Simulations Documentation

the AWESOME Project

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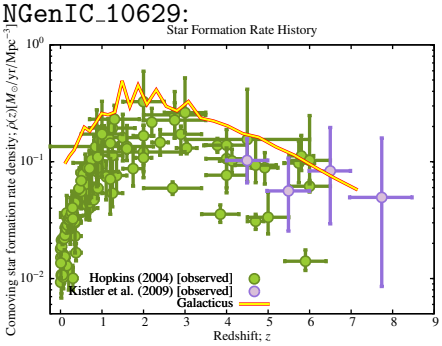
Chapter 1

Notes

05.06.2012 Test test

21.05.2012 Star formation rate mystery still unsolved - checked the parameter files for problems (including redshift) - but there is no obvious error / difference. One suspicion: it could be that new `linger.dat` files which produce initial conditions with rather late redshifts ($\cong 18$) influence the SFR negatively; reason to believe that is that the NGen-IC runs all have rather high SFR and their initial redshifts are quite high; e.g. `NGenIC_10629`:



In Galacticus revision 821 the latest bug 'I think this was due to a missing limitation on the rate at which metals can be driven out of hot halos' is fixed and the 100h simulations runs again

11.05.2012 Galacticus bug report

```
Fatal error in ODEIV2_Solve():
ODE integration failed with status -1
...
```

Link: `https://bugs.launchpad.net/galacticus/+bug/998007`
- occurs in `stages_12_h_44` with h100.

10.05.2012 Complete reinstallation of system since I had messed up my perl installation severely. Now the plotting scripts run again in revision 809.

08.05.2012 Compiler flags for checking linking

```
-Wl,--verbose
```

gives attempts/success/fail info about opening files.
New Galcticus revisions had problems compilingbut already fixed by Benson in rev 805. For consistency also update on pc122 so perl5 is still under construction

02.05.2012 Had to reinstall `perl5` (download + recompile) cause Galacticus plot routines did not work any more: Moreover I had to:

```
$PERL5LIB=/usr/lib/perl5:/usr/local/lib/perl/5.12.4:
/usr/share/perl5:/usr/local/share/perl/5.12.4
$export PERL5LIB
```

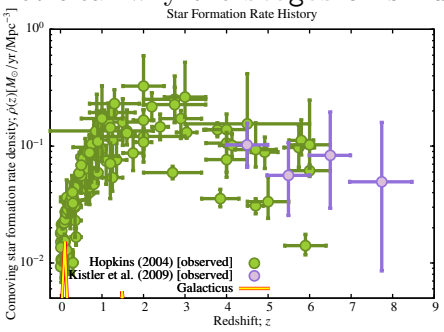
to get Galacticus itself compile again.

25.04.2012 Is low star formation rate in recent galacticus outputs related to missing IC redshift? (99 assumed)

19.04.2012 `stages_52` simulation still shows extremely low star formation rate in history plot (Galacticus rev. 771) although also in Markus' converter-ed input file the box size of 44.8 Mpc is correct

18.04.2012 Comparison runs look principally nice but not equal - may be caused by different `linger.dat`
Comparison runs have to be redone since `grafic_h70` and `grafic_h100` were not recompiled after changing `constr.f` and `grafic.inc`
2DO: check comparison runs, check new galacticus runs and restart rockstar job on MACH

17.04.2012 Started some comparison runs beweteen H=70.3 and H=100 with same `linger_syn` parameters, same constraints and seeds
found nice program with GUI to look at hdf5 files and also to edit them, called `vitables` - big files take very long to load but once loaded it runs smoothly
not clear why the `stages_52` simulation plots show such little star formation rate

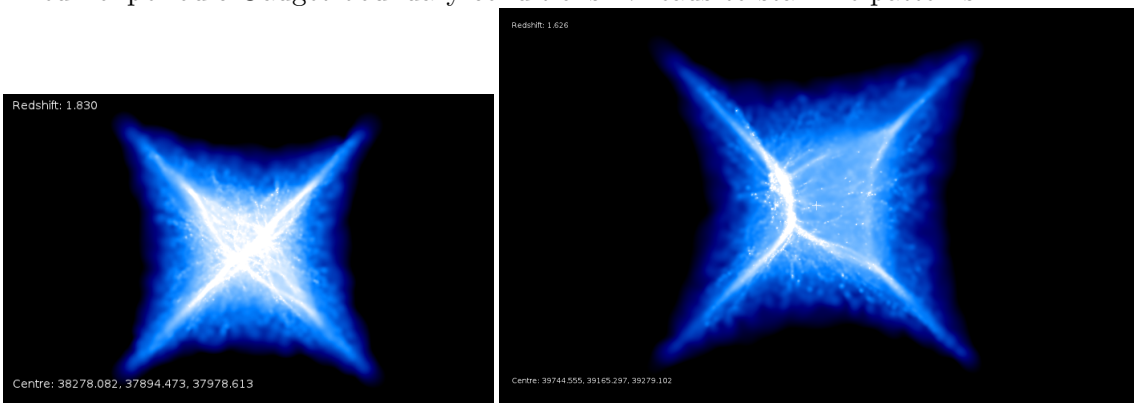


16.04.2012 re-doing the rockstar jobs that did not work on intel queue now on the AMD machines (`stages_54dr5d5`)
512er run is being rockstarred on MACH (128 cores) faster than on our AMDs → quit job on astro-cluster

12.04.2012 Explicitly defining the ports when havin several server processes on the frontend did not seem to work for the intel queue, all three rockstar jobs stopped working after some time

04.04.2012 E-Mail correspondence with Sabine Kreidl to Rockstar on MACH
Recompiled Gadget with `PLACEHIGHRESREGION=1` on and `PMGRID` resolution of 256 for 256er run

03.04.2012 Tried nonperiodic Gadget boundary conditions → leads to star-like patterns



02.04.2012 Correspondence with Peter Behroozi concerning OpenMP parallelization possibilities in Rockstar → tried suggested loops and auto-parallelization. Jobs on intel machines freeze ...

27.03.2012 `512er_major_merger` Rockstar run is very slow even on 24 cores
`consistentree` has parameter `BOX_DIVISIONS` which divides the box in this number cubed parts and makes `tree_X_Y_Z.dat` output and is very very fast this way → have to rewrite reading routine in Markus' converter

26.03.2012 Intel compiler auto-parallelization test runs on LEO3 for converter v0.5
512^3 runs produced Segfaults with Markus' converter v0.4 → fixed

21.03.2012 2DO: change virial radius reading in galaxcicusStart.xml to false and let intern value powmes scripts, plotting scripts (spin, vrms)

20.03.2012 powemes installed

19.03.2012 NGenIC starting redshift test, if corrected initial z leads to lower star formation rate did show, that suspicion was not proven. Other explanation has to be found. Vrms and Spin videos are in the works.

14.03.2012 2DO: new stages simulations in Documentation (at least 46, 50, 51)
Script that makes *.pngs out of halo masses at all time steps is running over all simulations in r256 for comparison beweteen Bertschinger and NGenIC ICs
Rerun some Bertschinger ICs with updated linger.dat and spectral index $\neq 1$ to see how this influences star formation rate (linger runs and runs)

13.03.2012 Unclear why all NGenIC simulations show much higher star formation and plot scripts yield different output files though the same .xml file as always is used

11.03.2012 `NGenIC_15039` produces "unreadable" output, is bein rerockstarred from scratch

```
 +++
 Plot_Star_Formation_History.pl:
 +++
Useless use of private variable in void context at ../../perl//XMP/MetaData.pm line
HDF5-DIAG: Error detected in HDF5 (1.8.4-patch1) thread 0:
  #000: ../../../src/H5D.c line 507 in H5Dget_type(): not a dataset
    major: Invalid arguments to routine
    minor: Inappropriate type
Error Calling PDL::IO::HDF5::Dataset::get: Can't get HDF5 Dataset type.
 at ../../perl//Galacticus/HDF5.pm line 88
HDF5-DIAG: Error detected in HDF5 (1.8.4-patch1) thread 0:
  #000: ../../../src/H5D.c line 507 in H5Dget_type(): not a dataset
    major: Invalid arguments to routine
    minor: Inappropriate type
Error Calling PDL::IO::HDF5::Dataset::get: Can't get HDF5 Dataset type.
 at ../../perl//Galacticus/HDF5.pm line 88
Illegal division by zero at Plot_Star_Formation_History.pl line 58.
```

09.03.2012 strange error in 2 galacticus jobs `stages_12` and `stages_13` → Markus' converter outdated with new consistenttrees?
idea: `drd5_r256_2` shows a major merger in progress → make a set of similar simulations with slightly different parameters
idea: make voids as constraints so that netto gravity is more centered towards overdensities

08.03.2012 add `nohup` to `./rockstar server_ib.cfg` in `qsubrockstar.sh` and rename `rocky_startscript` to something recognizable

```
83973 0.60500 wcon1Gy.st jan     r     11:01:23 astro14.astro-beowulf.      64
83974 0.50500 rocky_star harre   r     13:14:22 astro-x4600-04.astro-beo     1
83976 0.55421 stages_28_ harre   r     13:52:36 astro22.astro-beowulf.      32
83977 0.55421 stages_29_ harre   r     13:56:35 astro25.astro-beowulf.      32
83980 0.55421 stages_30_ harre   r     14:07:12 astro28.astro-beowulf.      32
83984 0.55421 stages_31_ harre   r     14:14:23 astro31.astro-beowulf.      32
83988 0.51611 rocky_star harre   r     14:49:20 astro-x4600-04.astro-beo     8
83989 0.51611 rocky_star harre   r     14:50:54 astro-x4600-03.astro-beo     8
83993 0.51611 rocky_star harre   r     15:12:52 astro-x4600-04.astro-beo     8
83995 0.51611 rocky_star harre   r     15:16:43 astro-x4600-03.astro-beo     8
83992 0.58278 c803_test_ markus  qw    14:54:54                             50
83985 0.55421 stages_32_ harre   qw    14:14:31                             32
83986 0.55421 stages_33_ harre   qw    14:14:41                             32
```

re-galacticussing `NgenIC_15039` again since plotting scripts complain that there is no output for a=0
2DO: test speedup of galacticus with 1,2,4,8 threads
Rockstar works if infiniband is forced with `PARALLEL_IO_SERVER_INTERFACE = "ib0"`, the client IP address is indeed NOT necessary, client process is started with `auto-rockstar.cfg`
Gadget recompiled with newest openmpi version → should use infiniband now

06.03.2012 submitted 4 jobs with same seed but different constraints parameters
Memory agglomeration fix also on cluster + email to develooper

Wrote E-Mails to Rien de Weijgaert and Peter Behroozi
re-rockstarring `stages_21` on my machine pc122 → dumped due to memory

02.03.2012 re-galacticussing `NgenIC_15039` cause 200 output redshifts lead to > 30GB file + added luminosity output redshifts from Markus' .xml file
Peter answered and sent `consistent_trees v0.99`, but problem persists - suspicion: Snapshotnames.dat must be changed (delete corresponding lines) for runs that have < 200 outputs!
rockstar won't start any more ... network problem suspected

01.03.2012 wrote E-Mail to Peter concerning `find_parents_and_cleanup:` `find_parents_and_cleanup.c:130` problem
consistentree: `NgenIC_15039`, galacticussing
restarted: `stages_21` rockstarred auf AMD-04
first 512^3 simulation `NgenIC_7755` finished successfully - lasted 1 day on 64 cores
wrote E-mail to de Weijgaert concerning constrained ICs

29.02.2012 `stages_12` re-rockstarred auf AMD-03
`stages_21` rockstarred auf AMD-04 - crashed
100Mpc 512^3 jobs: 11410, 15725, 27036, 7755
10 100Mpc ICs generated
Note: try bigger volumes with NGen-IC
added output redshifts derived from `gadget_timer.txt` as parameter `outputRedshifts` in .xml file
Random seeds that do not create cluster like structures at 32Mpc box: 589, 12170, 13610, 16604, 16749, 17362, 17433, 29666, 32223, 17595, 22045, 3724, 3183, 4152, 7581, 8502, 10153, 10657, 22946, 14841, 25060, 29468, 32634
Random seeds that look a little interesting: 15039 → rockstarred on AMD-03 (finished), 26214 → rockstarred on AMD-04

28.02.2012 Successfully started some N-GenIC jobs for comparison of IC generation

17.02.2012 Discussion with Asmus about Stages Cluster → try more systematic approach to ICs

15.02.2012 Galacticus revisision 708 - `drd5_r256_2` not fixed → E-Mail to Andrew
check tomorrow: Galacticus jobs `fuenfincr256_1` and `drdx_3_r256`
Note: think about / find a good method for common metadata

14.02.2012 Wrote E-Mail to Bertschinger.

13.02.2012 Deleted some jobs I started yesterday because they had artificial crosses or were practically unconstrained
Third simulation `fuenfincr256_1` ran through - Galacticus restart worked well!
Note: IC with same seed but higher resolution do not yield the same simulation! → started two more test runs from r128 sims to doublecheck
→ Note from April 2012: different `linger.dat` suspected

12.02.2012 Updated Galacticus to revision 707 as suggested by Andrew and added parameter `hotHaloOutflowAngularMomentumAlwaysGrows` to xml file.

