Uso de Powmes & Rockstar

Erick Almaraz (IFUNAM)

Instituto de Ciencias Físicas, Julio 2018

POWMES

Bibliografía:

S. Colombi et al, MNRAS **393**, 511 (2009)

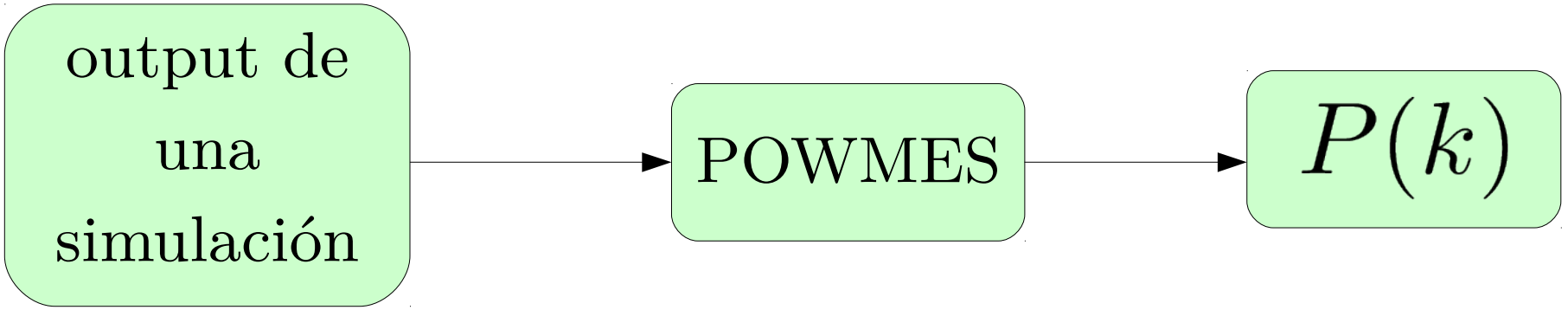
http://www.projet-horizon.fr/article345.html

¿Qué hace este programa?

Reconstruye el espectro de potencias de la materia

$$P(k) = \frac{2\pi^2}{k^3}\delta_m^2(k)$$

Entrada – salida del programa



part_xxxxx.yy powmes.config powspec.dat

Requisitos de instalación

* compilador de fortran
* FFTW (¡versión 2!)

sudo ./configure --enable-type-prefix --enable-mpi

Tiempo de ejecución

Depende de las características de la simulación: para simulaciones grandes hay que correr en un cluster

Ejecución del programa

i) editar powmes.config

```
&input
 verbose=.true.
 megaverbose=.true.
 filein='/home/ealmaraz/software/ramses/example/output/lcdm/bfbdev3/part128_lbox128/gadget/gadget_00001/part_00001.'
 nfile=1
 nmpi=64
 read_mass=.false.
 nfoldpow=-128
 ngrid=128
 norder=3
 shift=0.0 0.0 0.0
 filepower='/home/ealmaraz/software/powmes/example/output/lcdm/bfbdev3/part128_lbox128/output_00001/powspec.dat'
 filepower_fold='#powspec'
 filetaylor='#powspec.taylor'
```

filein: ubicación de los archivos de las simulaciones

nfile: tipo de archivo (1 GADGET)

nmpi: si nfile=1, nmpi es el número de archivos

nfoldpow: -kmax a reconstruir

ngrid: resolución de la malla

ii) ejecutar el programa

modo local: ./bin/powmes < powmes.config

cluster: preparar un script

iii) analizar la salida

vista de powspec.dat (¡ver el notebook!)

