Star Wells: Rise of Satellites

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Introduction

Large galaxies are made up of smaller satellite galaxies. This makes these satellite galaxies crucial to understanding how stars form. Shallow gravity wells make them extremely sensitive to internal and external disturbances. Therefore, they are excellent laboratories to explore stellar physics. We use multi-body simulations of a Milky Way-like galaxy to explore the stellar properties of satellite galaxies surrounding a possible Large Magellanic Cloud (LMC). LMC is the largest satellite galaxy of the Milky Way. We compare the resulting properties such as chemical composition, light, radial distribution to observations from McConnachie et al. 2012.

Simulation

We use an existing high resolution gravitational N-body simulations of Milky Way like simulation run from 100 million years after the Big Bang to the present day using Gadget 2 (Springel, 2005).
Initial conditions are regenerated with MUSIC (Hahn Abel, 2011).
dark matter halos with 100 particles.

Halo Finder

Stars of every galaxy is held together by dark matter. We analyze the properties of dark matter spheres using ROCKSTAR halo finder (Behroozi et al. 2011).

Properties such as mass, V_{max}, M_{DM}, R_{vir} etc are analyzed.

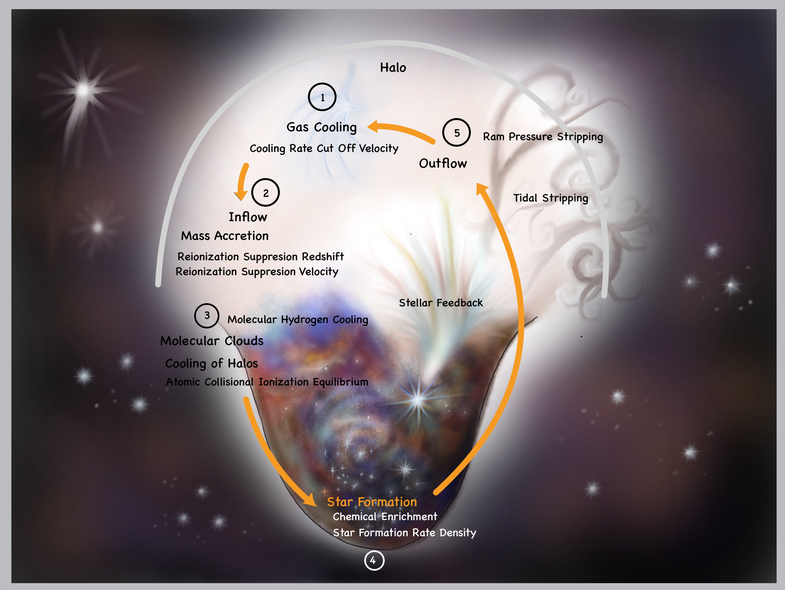

Figure 1: This figure shows an artist illustration of the life cycle of stars.

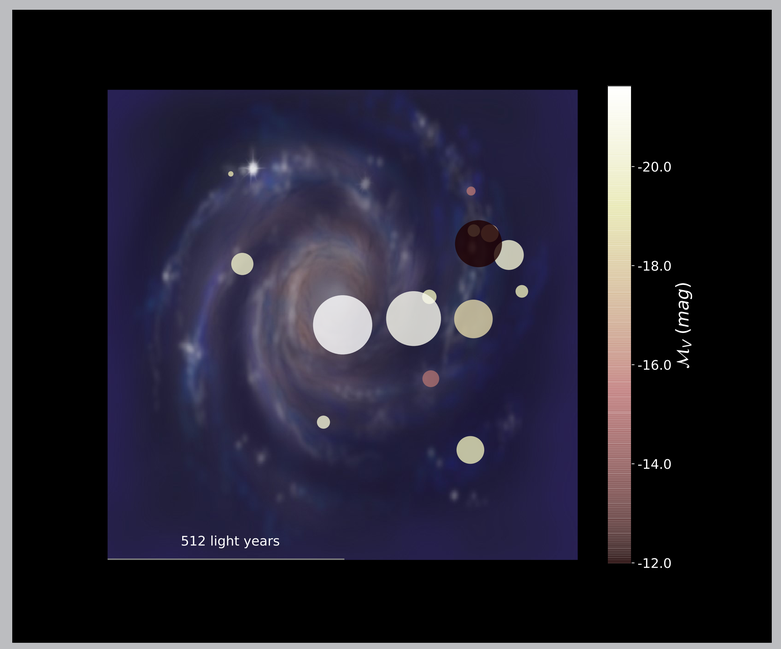

Figure 2: This figure shows galaxies within 160 kpc of LMC like galaxy. Each galaxy is colored by their brightness and sized by their virial radius.

Results

We compare the predicted chemical composition of satellites of the LMC to observations.

Our model estimates chemical composition vs luminosity relation very well.

We predict the luminosity and chemical abundance of the LMC fairly well.

However, our model underpredict the brightness of the Small Magellanic Cloud (SMC) which is a satellite of the LMC.

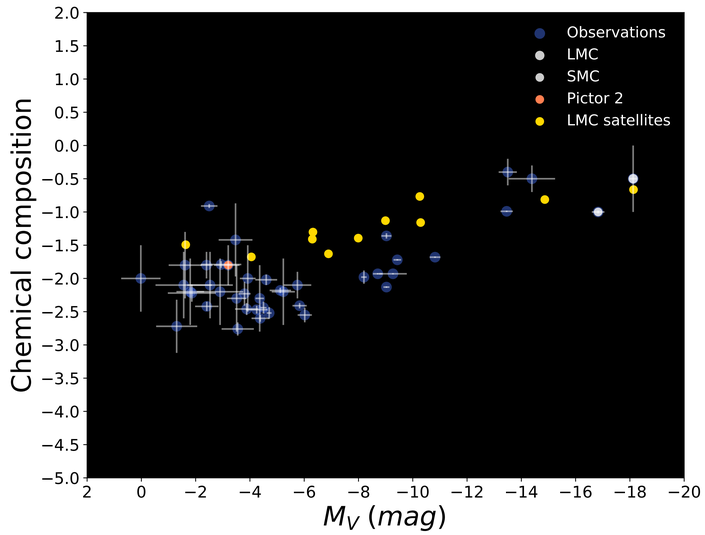

Figure 3: This figure shows chemical composition vs light relation of galaxies within 160 kpc of LMC like galaxy. Yellow dots shows the galaxies within 160 kpc of a LMC like galaxy while blue dots shows galaxies within 150 kpc of the Milky Way. White dots shows observational data of the LMC and its satellite galaxies.

Conclusions

We predict the brightness and chemical abundance of the LMC satellites fairly well.
However, further tuning of parameter space is required for better results.

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