Two of four simulations ran through (copied hdf5 to transfer), two crashed → try to continue at saved states!

10.02.2012 wrote E-Mail to Andrew about performance problems and wavelenght computation error in `fuenfincr256_1`
started some runs with higher central delta and broader smoothing lenghts, i.e. 32/dx and 100/dx; all 128 resolution except second last one (same seed!):

```
83492 0.60500 d31c_1_sta harre   r     02/10/2012 15:19:56 astro18  16
83493 0.60500 d31c_2_sta harre   r     02/10/2012 15:20:37 astro29  16
83494 0.60500 d31c_3_sta harre   r     02/10/2012 15:21:17 astro25  16
83495 0.60500 d51c_sl100 harre   r     02/10/2012 15:23:21 astro31  16
83496 0.54786 d3+3c_sl50 harre   r     02/10/2012 15:37:13 astro12  16
83497 0.60500 d3+3c_sl50 harre   r     02/10/2012 15:39:16 astro30  32
83498 0.60500 d15+3c_sl5 harre   r     02/10/2012 15:44:23 astro30  16
```

09.02.2012 `drd5_r256` last written to hdf5 file feb 09, 05:07
`fuenfincr256_2` last written to hdf5 file feb 06, 03:28
`drd5_r256_2` last written to hdf5 file feb 07, 00:50

02.02.2012 `drdx_h100_128_1` run has again severe consistency metric problem
→ not clear why
upper python script does not work, was commented out again
plan: **move to python scripts in general in order to have easier arithmetic calculations**
plan: create new folder structure and remove old simulations → done

31.01.2012 note: h=70.3 in galacticus xml input file is expected, consistent tree obviously implies it
→ fixed: changed in markus parameter file for the converter and in xml file
→ question: why not read out?
→ python updateGalacticusStart.py from Markus

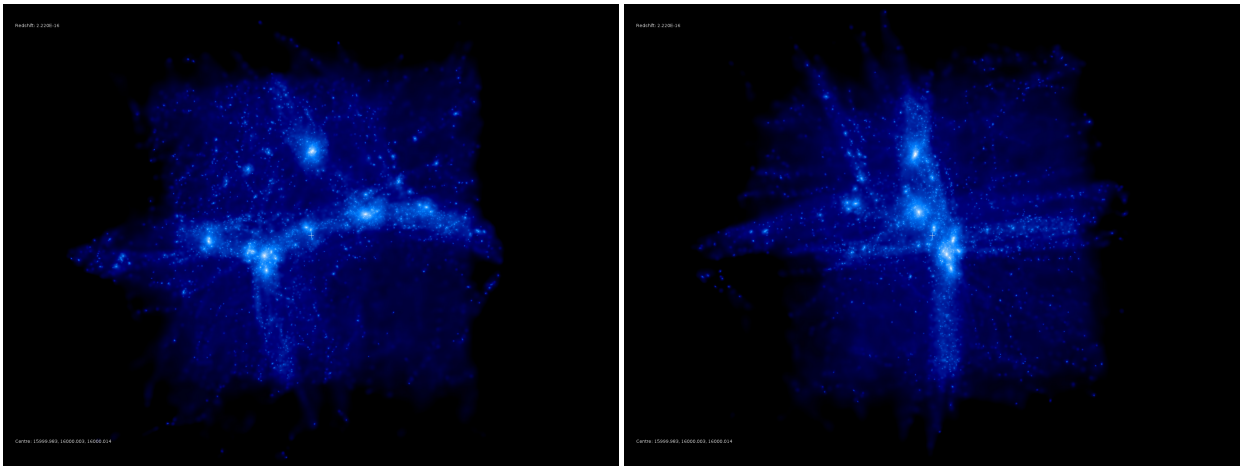
30.01.2012 new consistenttree with vmax=20

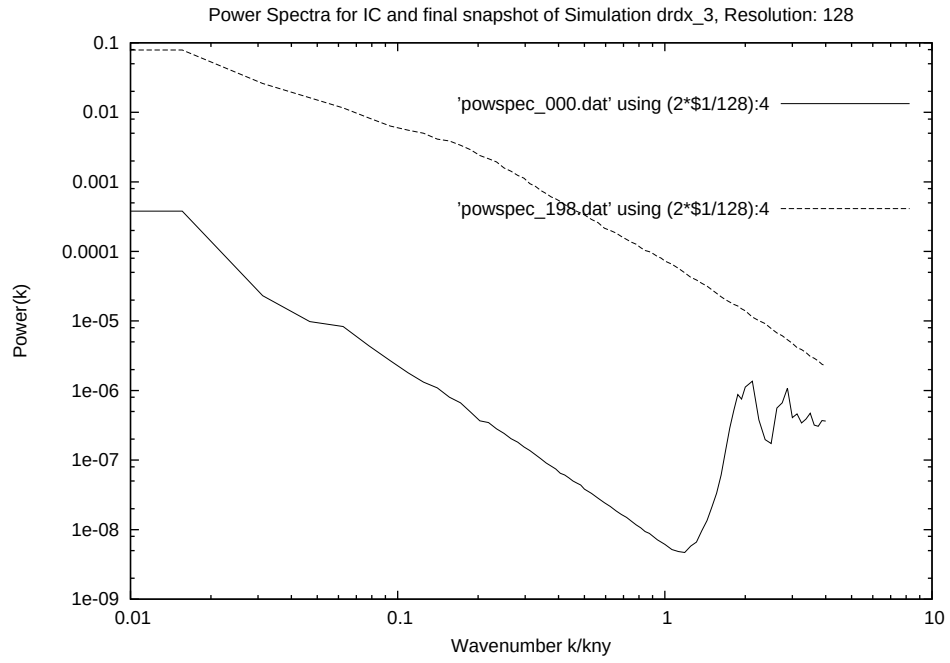
Chapter 2

Simulations

2.1 r128

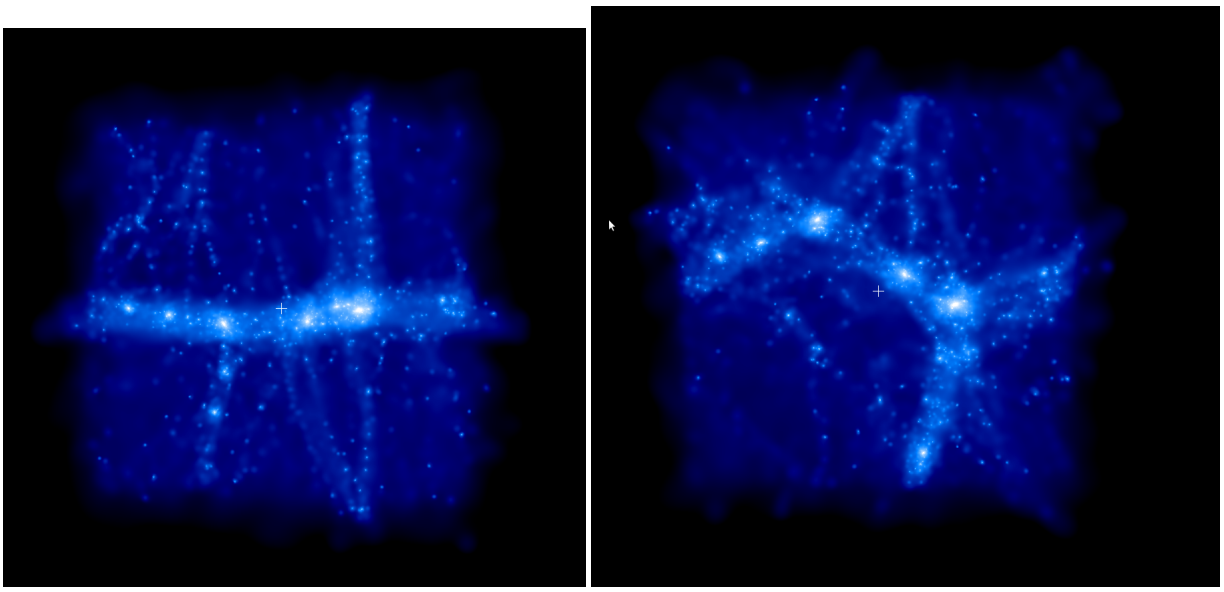
2.1.1 drdx_3

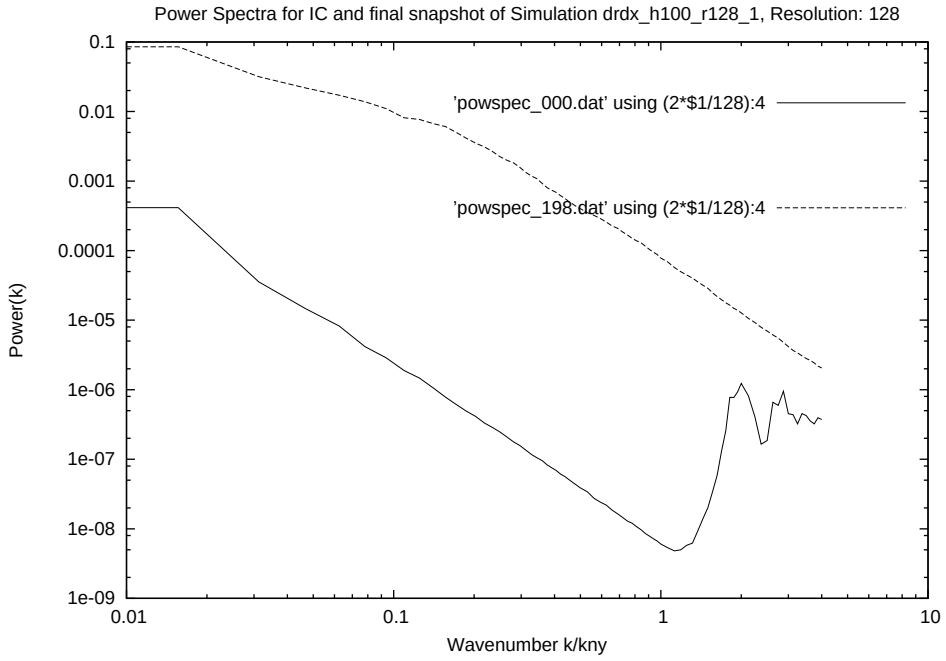




ROCKSTARRED $\surd$
pfff $\rightarrow$ Error: too few halos at scale factor 0.926072 to calculate consistency metric.

