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The effect of dust evolution on the multi-phase interstellar medium

The interstellar medium (ISM) is fundamental to star formation and galaxy evolution, with dust serving as a pivotal regulator of various astrophysical processes. Yet, the mechanisms driving dust evolution in stellar feedback–dominated environments remain elusive. While photoionization feedback from massive stars—responsible for generating HII regions and reshaping the ISM's structure and chemistry—is widely acknowledged, its specific impact on dust survival, sputtering, and redistribution is far less understood than that of supernova-driven shocks. Recent observational evidence highlighting pronounced spatial variations in dust properties challenges conventional wisdom and invites further scrutiny.

In this study, we employ the GIZMO code to simulate the intricate interplay between dust growth, photoionization, and chemical evolution. Our goal is to disentangle and quantify the distinct contributions of photoionization to the thermal structure, chemical composition, and spatial distribution of dust within the ISM. By questioning established paradigms and embracing innovative computational strategies, our research offers a forward-looking perspective on how stellar feedback mechanisms drive dust processing—and, by extension, galaxy formation—in diverse cosmic environments.

Section

Galaxy/Extragalactic

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