Synthetic HI Line Observations of Simulated Galaxies using `Simba-C` and `MARTINI`

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This project aims to use the large-scale cosmological `Simba-C` simulation and the Mock Array Radio Telescope Interferometry of the Neutral ISM (`MARTINI`) Python package to generate synthetic HI observations of galaxies. This will enable analysis of the simulated neutral atomic Hydrogen (HI) gas distribution and kinematics, advancing our understanding of star formation, galactic evolution, the interplay between gas dynamics and feedback mechanisms, as well as the galactic environment.

1 Objectives

- Learning how to analyse the `Simba-C` simulation.

- Generating synthetic HI line observations (data cubes) of simulated galaxies using the `MARTINI` Python package.

- Analysing the properties of the HI gas in the synthetic observations, e.g:

  - HI mass distribution and spatial extent.
  - Kinematics and velocity structure.
  - Correlation with other galaxy properties (e.g., stellar mass, morphology).

- Comparing, if possible, the synthetic observations with observational data to validate the simulation results.

2 Special requirements

The student should have experience in programming in Python, as well as Linux terminal usage.

This can become a Master's level project.

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