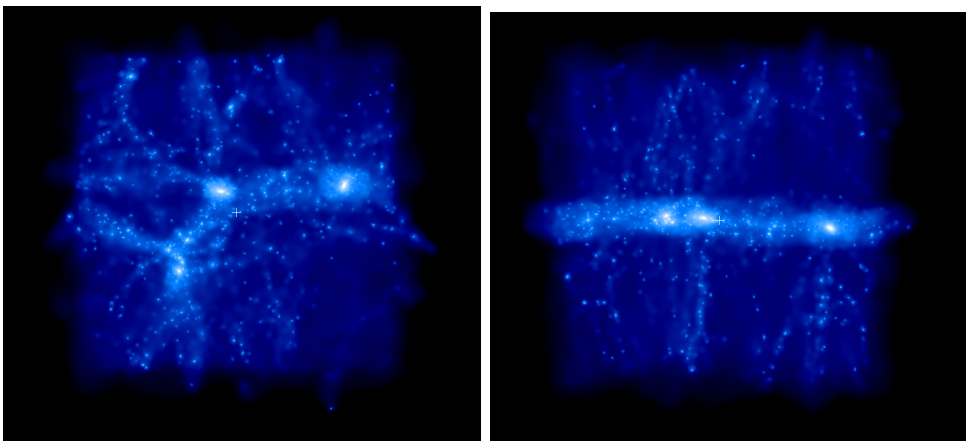
2.1.2 drdx_h100_r128_1

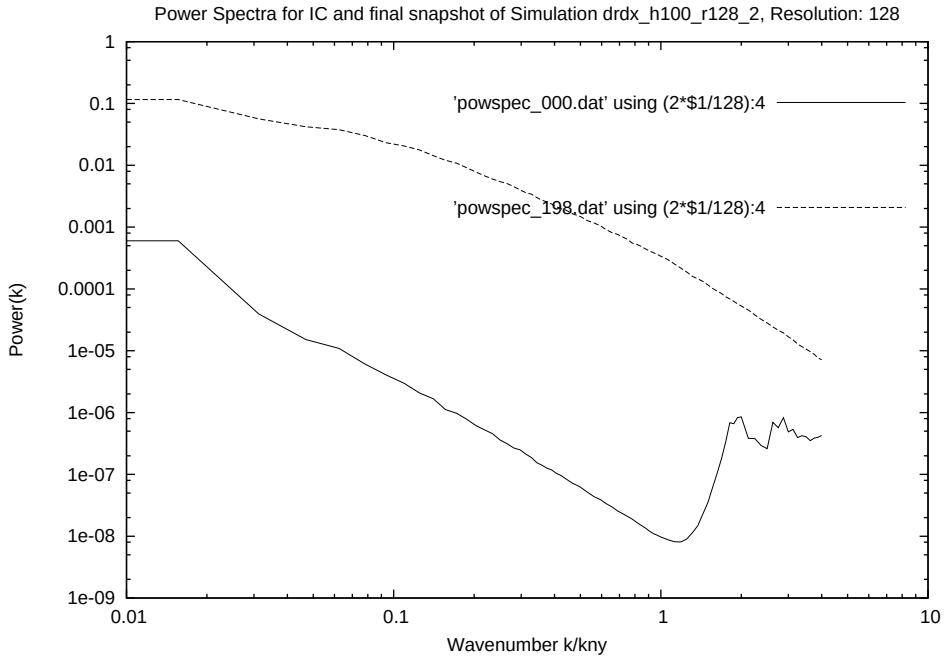




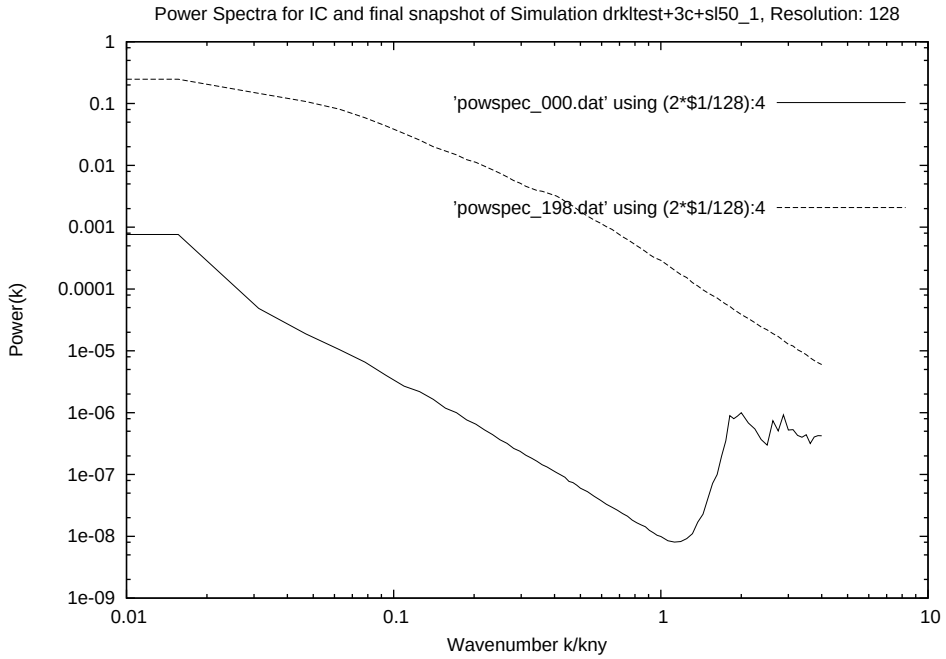
ROCKSTARRED $\surd$
consistenttree: too few halos at scale factor 0.896 ... $\rightarrow$ wtf?

2.1.3 drdx_h100_r128_2

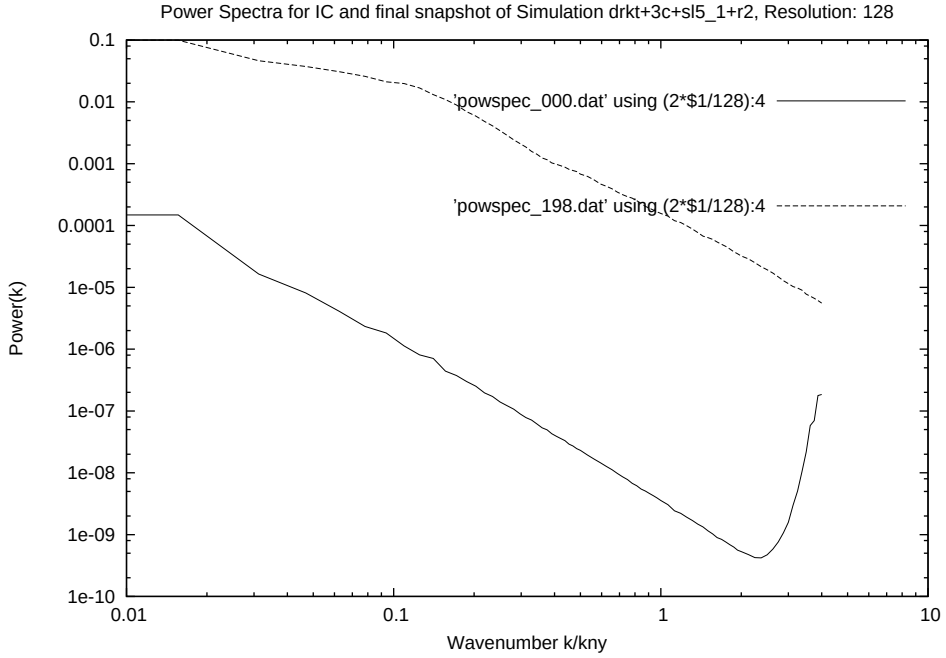


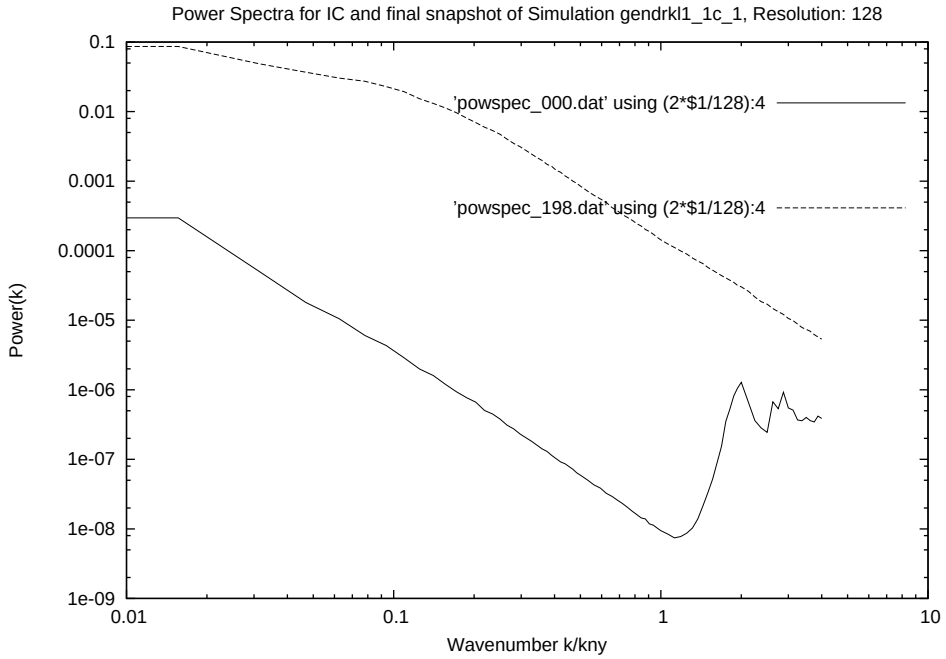


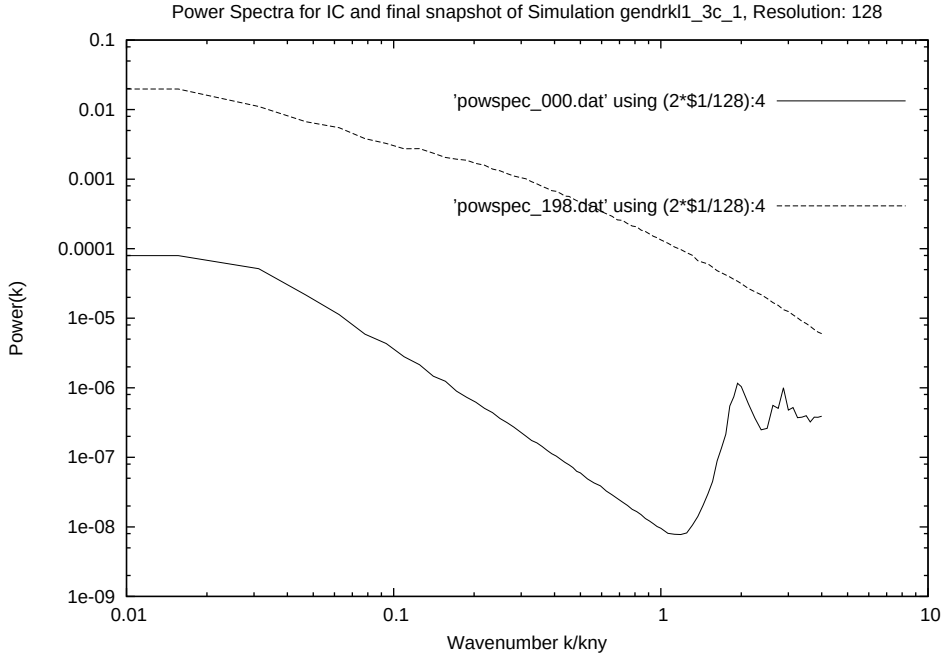
2.1.4 drkltest+3c+sl50_1




```
Error: too few halos at scale factor 0.890265 to calculate consistency metric.
Please remove this and all earlier timesteps from the scale file and rerun.
(DescScales.txt)
```


Power Spectra for IC and final snapshot of Simulation drkt+3c+sl5_1+r2, Resolution: 128
'powspec_000.dat' using (2*$1/128):4
'powspec_198.dat' using (2*$1/128):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
0.01
0.1
1
10

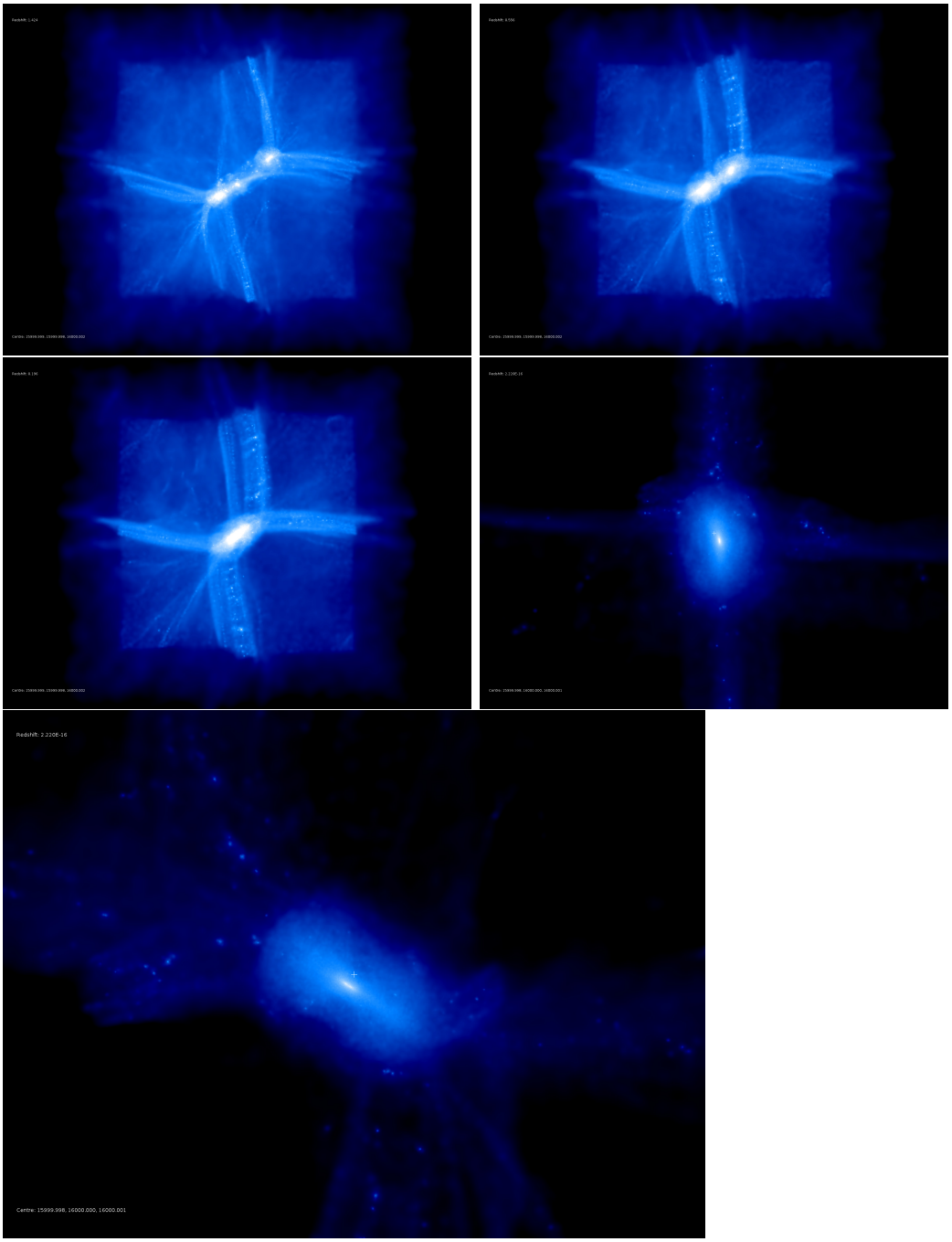

Power Spectra for IC and final snapshot of Simulation gendrkl1_1c_1, Resolution: 128
'powspec_000.dat' using (2*$1/128):4
'powspec_198.dat' using (2*$1/128):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
0.01
0.1
1
10

