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Formation of carbon-enhanced metal poor (CEMP) stars in the early Universe

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We present here a three-dimesional hydrodynamical simulation for star formation. Our aim is to explore the effect of the metal-line cooling on the thermodynamics of the star-formation process. We explore the effect of changing the metallicty of the gas from $Z/Z_{\odot} = -4$ to $Z/Z_{\odot} = -2$. Furthermore, we explore the implications of using the observational abundance pattern of a set of CEMP-no stars, which have been considered as truly second-generation stars.

In order to pursue our aim, we modelled the microphysics by employing the public astrochemistry package KROME, using a chemical network which includes sixteen chemical species. We couple KROME with the fully three-dimensional hydrodynamical SPH code GRADSPH. With this framework we investigate the collapse of a metal-enhanced cloud, exploring the fragmentation process and the formation of stars.

We found that the metallicity has a clearly impact on the thermodynamics of the collapse, allowing the cloud to reach the CMB temperature floor for a metallicity $Z/Z_{\odot} = -2$, which is in agreement with previous work. As long as only metal line cooling is considered, our results support the metallicity threshold proposed by Bromm+2001, which will very likely regulate the first episode of fragmentation and potentially determine the masses of the resulting star clusters.

Affiliation

Universidad de Concepcion

Talk/Poster

Poster

Primary author: Mr FIBLA, Patricio (Universidad de Concepcion)

Co-author: Dr SCHLEICHER, Dominik (Universidad de Concepcion)

Presenter: Mr FIBLA, Patricio (Universidad de Concepcion)

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