Modeling Galactic Chemical Evolution

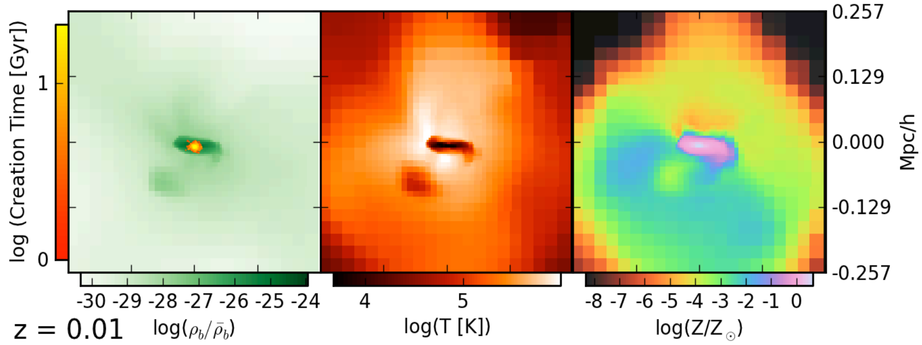

Fig. 1 - In this Enzo cosmological simulation of a disk galaxy we see stars forming from dense cold clouds in the inner most regions of the disk. As stars die their metals are released to enrich the interstellar medium and provide a new environment for the next generation of stars.

The amount of observational data available on the chemical enrichment history of our Milky Way is enormous and growing rapidly due to large survey initiatives such as the Sloan Digital Sky Survey: Sloan Extension for Galactic Understanding and Exploration (SDSS/SEGUE). Understanding and interpreting these data requires a bridge between theoretical models and observations.

Carolyn Peruta, a graduate student in the Department of Physics and Astronomy at Michigan State University, and her advisor Brian O'Shea have developed a detailed model tracing chemical enrichment through the birth and death of stars. Within Enzo cosmological simulations, these models will determine if significant abundance trends can allow one to distinguish between galaxy merger histories or varied initial stellar mass distributions as a function of metallicity and redshift.

Contact:
Brian O'Shea
Michigan State University
oshea@msu.edu

Researchers:
Carolyn C Peruta (MSU)
Brian W. O'Shea (MSU)
Jason Tumlinson (STScI)

Publication:
ApJ, in prep.

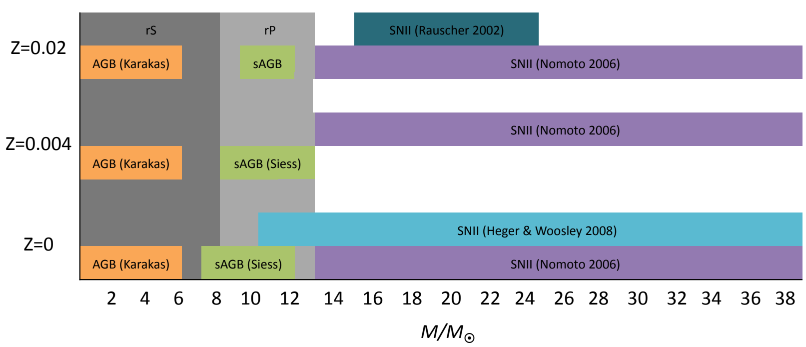

Fig. 2 - Currently, the chemical yields necessary to build a self-consistent model are sparse but growing. Subtle differences in included physics and theoretical assumptions can lead to large discrepancies in yield calculations. Filling in the gaps in a key goal of JINA researchers and colleagues.

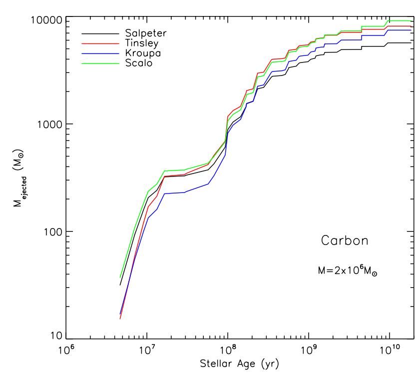

Fig.3 - Results from single star populations already show interesting differences between observationally determined initial stellar mass distributions. Here we track the ejection of carbon from stars formed at the same time but with four different initial mass functions along the entire history of the stellar population.