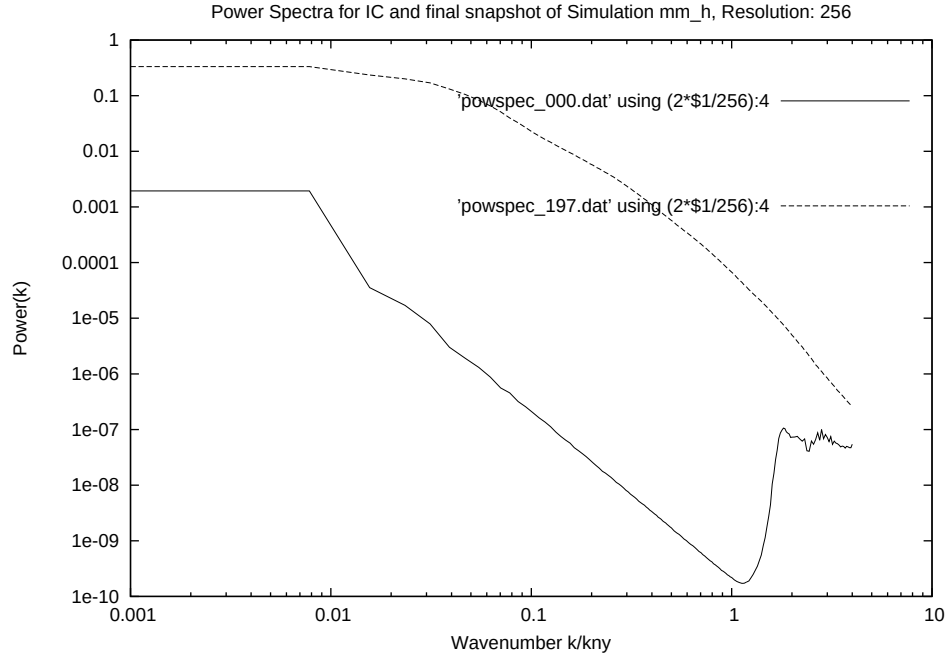

Power Spectra for IC and final snapshot of Simulation gendrkl1_3c_1, Resolution: 128
'powspec_000.dat' using (2*$1/128):4
'powspec_198.dat' using (2*$1/128):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
0.01
0.1
1
10

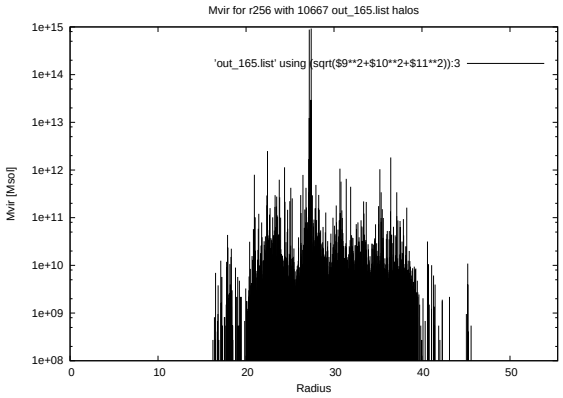
2.2 r256

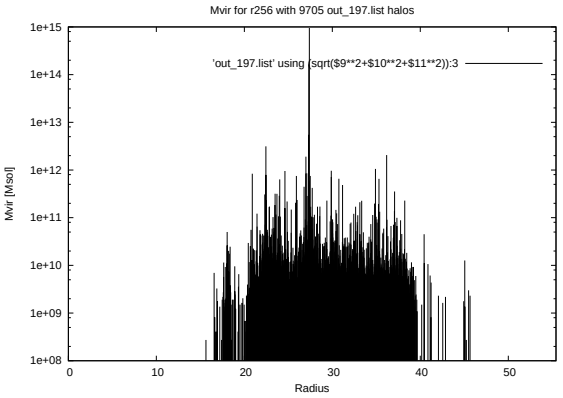
2.2.1 h70

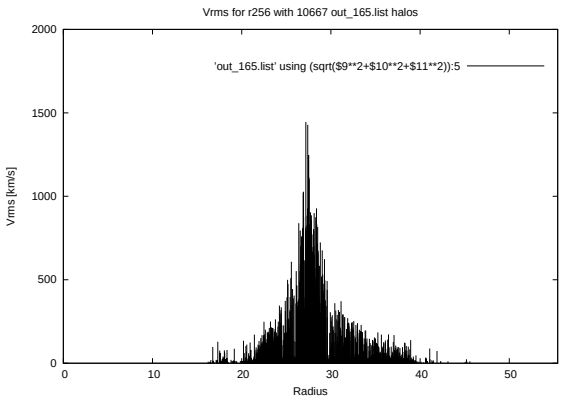
mm_h (major merger H comparison)

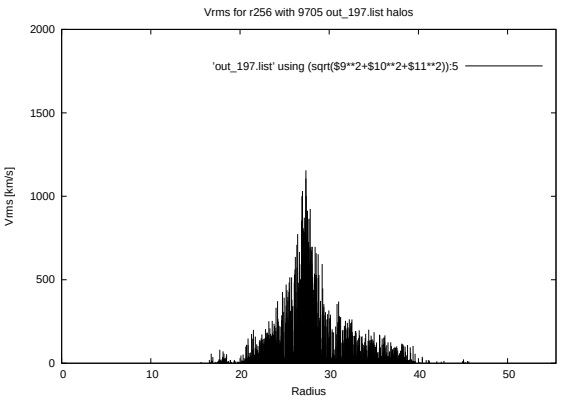








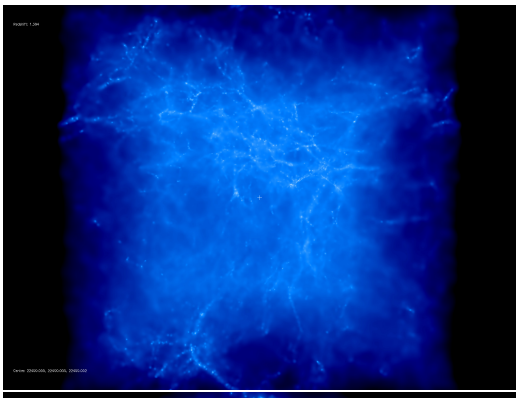


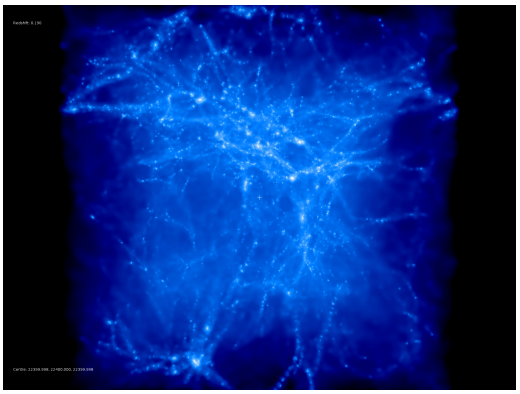


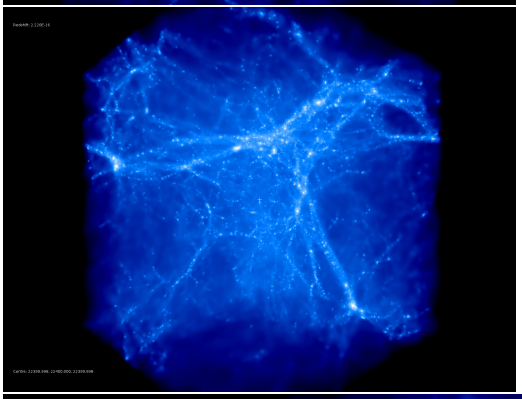
GALACTICUSSED $\surd$
CONSISTENTTREED $\surd$

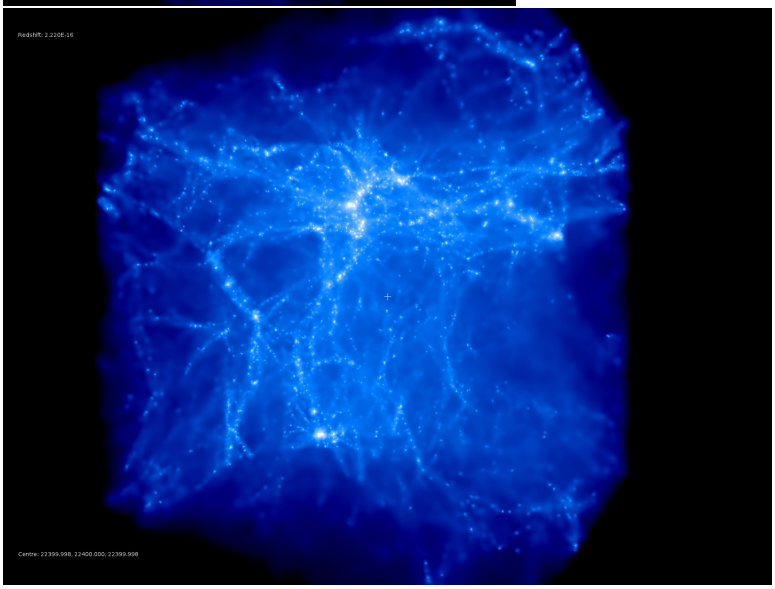
ROCKSTARRED $\surd$

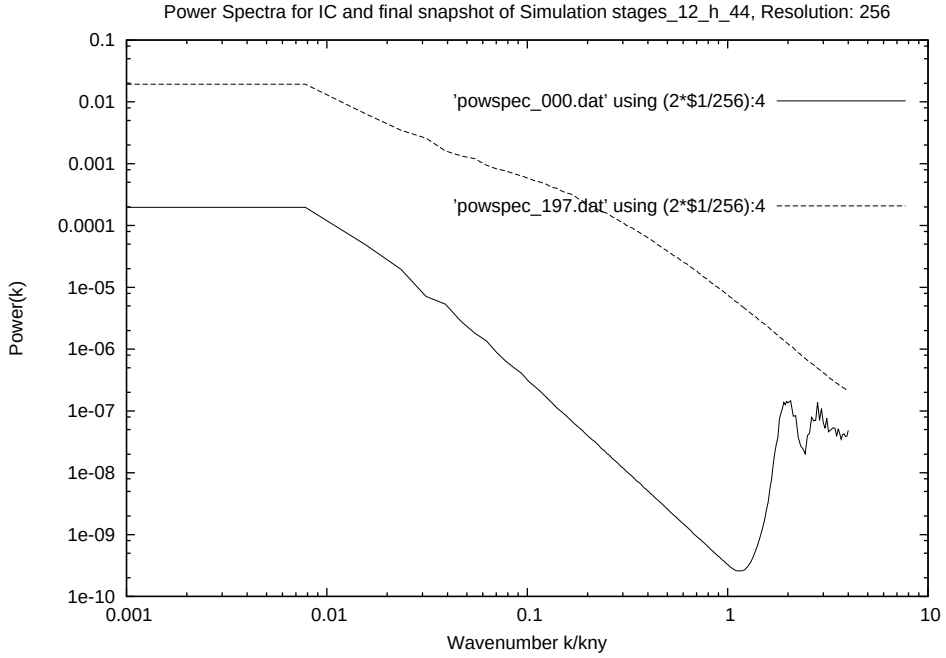
stages_12_h_44

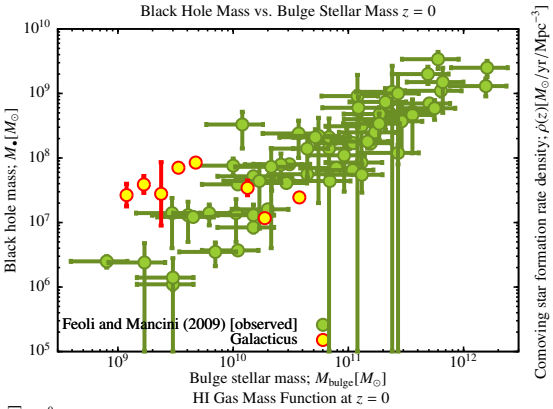


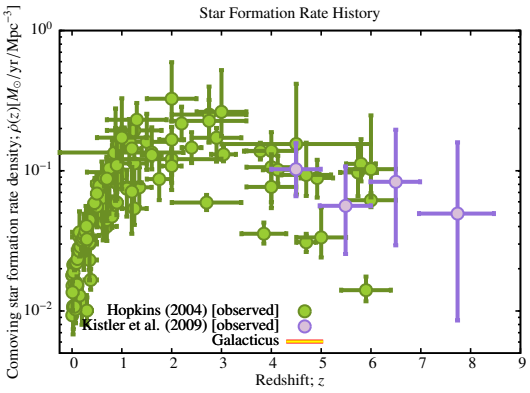


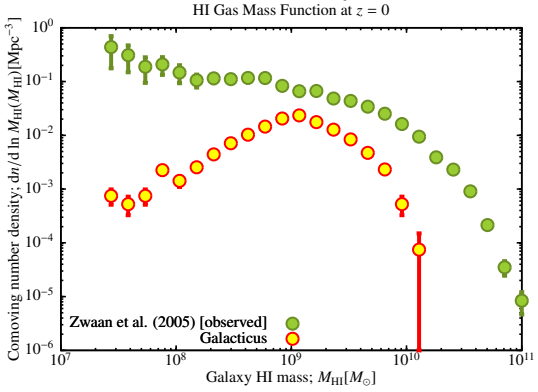





Power Spectra for IC and final snapshot of Simulation stages_12_h_44, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
0.001
0.01
0.1
1
10


