Evolution of Gas-Star Cycle in Nearby Galaxies

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The cycling between gas and star is known as one of the most important drivers of galaxy evolution. While there is a clear integrated relations between gas content and star formation rate (so-called the Kennicutt-Schmidt relation), there is significant galaxy-to-galaxy variations in the "spatially resolved" Kennicutt-Schmidt relation. The purpose of this work is to elucidate the spatially-resolved star formation processes in galaxies using knowledge of the total fuel reservoir for star formation in nearby galaxies. This project makes use of recent large optical and millimeter surveys: SDSS-IV MaNGA optical integral-field spectroscopic observations and JCMT molecular gas survey towards MaNGA galaxies. The large samples of galaxies and homogeneous dataset provide an unbiased view of the interplay between the gas properties (e.g., gas fraction), star formation properties (e.g., efficiency and spatial distribution), and the internal structure of galaxies (e.g., morphology and bulge-to-total light ratio), and the evolution of these properties from star-forming, to green valley, and to quiescent galaxies.