

Seminarium Szkoły Doktorskiej NCBJ

Thursday, 16 May 2024, 9:15

room 207, Pasteura 7

<https://www.gotomeet.me/NCBJmeetings/phd-seminar>

https://events.ncbj.gov.pl/e/Seminar_23_24

Speaker: Prasad Sawant (Szkoła Doktorska NCBJ)

Title: The ALPINE - ALMA [CII] Survey: Unveiling the baryon cycle in $z \sim 5$ star-forming galaxies

Abstract:

When the Universe was only one billion years old, it underwent a crucial transformation from the primordial galactic formation to the onset of the peak of cosmic star formation rate density. During this critical phase, galaxies rapidly grew in size and mass, triggered by interactions with other sources and fueled by the accretion of gas from their surroundings. However, studying the evolution of these early galaxies is challenging due to degeneracies in cosmological simulations and chemical evolution models.

In this work, we make use of chemical evolution models to probe the evolution of gas and dust within star-forming galaxies at a redshift of ~ 5 , observed by the ALMA Large Program ALPINE. We attempt to match the observed dust content and star formation rate of these galaxies by considering different dust production mechanisms, including Type II supernovae (SNII), asymptotic giant branch stars, and dust growth within the ISM.

Our models successfully reproduce the gas and dust content in most of these primordial galaxies, indicating dust production primarily through SNII and gas/dust removal via galactic outflows and moderate inflow of primordial gas. However, a small number of galaxies show a rapid dust build-up in a short timeframe ($\sim 20 - 100$ Myr). This fast dust production might be partially explained by adopting a top-heavy initial mass function, thus favoring the formation of more massive stars and a more rapid stellar evolution. Our results, combined with future observations from the James Webb Space Telescope, will help us to reconcile observations with models and gain deeper insights into dust production mechanisms in the early Universe.

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