Black Hole Mass vs. Bulge Stellar Mass $z = 0$
Black hole mass; $M_\bullet[M_\odot]$
Bulge stellar mass; $M_{\rm bulge}[M_\odot]$
Feoli and Mancini (2009) [observed]
Galacticus

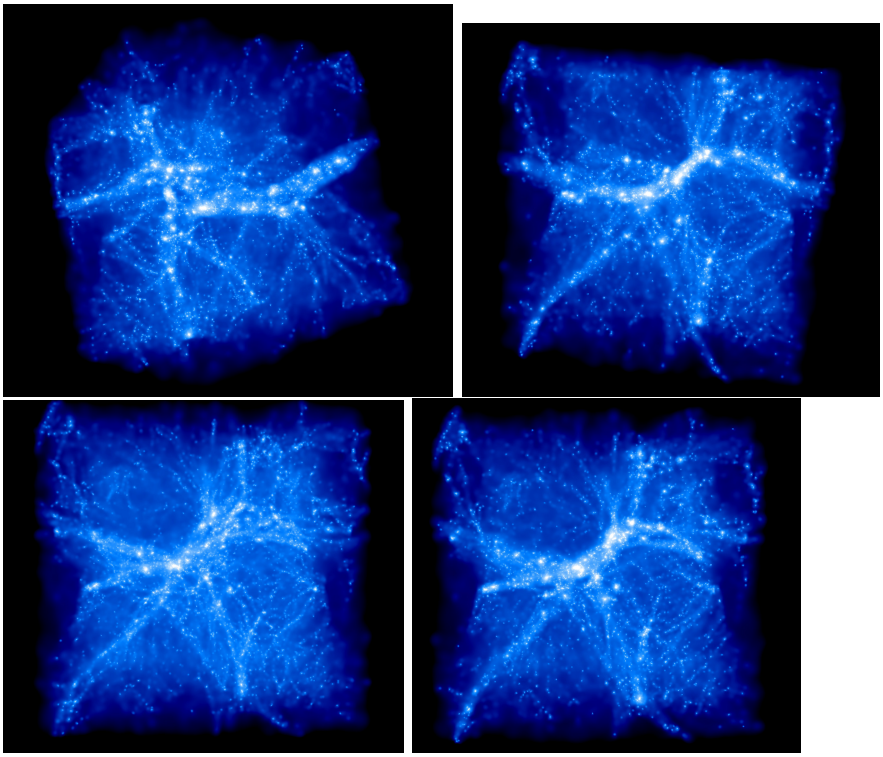

Star Formation Rate History
Comoving star formation rate density; $\dot\rho(z)[M_\odot/{\rm yr}/{\rm Mpc}^3]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus

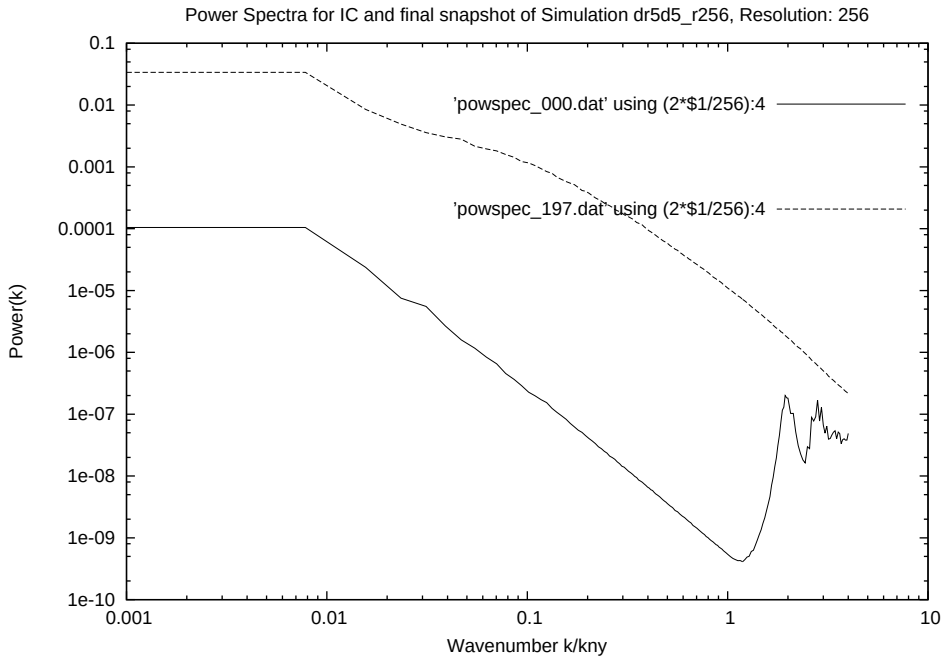

HI Gas Mass Function at $z = 0$
Comoving number density; $dn/(d\ln M_{\rm HI})[{\rm Mpc}^{-3}]$
Galaxy HI mass; $M_{\rm HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus

