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Cosmic Chemical Evolution with an Early Population of Intermediate Mass Stars

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We explore the consequences of an early population of intermediate mass stars in the 2 - 8 M\odot range on cosmic chemical evolution. We discuss the implications of this population as it pertains to several cosmological and astrophysical observables. For example, some very metal-poor galactic stars show large enhancements of carbon, typical of the C-rich ejecta of low-mass stars but not of supernovae; moreover, halo star carbon and oxygen abundances show wide scatter, which imply a wide range of star-formation and nucleosynthetic histories contributed to the first generations of stars. Also, recent analyses of the 4He abundance in metal-poor extragalactic H II regions suggest an elevated abundance Yp \simeq 0.256 by mass, higher than the predicted result from big bang nucleosynthesis assuming the baryon density determined by WMAP, Yp = 0.249. Although there are large uncertainties in the observational determination of 4He, this offset may suggest a prompt initial enrichment of 4He in early metal-poor structures. We also discuss the effect of intermediate mass stars on global cosmic evolution, the reionization of the Universe, the density of white dwarfs, as well as SNII and SNIa rates at high redshift. We also comment on the early astration of D and 7Li. We conclude that if intermediate mass stars are to be associated with Population III stars, their relevance is limited (primarily from observed abundance patterns) to low mass structures involving a limited fraction of the total baryon content of the Universe.

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