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# The sensitivity of ultra-faint dwarfs to a metallicity-dependent initial mass function

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## Abstract

I present high-resolution, cosmological simulations quantifying the response of an ultra-faint dwarf galaxy to a metallicity-dependent initial mass function in its interstellar medium. Ultra-faint dwarf galaxies are the least luminous galaxies in the Universe. Their shallow potential wells make them highly sensitive to their internal, astrophysical processes, providing an ideal laboratory for testing how star formation occurs and is regulated across cosmic times. Meeting this promise, however, requires us to quantify the expected observables produced by each model in order to interpret findings from the next generation of deep, wide sky, surveys (e.g. LSST).

To pursue this quantification, I present multiple re-simulations of a low-mass dark matter halo, each with a systematic variation in interstellar medium modelling. Each simulation is evolved through hydrodynamical, cosmological zoomed simulations capable of resolving the explosions of individual supernovae, and is complemented in turn by (i) a stellar initial mass function systematically varying with gas metallicity and (ii) the account of photo-ionisation feedback from young stars using radiative transfer. Comparing simulations between each other, we construct a causal account between these physical processes and the dwarf's observables today. We show how a metallicity-dependent initial mass function provides a particularly interesting avenue to explain the challengingly-high iron contents within ultra-faint dwarfs.

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