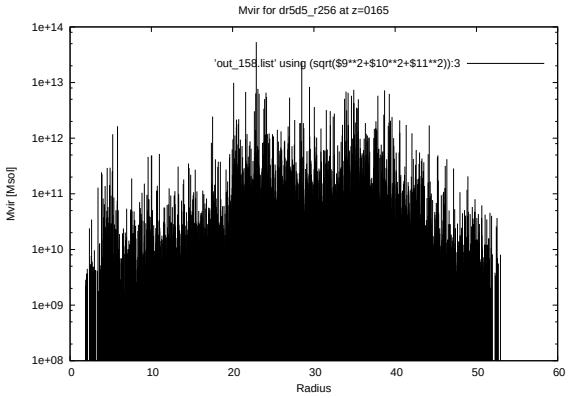
stages_20_h

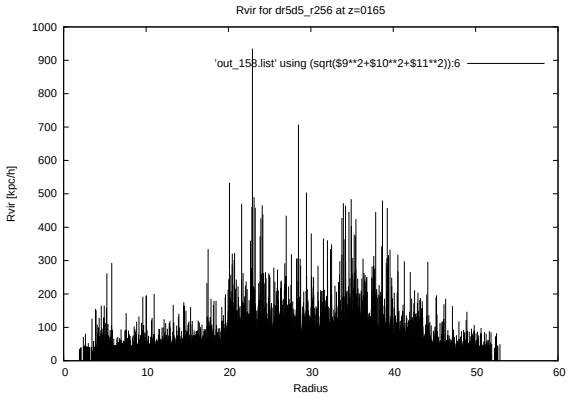
2.2.2 h100

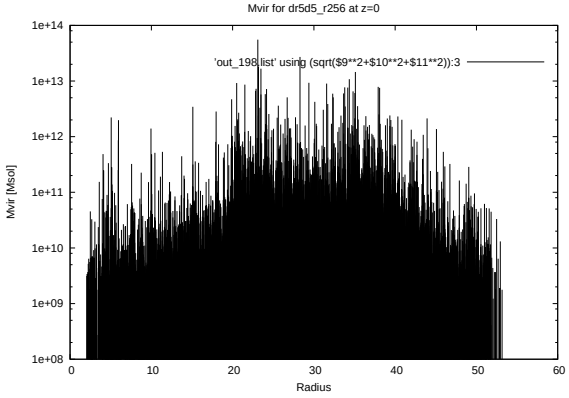
dr5d5_r256

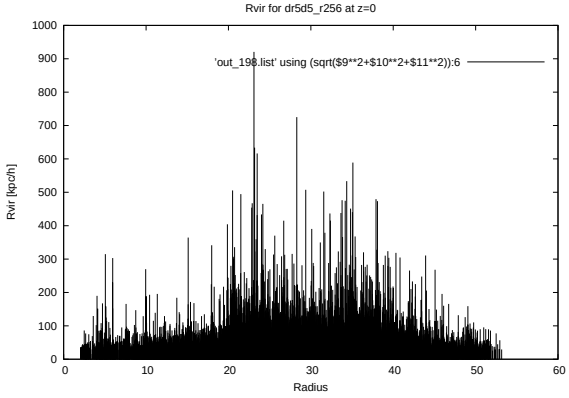


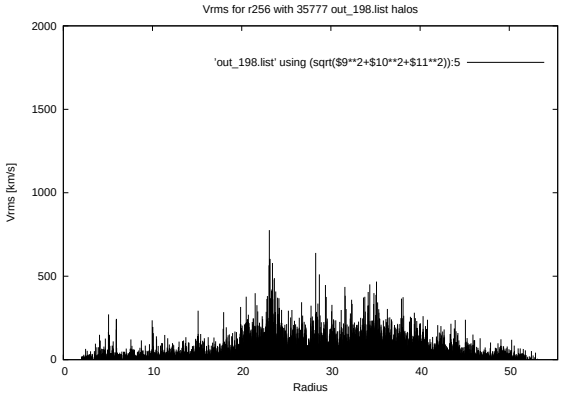


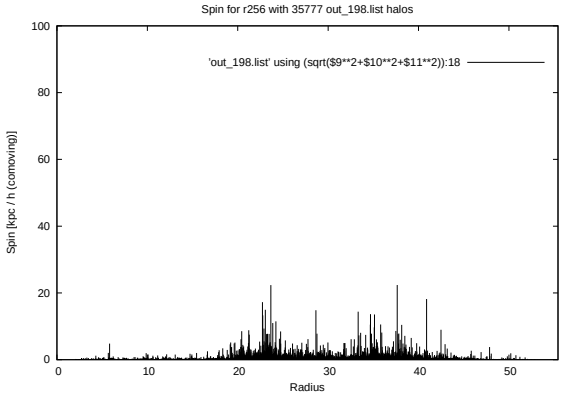










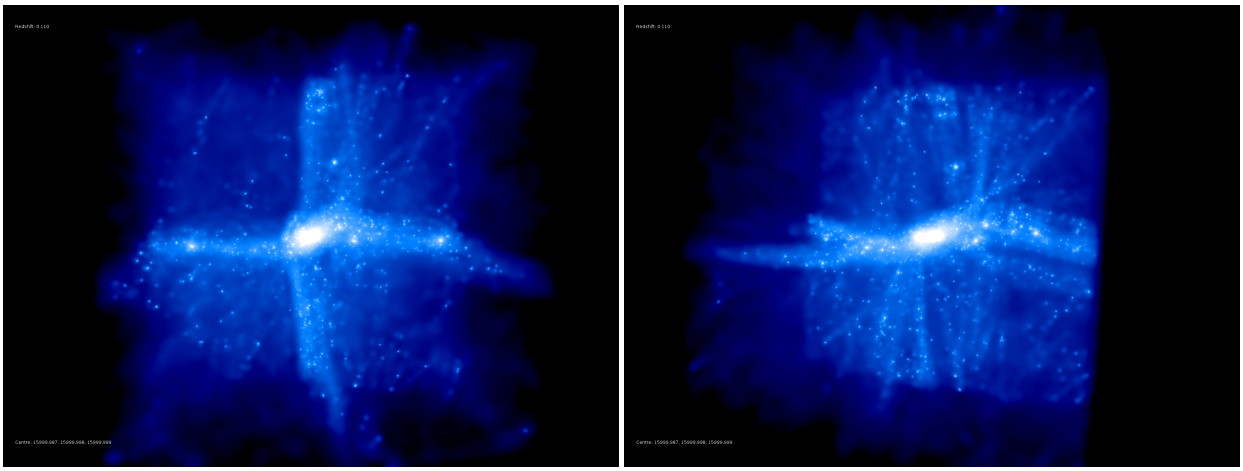


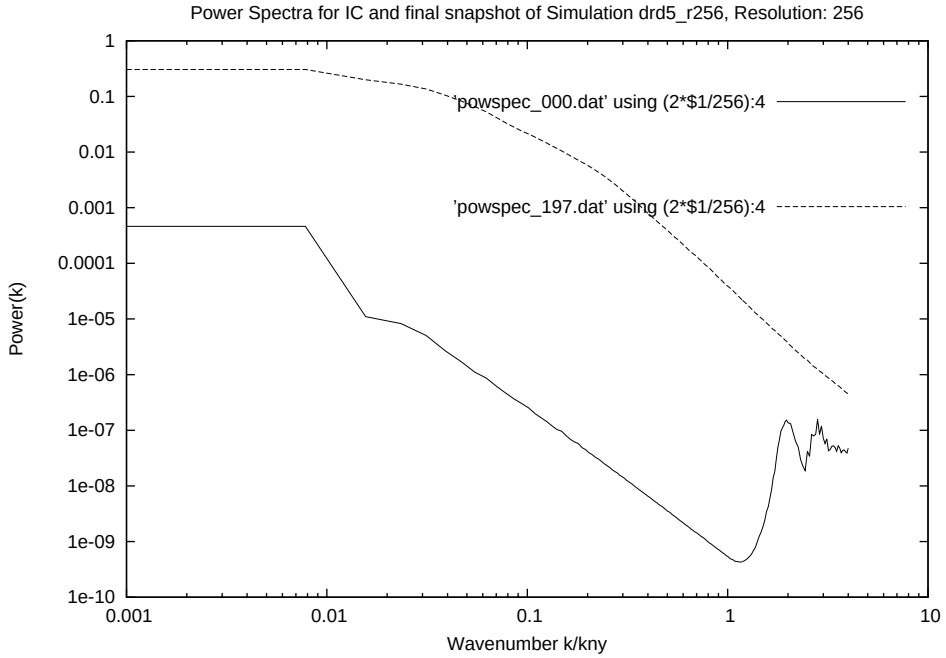
is being galacticussed
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$
$\rightarrow$ re-rockstar on AMD ...-03

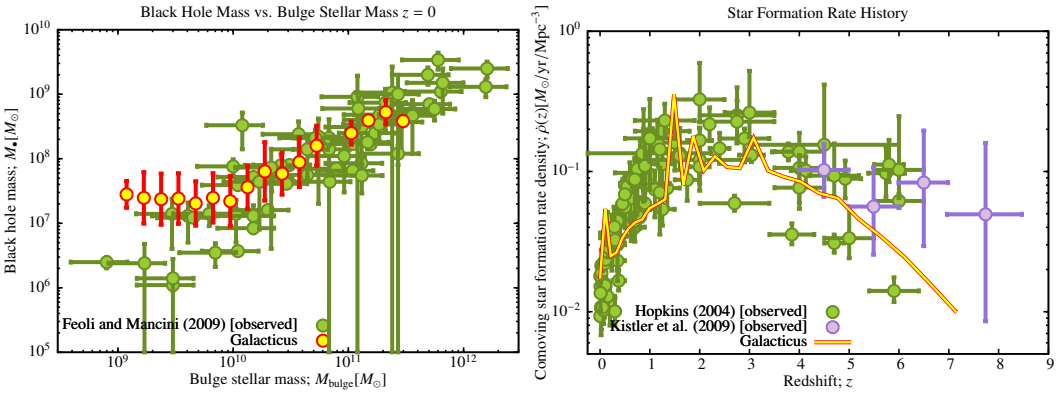
```
find_parents_and_cleanup.c:130:
lookup_new_id: Assertion 'new_id' failed.
```

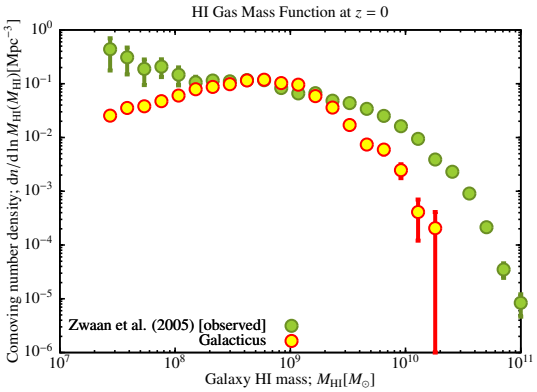
is being consistenttreed

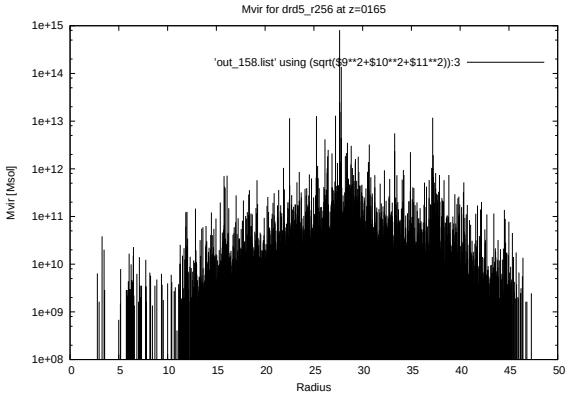
drd5_r256 (∼)

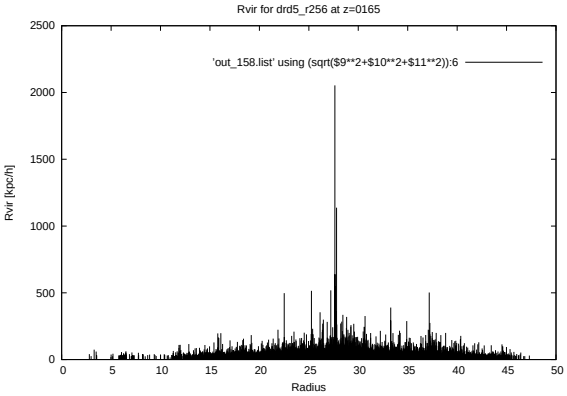


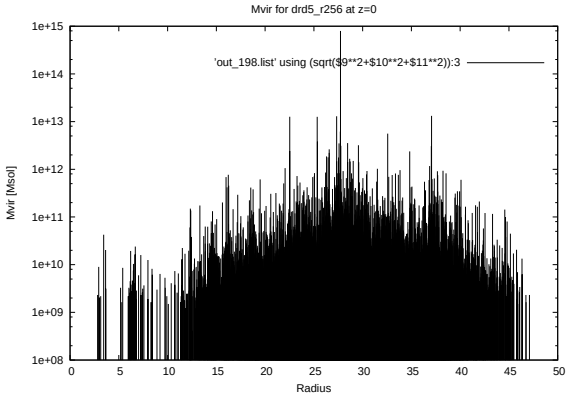

Power Spectra for IC and final snapshot of Simulation drd5_r256, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
1
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
0.001
0.01
0.1
1
10

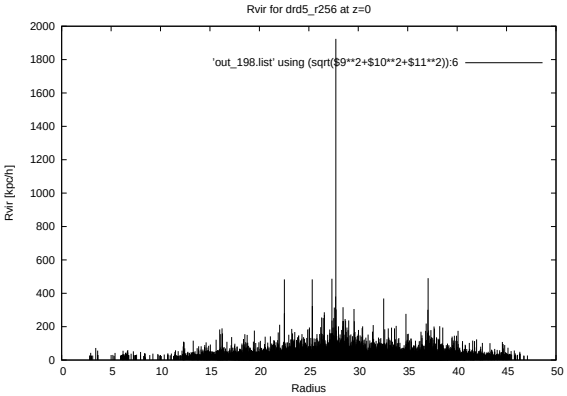

Black Hole Mass vs. Bulge Stellar Mass z = 0
Black hole mass; $M_\bullet[M_\odot]$
Bulge stellar mass; $M_{\rm bulge}[M_\odot]$
Feoli and Mancini (2009) [observed]
Galacticus
Star Formation Rate History
Comoving star formation rate density; $\dot{\rho}(z)[M_\odot/{\rm yr}/{\rm Mpc}^{-3}]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus

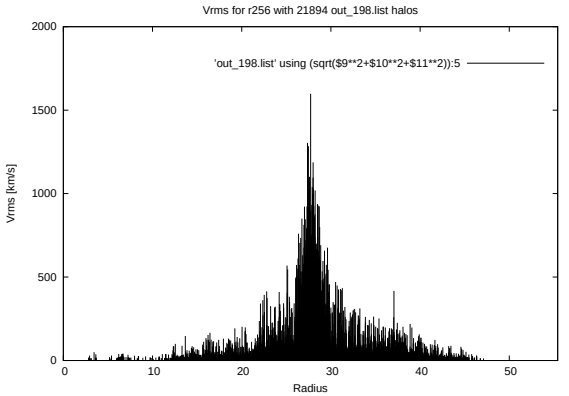

HI Gas Mass Function at $z = 0$
Comoving number density; $dn/d\ln M_{HI}(M_{HI})[Mpc^{-3}]$
Galaxy HI mass; $M_{HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus

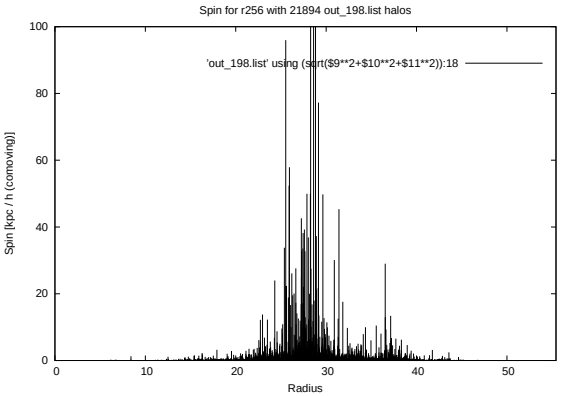

Mvir for drd5_r256 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for drd5_r256 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for drd5_r256 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for drd5_r256 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Vrms for r256 with 21894 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

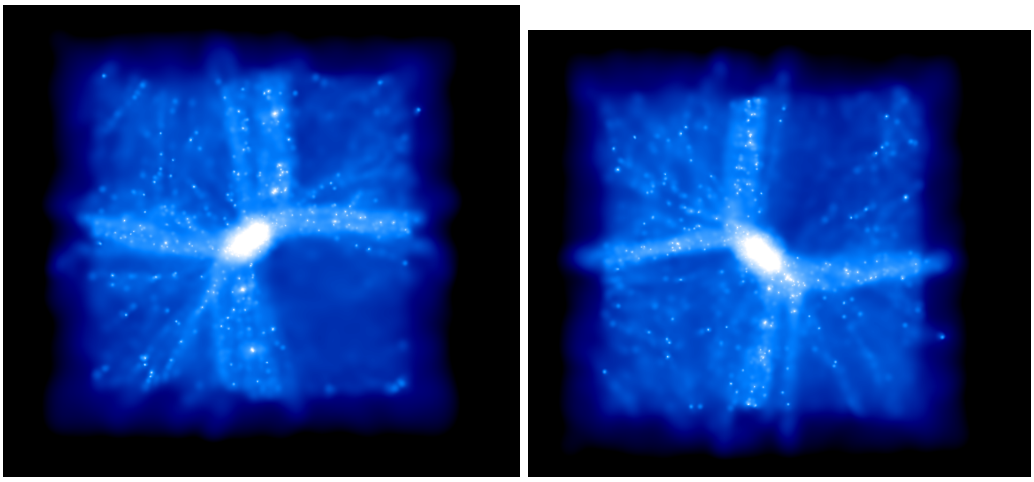

Spin for r256 with 21894 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

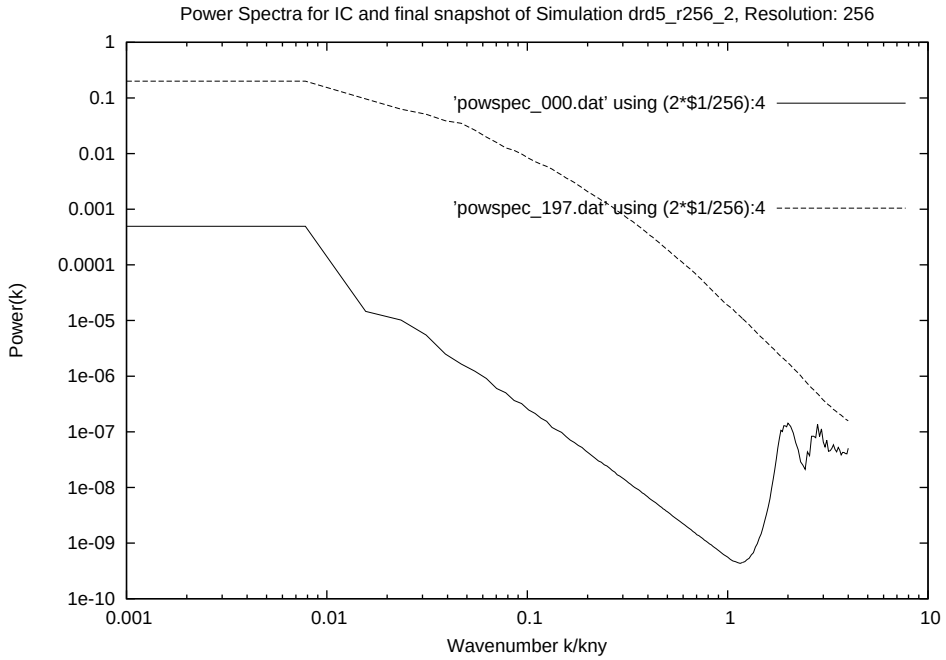
GALACTICUSSED $\surd$
galacticus running on SGE
$\rightarrow$ re-converted with bugfixed converter
tree copied to markus transfer
GALACTICUS:

```
Fatal error in Build_Descendent\_Pointers():
failed to find descendent node: 5546454 of 5522259
galacticus.sh: line 67: 25689 Aborted
```

