

Millennium

This simulation is good for

- Modelling galaxies with stellar mass above $\sim 10^{8.5} M_{\text{sun}}$
- Probing scales up to $500 h^{-1}$ Mpc (without repetition)
- General-purpose galaxy evolution studies with the likes of the SDSS
- Detailed structural stellar, H α , and H $_2$ properties of galaxies (with [Dark Sage](#))

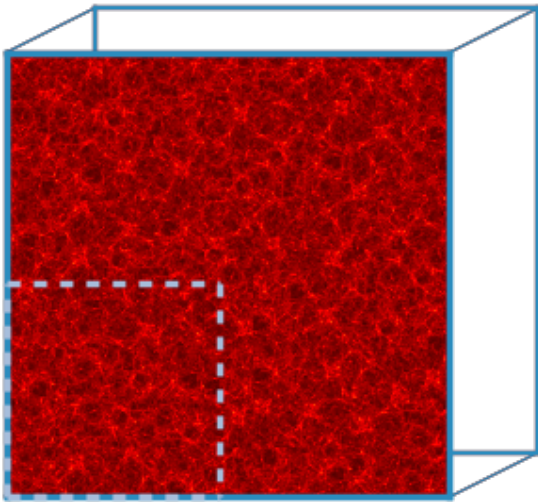
Overview

At the time of its publication in 2005, the Millennium simulation was the largest CDM cosmological N -body simulation ever run. It has since become the standard simulation for constructing galaxies with semi-analytic models and is still actively used for research today. The simulation was performed with [GADGET2](#), which uses a 'Tree Particle Mesh' algorithm to compute gravitational forces. Further details of the simulation can be found in the paper by [Springel et al. \(2005\)](#) and at [this address](#).

Size

Box length: $500 h^{-1}$ cMpc

Relative volume to an [all-sky survey out to \$z=0.05\$](#) :



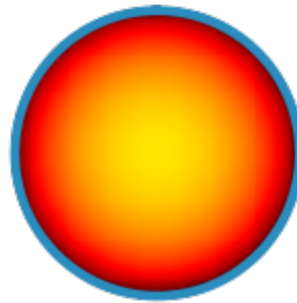
Resolution

Particle mass: $8.6 \times 10^8 h^{-1} M_{\text{sun}}$

Gravitational softening: $5 h^{-1}$ ckpc

Number of particles: 2160^3

Number of snapshots to $z=0$: 64



Cosmology

The cosmological parameters of the Millennium simulation are based on *WMAP-1* data ([Spergel et al. 2003](#)) and the 2dF Galaxy Redshift Survey ([Collins et al. 2001](#)).

$\Omega_m = 0.25$

$\Omega_b = 0.045$

$h = 0.73$

$n_s = 0.96$

$\sigma_8 = 0.8$

$\Omega_{\Lambda} = 0.75$

Halo

Halo and subhalo were identified using the popular [SUBFIND](#) code. The merger trees of these halo were built using LHALOTREE, which is described in the [Supplementary Information](#) of the Millennium paper. A minimum of 20 particles was required for a (sub)halo to be included in the trees.

Semi-analytic galaxies

Galaxy catalogues for the Millennium simulation available on *TAO* have been built with the following semi-analytic models:

[SAGE](#)
[Dark Sage](#)