Indra Simulation Parameters

1 General Parameters

- Box size = 1000 $h^{-1}\,\mathrm{Mpc}$
- $N_\mathrm{p} = 1024^3$
- force softening $\epsilon = 0.04\ h^{-1}\,\mathrm{Mpc}$
- initial $z = 127$
- particle mass $m_p = 7.031 \times 10^{10}\ h^{-1}\,\mathrm{M}_\odot$
- 6-bit Peano-Hilbert curve, i.e. 64^3 PH cells

2 Cosmology

The cosmology for the Indra parameters is from WMAP7, specifically the CMB + BAO + H_0 maximum likelihood values (second column of parameters in Table 1 of [1]).

Ω_0	Ω_Λ	Ω_b	h	σ_8	n_s
0.272	0.728	0.045	0.704	0.81	0.967

Table 1: Indra Cosmology Parameters

3 Initial Conditions

The initial conditions are generated using the IC_2lpt_Gen code, and the initial phases are set with Panphasia [2, 3]. Note: due to a bug in the code, the first 128 Indra simulations do not have 2LPT initial conditions. Also, the first 128 have $|\mathbf{k}| > k_\mathrm{Ny}$ zeroed, while the rest do not [4].

Each Indra simulation can be identified using three digits that each go from 0 to 7, corresponding to the x, y, z coordinates of an $8\,h^{-1}\,\mathrm{Gpc}$ box. The initial phases of the simulations can be described by a text string used by Panphasia:

$$[\mathrm{Panph1}, \mathrm{L15}, (<\mathrm{X}>, <\mathrm{Y}>, <\mathrm{Z}>), \mathrm{S75}, \mathrm{CH}-999, \mathrm{INDRA\_xyz}]$$

where xyz are the three identifiers that go from 0 to 8 and

$$\begin{aligned} <X> &= 31248 + 100 * x, \\ <Y> &= 31376 + 100 * y, \\ <Z> &= 31504 + 100 * z. \end{aligned}$$

The CH refers to a check digit which is set to -999 in this case.

4 Halos

The L-Gadget code calculates FOF halos as the simulation is running and uses the standard linking length parameter $\mathbf{b = 0.2}$ (in units of the mean inter-particle separation, $L/N = 1000/1024$ $h^{-1}\,\mathrm{Mpc}$). The subhalos are calculated later using SUBFIND; both FOF and SUBFIND halos have a minimum particle number of **20**. The FOF halos are included in the SUBFIND catalog (i.e. a field halo has itself as a subhalo), but SUBFIND removes unbound particles so they are in principle different halos with different sets of particles.

5 Data

The location of the data and status of the runs can be found in the document `IndraStatus.xlsx`. Each run has at least **64** snapshots (those with 65 have the $z = 0$ snapshot output twice), consisting of **256** data files for the particles and halos. The FFT data has **505** outputs. The z and a for each *snapnum* is also given in the `IndraStatus.xlsx` document.

References

[1] Komatsu, E., Smith, K. M., & Dunkley, J., et al. 2011, ApJS, 192, 18

[2] Jenkins, A. 2013, MNRAS, 434, 2094

[3] Jenkins, A. & Booth, S. 2013, arXiv:1306.5771

[4] Falck, B., McCullagh, N., Neyrinck, M. C., Wang, J., & Szalay, A. 2017, ApJ, 837, 181