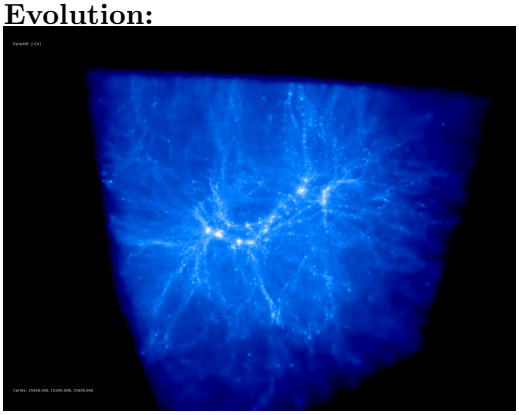
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

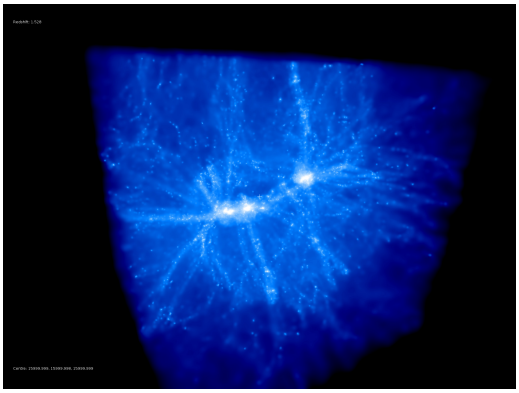
drd5_r256_2 (+ major merger in progress)

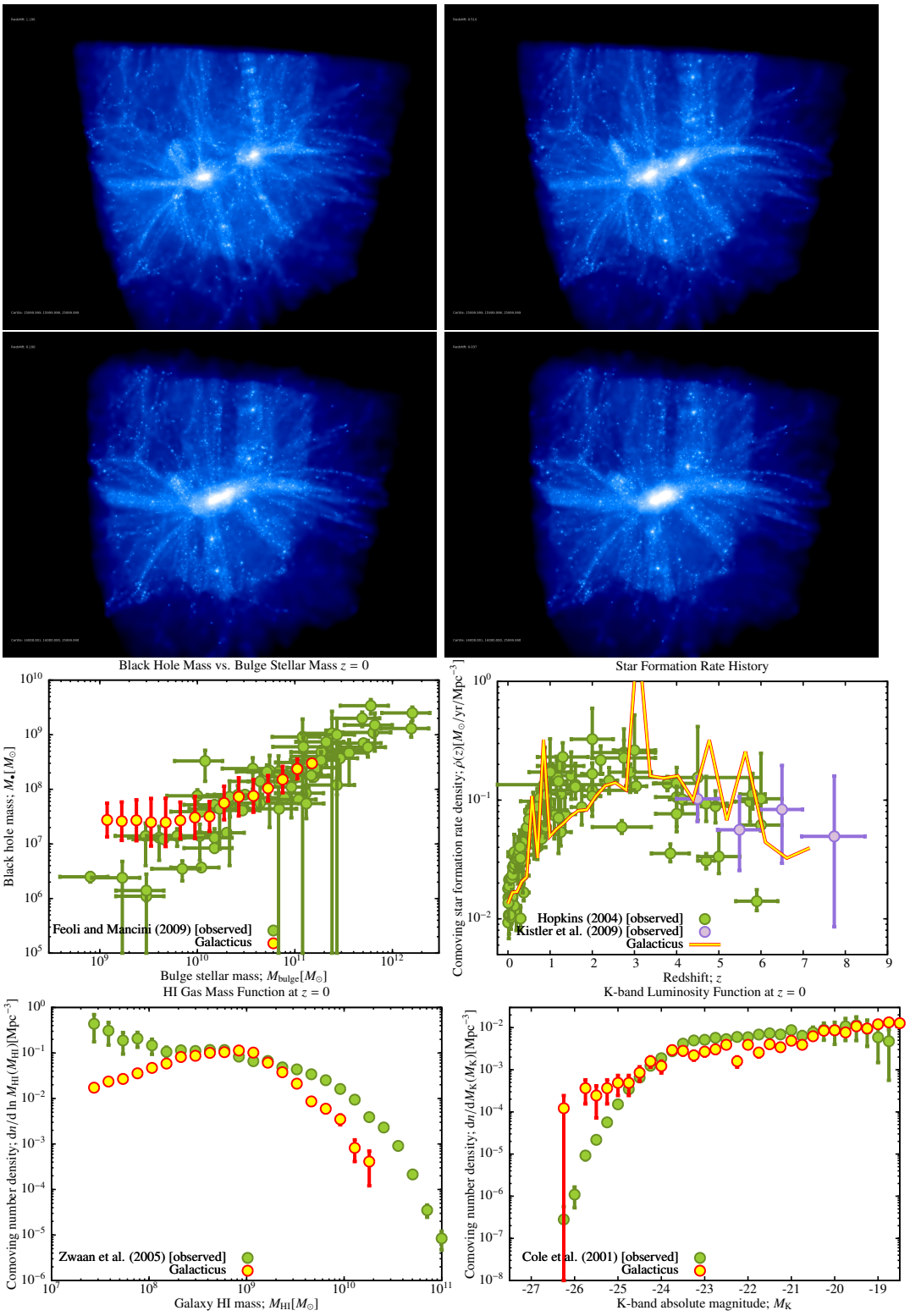


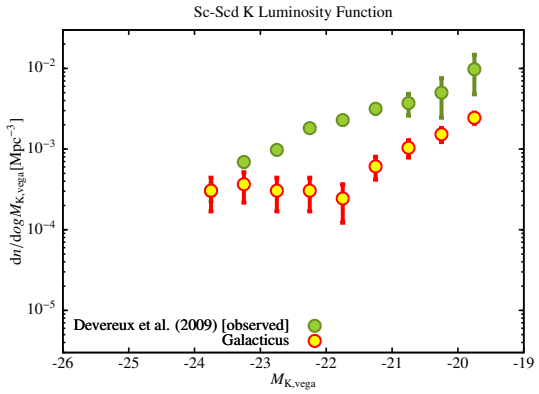


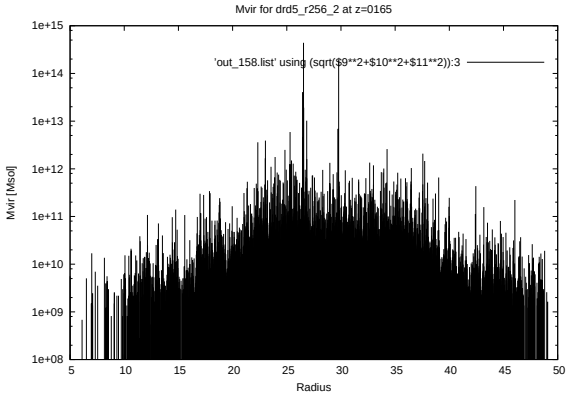
Evolution:

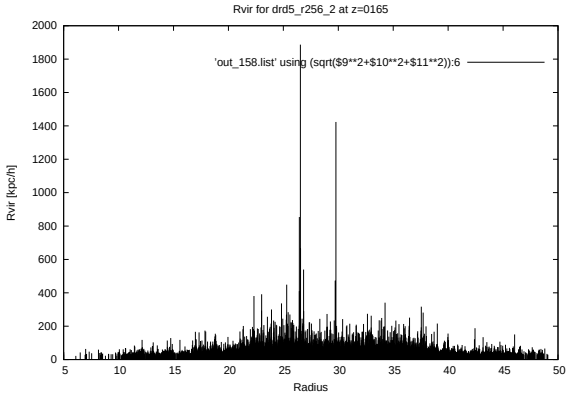


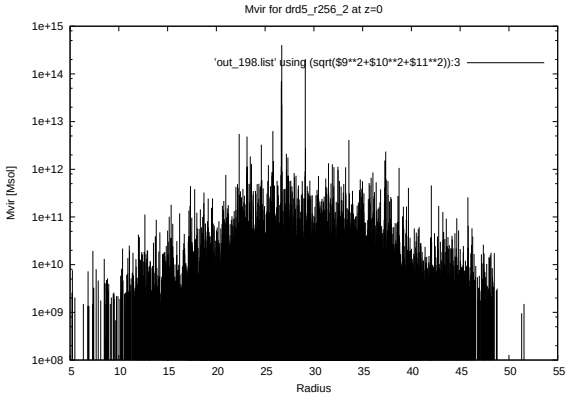


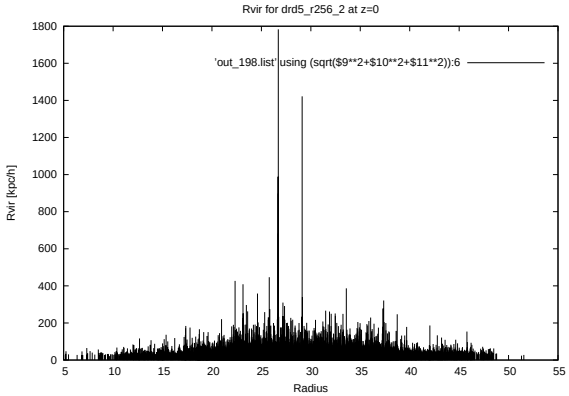

Black Hole Mass vs. Bulge Stellar Mass $z = 0$
Black hole mass; $M_\bullet[M_\odot]$
Bulge stellar mass; $M_{\rm bulge}[M_\odot]$
Feoli and Mancini (2009) [observed]
Galacticus
Star Formation Rate History
Comoving star formation rate density; $\dot{\rho}(z)[M_\odot/{\rm yr}/{\rm Mpc}^{-3}]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus
HI Gas Mass Function at $z = 0$
Comoving number density; $dn/d\ln M_{\rm HI}(M_{\rm HI})[{\rm Mpc}^{-3}]$
Galaxy HI mass; $M_{\rm HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus
K-band Luminosity Function at $z = 0$
Comoving number density; $dn/dM_K(M_K)[{\rm Mpc}^{-3}]$
K-band absolute magnitude; M_K
Cole et al. (2001) [observed]
Galacticus

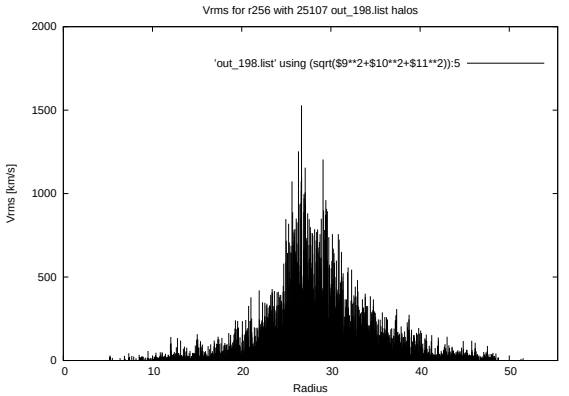

Sc-Scd K Luminosity Function
Devereux et al. (2009) [observed]
Galacticus
$M_{K,vega}$
$dn/d\log M_{K,vega}$ [Mpc^{-3}]

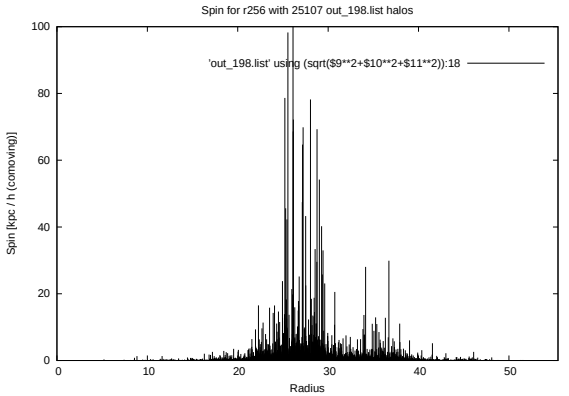

Mvir for drd5_r256_2 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for drd5_r256_2 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for drd5_r256_2 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for drd5_r256_2 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Vrms for r256 with 25107 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

