Interacting galaxies on FIRE-2: The connection between enhanced star formation and interstellar gas content

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Abstract

We employ a suite of 24 high-resolution galaxy merger simulations (stellar mass ratio 2.5:1) to investigate the connection between interaction-induced star formation and the evolution of mass content in various gas phases of the interstellar medium (ISM). These simulations use the GIZMO code, along with the second version of the "Feedback in Realistic Environments" model (FIRE-2), which captures the multi-phase structure of the ISM. Our simulations are designed to represent galaxy mergers in the local Universe. In this work, we focus on the 'interacting period' between first and second pericentric passage. We nd that, on average, interactions enhance the star formation rate of the galaxy pair (30%, merger-suite sample average) and elevate their molecular gas content (23% on average). The dense molecular gas content (densities $>$ 1000 cmˆ3) is elevated signicantly (242% on average), but only accounts for 0.15% (on average) of the molecular gas budget. Additionally, this is accompanied by a decrease in the ionised gas content (1% on average), no change in the atomic gas content (2% increase on average), and a substantial increase (390% on average) in hot gas content (with temperatures exceeding 1 million Kelvin). The build up and maintenance of a molecular (and atomic) gas reservoir in the presence of elevated star formation challenges scenarios that require the blowout or drainage of this fuel in order to quench galaxies as a result of the interaction.

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