in spiral galaxies with the exception of the nuclear starburst and the tip of one of the tails. We examine whether this diversity is due to uncertainties in the manner the SFR is determined or whether the conditions in the nuclear starburst region are such that it does not follow the same KS law as other regions. Observations of the interacting system Arp 158 provide the first evidence in a resolved fashion that different star-forming regions in a merger may be following different KS laws. This suggests that the physics of the interstellar medium at a scale no larger than 1 kpc, the size of the largest gravitational instabilities and the injection scale of turbulence, determines the origin of these laws.

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