0	0.1000000000000000E+01	0.1000000000000000E+01	0.1000000000000000E+01	0.1000000000000000E+01	0.1000000000000000E+01
1	0.9000000000000000E+01	0.4833353862346925E-02	0.4833353957877370E-02	0.1000000000000001E+01	0.2042047759113712E+00
2	0.3100000000000000E+02	0.2835537123180891E-02	0.2835537615524639E-02	0.1000000000000052E+01	0.1545542130755337E+00
3	0.4900000000000000E+02	0.1941822867518021E-02	0.1941824289434881E-02	0.1000000000000624E+01	0.1361854865757785E+00
4	0.1050000000000000E+03	0.1000606165333810E-02	0.1000608217450514E-02	0.1000000000004878E+01	0.1074204555199741E+00
5	0.1750000000000000E+03	0.9686817080252387E-03	0.9686866453291521E-03	0.1000000000029754E+01	0.7927000657546147E-01
6	0.2250000000000000E+03	0.7097137234764634E-03	0.7097215894097512E-03	0.1000000000125120E+01	0.6697861306801810E-01
7	0.3010000000000000E+03	0.6371899335667720E-03	0.6372021114593629E-03	0.1000000000397040E+01	0.5648799784164063E-01
8	0.3810000000000000E+03	0.5491041016565323E-03	0.5491212265618316E-03	0.1000000001079965E+01	0.5106001067804894E-01
9	0.5710000000000000E+03	0.5194770940039121E-03	0.5195036076624160E-03	0.1000000002932007E+01	0.4082541720355029E-01
10	0.6250000000000000E+03	0.4279705964472459E-03	0.4280038465295184E-03	0.1000000006699571E+01	0.3987133305046471E-01
11	0.7290000000000000E+03	0.4369083273212102E-03	0.4369571274229795E-03	0.1000000013808805E+01	0.3732312311574393E-01
12	0.9070000000000000E+03	0.3821567002542169E-03	0.3822163952015552E-03	0.1000000028026792E+01	0.3313390177444165E-01
13	0.1089000000000000E+04	0.3560122945679367E-03	0.3560885388967362E-03	0.1000000052418548E+01	0.2882886788218940E-01
14	0.1249000000000000E+04	0.3388178747005516E-03	0.3389148207785881E-03	0.1000000094970541E+01	0.2814734012418796E-01
15	0.1311000000000000E+04	0.3087026011110513E-03	0.3088171944639845E-03	0.1000000161860350E+01	0.2720725593685221E-01
16	0.1669000000000000E+04	0.2887412044549436E-03	0.2888793009762535E-03	0.1000000273623968E+01	0.2329261360821292E-01
17	0.1861000000000000E+04	0.2643755170793960E-03	0.2645355164349382E-03	0.1000000444978725E+01	0.2352517843935546E-01
18	0.2085000000000000E+04	0.2468717544193878E-03	0.2470590178459557E-03	0.1000000706723460E+01	0.2237602354190356E-01
19	0.2179000000000000E+04	0.2361217935531236E-03	0.2363419524214622E-03	0.1000001085554263E+01	0.2091599508433606E-01
20	0.2517000000000000E+04	0.2328403094408282E-03	0.2331031306807702E-03	0.1000001643771031E+01	0.1943398796605973E-01

ROCKSTAR

* Bibliografía:

P. Behroozi et al, ApJ **762**, 109 (2013)

https://bitbucket.org/gfcstanford/rockstar

¿Qué hace este programa?

Encuentra halos de CDM en una simulación

Entrada – salida del programa

part_xxxxx.yy

parallel.cfg

halos.bin,
halos.ascii,
out.list,
parents.dat

Requisitos de instalación

* compilador de C
* OS diferente de Windows

Tiempo de ejecución

1 – 30 minutos

Ejecución del programa

i) editar parallel.cfg (ver el ejemplo & sitio web)

```
FILE_FORMAT = "GADGET2" # or "ART" or "ASCII"
PARTICLE_MASS = 0       # must specify (in Msun/h) for ART or ASCII

# You should specify cosmology parameters only for ASCII formats
# For GADGET2 and ART, these parameters will be replaced with values from the
# particle data file
SCALE_NOW = 1
h0 = 0.6768
Ol = 0.6768
Om = 0.3053

# For GADGET2, you may need to specify conversion parameters.
# Rockstar's internal units are Mpc/h (lengths) and Msun/h (masses)
GADGET_LENGTH_CONVERSION = 1e-3    #erick - see documentation & Baojiu's indications
GADGET_MASS_CONVERSION = 1e+10

FORCE_RES = 0.03125 #Force resolution of simulation, in Mpc/h. erick - FORCE_RES = 2*lbox/(2**max_refin_level), see Baojiu's indications

#This specifies the use of multiple processors:
PARALLEL_IO=1

#This specifies the input filenames:
INBASE="/home/ealmaraz/software/ramses/example/output/lcdm/bfbdev3/part128_lbox128/gadget/gadget_00001"
FILENAME="part_00001.<block>"
NUM_SNAPS=1
NUM_BLOCKS=64   #erick - number of gadget files. See documentation

#This specifies the output folder:
OUTBASE="/home/ealmaraz/software/rockstar/example/rc3/output/lcdm/bfbdev3/part128_lbox128/output_00001"
```

