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Simulating the enrichment of cosmological gas

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Large, state-of-the-art cosmological simulations allow us to follow the evolution of various galaxies, and since it contains detailed knowledge of e.g. the metal content of the stars in each galaxy, it can be used to compare to galaxies in the real Universe. In our work, we are improving the implementations of the stellar feedback model within the GIZMO-Mufasa cosmological simulation. This particular simulation is the merged product of GIZMO's public available code and Mufasa/SIMBA to create realistic large-scale enviroments. Specifically, we are improving the current simplistic instantaneous recycling of the metals model, with a more accurate Cosmic Chemical Enrichment model developed by Kobayashi et al (2007) and updated in Kobayashi et al (2020). This will improve the time delay due to the star's evolution and the time delay for the local enrichment to occur, as well as add new metals to the evolutionary tracks of stars tracked by simulations. We added a probability distribution to determine if a specific region will be enriched (rather than a fixed distance distribution) into the mechanical feedback process. This distribution can be found in the thermal feedback process in the main GIZMO simulation. This will lead to more realistic black hole seedings. Ultimately, we can compare the new model to the old simplistic model using various different well-tested scenarios (e.g Mass-Metallicity relation) and interpret any differences.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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