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The Chemical Enrichment and Evolution of Low Mass Galaxies

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Chemical elements, or “metals”, are produced by stellar nucleosynthesis and redistributed in and around galaxies by exploding stars or supernovae. This chemical enrichment process of galaxies is known to scale with stellar mass in the sense that higher mass galaxies have higher metal content. Theoretical notions have long held that higher mass galaxies are more efficient at making stars and are therefore more chemically enriched whereas low mass galaxies, in addition to being less efficient at turning gas into stars, are also prone to having metals driven out of their shallow potential wells by the energy deposition from supernovae. This is seen in cosmological simulations where stellar feedback-driven galactic winds transport metals from galaxy disks to large distances, with a steep inverse dependence of the amount of metals lost with galaxy mass. In this talk, I will discuss how we are quantitatively testing this framework of stellar feedback and metal loss by (i) measuring the production, distribution, and retention of metals in low-mass galaxies and (ii) using statistical relations and the measured properties of low-mass galaxies to constrain likely chemical evolution pathways.