ii) ejecutar el programa

a) make

b) make parents

c) ./rockstar -c parallel.cfg &

d) ./rockstar -c path/auto-rockstar.cfg

e) ./util/find_parents path/out_0.list lbox > parents.dat

iii) analizar la salida: vista de parents.dat (¡ver el notebook!)

```
#ID DescID M200c Vmax Vrms R200c Rs Np X Y Z VX VY VZ JX JY JZ Spin rs_klypin M200c_all M200b M200c M500c M2500c Xoff Voff spin_bullock b_to_a c
_to_a A[x] A[y] A[z] b_to_a(500c) c_to_a(500c) A[x](500c) A[y](500c) A[z](500c) T/|U| M_pe_Behroozi M_pe_Diemer PID
#a = 1.003181
#Om = 0.305300; Ol = 0.694700; h = 0.676800
#FOF linking length: 0.280000
#Unbound Threshold: 0.500000; FOF Refinement Threshold: 0.700000
#Particle mass: 8.47293e+10 Msun/h
#Box size: 128.000000 Mpc/h
#Force resolution assumed: 0.0311509 Mpc/h
#Units: Masses in Msun / h
#Units: Positions in Mpc / h (comoving)
#Units: Velocities in km / s (physical, peculiar)
#Units: Halo Distances, Lengths, and Radii in kpc / h (comoving)
#Units: Angular Momenta in (Msun/h) * (Mpc/h) * km/s (physical)
#Units: Spins are dimensionless
#Np is an internal debugging quantity.
#Rockstar Version: 0.99.9-RC3
311 -1 3.559e+12 284.14 233.90 247.741 31.644 74 2.53415 3.64182 18.69481 166.42 567.24 148.57 -4.776e+12 1.359e+12 9.321e+12 0.03502 31.64398 3
.5586e+12 4.9143e+12 3.5586e+12 2.9655e+12 1.0168e+12 14.14446 25.21 0.02273 0.72341 0.54304 12.91874 26.26599 35.07372 0.6496 -1
309 -1 1.695e+11 97.55 0.00 89.796 15.590 76 9.35786 1.32030 24.64756 -52.24 532.73 178.05 0.000e+00 0.000e+00 0.000e+00 0.00000 15.58970 1.6946
e+11 3.3892e+11 1.6946e+11 0.0000e+00 0.0000e+00 61.88658 0.00 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.0000 -1
233 -1 6.524e+12 356.11 330.71 303.211 34.443 153 7.68553 0.13954 5.48757 210.45 309.87 188.84 1.126e+13 -3.958e+13 8.704e+12 0.04680 34.44284 6
.5242e+12 8.3035e+12 6.5242e+12 5.3379e+12 2.7961e+12 19.64167 2.49 0.04050 0.43025 0.36497 44.91805 0.66177 -28.75230 0.3761 -1
157 -1 1.483e+13 418.53 417.94 398.652 126.753 364 9.22001 10.08412 31.63276 191.51 515.46 449.27 2.557e+13 1.466e+14 3.253e+13 0.04157 88.27436
 1.4828e+12 2.0928e+13 1.4828e+13 1.0252e+13 4.4059e+12 59.49366 30.15 0.02998 0.47141 0.37203 37.03519 -4.83955 50.33957 0.4477 -1
158 -1 8.473e+11 162.01 124.60 153.549 32.676 37 9.61220 9.24171 32.36638 192.64 112.36 302.44 -1.649e+11 -1.217e+12 2.720e+12 0.06672 32.67633
8.4729e+11 1.2709e+12 8.4729e+11 0.0000e+00 0.0000e+00 26.81506 7.34 0.06064 0.62014 0.24072 70.06935 18.54105 -1.56793 0.0000 -1
365 -1 5.931e+11 139.85 61.99 136.337 37.545 48 1.57589 2.56927 25.70767 167.05 531.25 34.86 -3.710e+11 -7.389e+11 5.643e+11 0.05216 37.54510 5.
9311e+11 1.0168e+12 5.9311e+11 3.3892e+11 0.0000e+00 33.68734 17.59 0.03754 0.44466 0.02029 24.57851 30.54692 -8.21755 0.7136 -1
262 -1 3.728e+12 302.66 237.66 251.612 25.569 75 11.87642 11.95438 13.96949 -430.25 365.06 76.30 -1.068e+13 -1.349e+12 -6.135e+12 0.03660 25.569
38 3.7281e+12 4.1517e+12 3.7281e+12 2.8808e+12 5.9311e+11 23.63880 0.00 0.03064 0.81123 0.52655 36.37506 22.75283 -14.60168 0.8657 -1
```