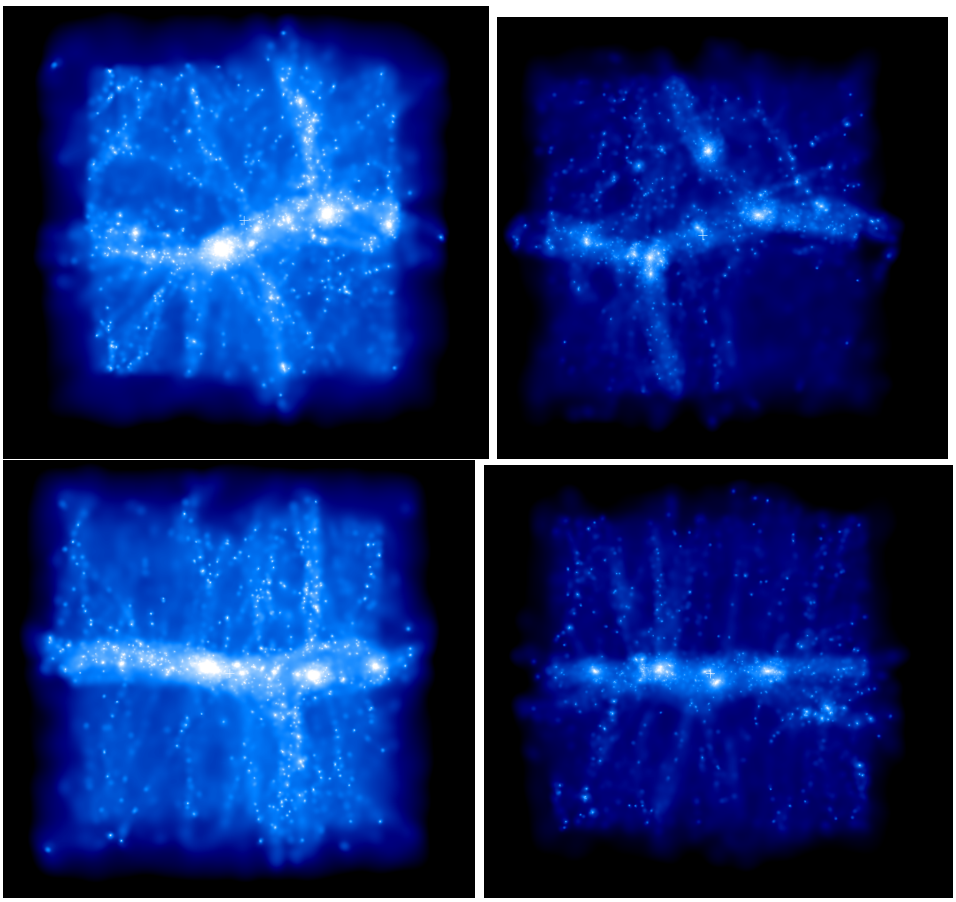

Spin for r256 with 25107 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

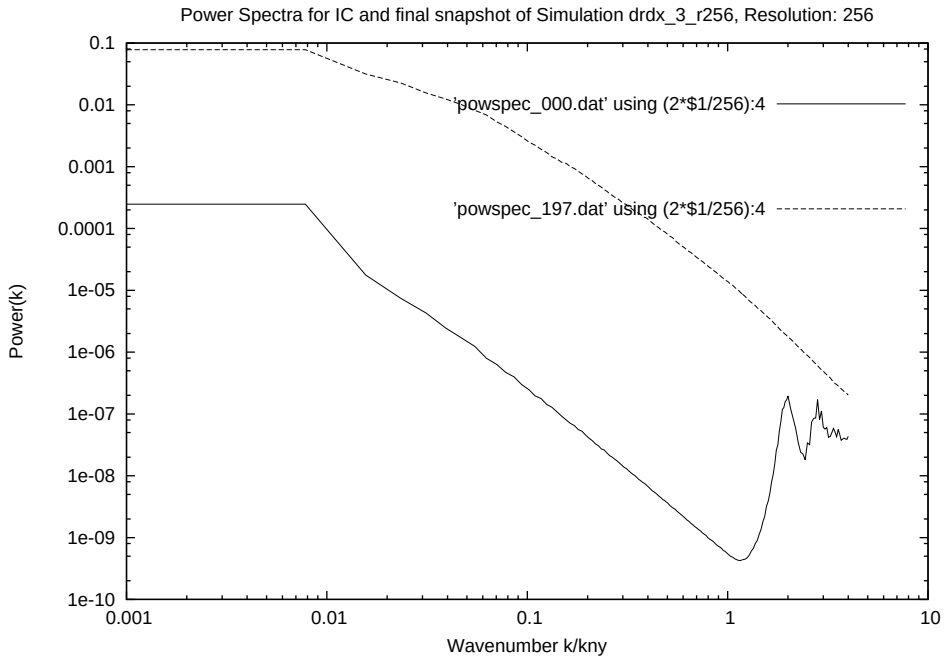
GALACTICUSSED $\surd$
→ fixed in revision 709
→ not fixed! E-Mail to Andrew
After fix in rev. 708 → is being re-galacticussed
→ DUMP IT ?
→ gadgetviewer: simulation has "artificial" cross galacticus running on SGE
→ re-converted with bugfixed converter (v0.3)
is being galacticussed → job seems to run!

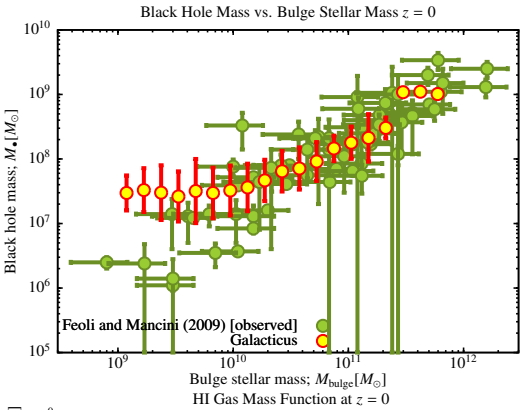
```
no: A fatal error occurred! Backtrace for this error:
#0  0x2B3F2E65E897
#1  0x2B3F2E65EE4E
#2  0x301763648F
#3  0x487AA0 in __merger_tree_read_MOD_build_descendent_pointers
#4  0x48ADC3 in __merger_tree_read_MOD_merger_tree_read_do
#5  0x48205E in __merger_tree_construction_MOD_merger_tree_create
#6  0x46F469 in __galacticus_tasks_evolve_tree_MOD_galacticus_task_evolve_tree._omp_fn.0
.F90:0
#7  0x46F9C4 in __galacticus_tasks_evolve_tree_MOD_galacticus_task_evolve_tree
#8  0x46FA4F in __galacticus_tasks_MOD_galacticus_task_do
#9  0x4600E4 in MAIN__ at Galacticus.F90:0
```

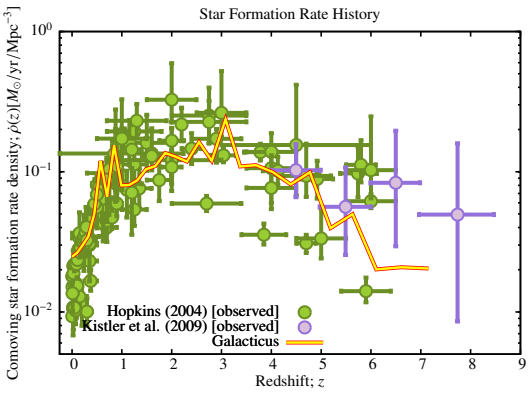
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$ (lasted about 9000minutes)

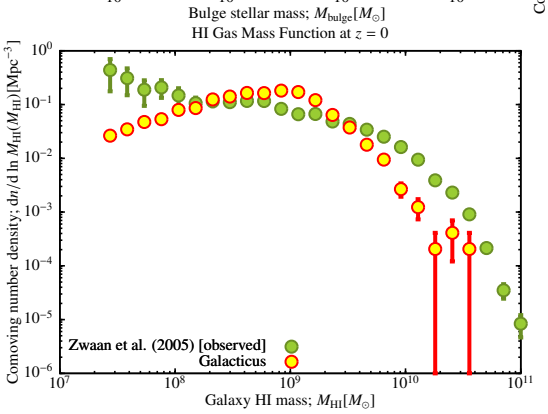
drdx_3_r256

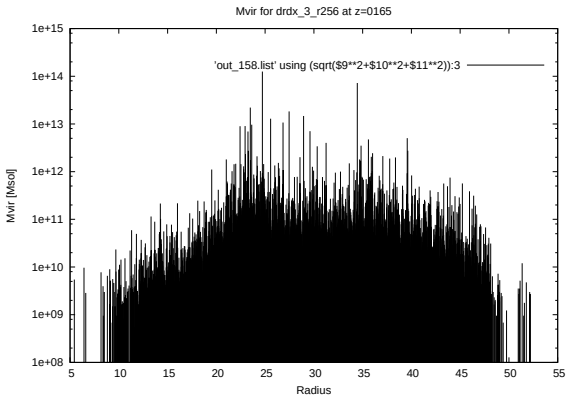


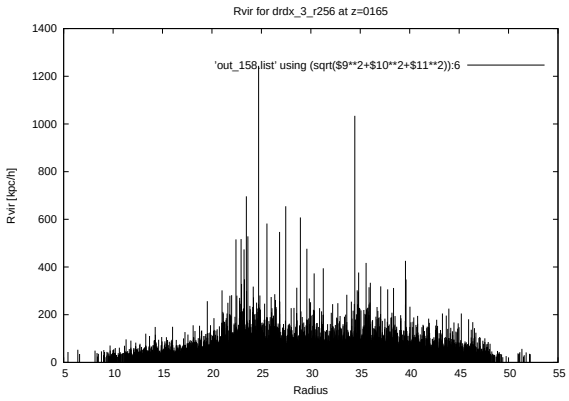

Power Spectra for IC and final snapshot of Simulation drdx_3_r256, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
0.001
0.01
0.1
1
10

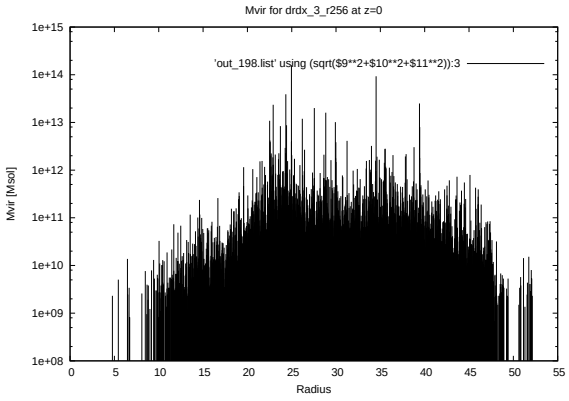

Black Hole Mass vs. Bulge Stellar Mass $z = 0$
Black hole mass; $M_\bullet[M_\odot]$
Bulge stellar mass; $M_{\rm bulge}[M_\odot]$
Feoli and Mancini (2009) [observed]
Galacticus

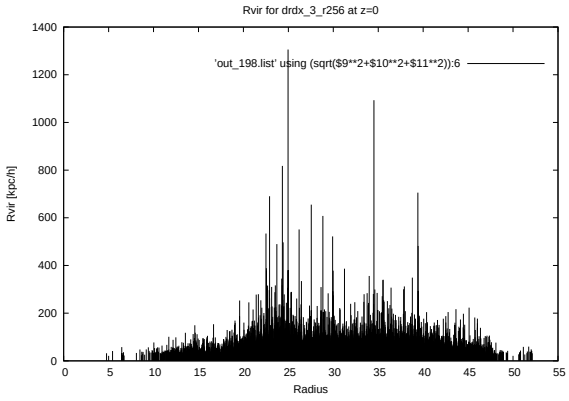

Star Formation Rate History
Comoving star formation rate density; $\dot{\rho}(z)[M_\odot/{\rm yr}/{\rm Mpc}^{-3}]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus

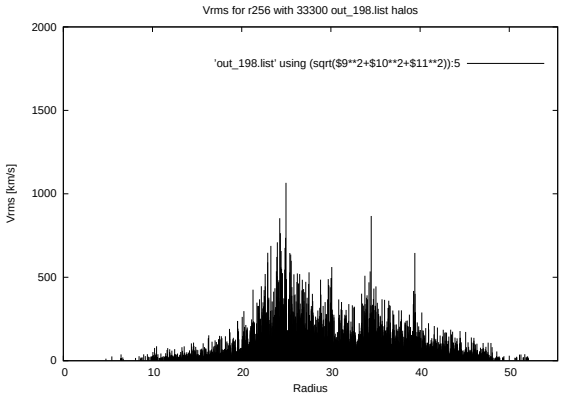

HI Gas Mass Function at $z = 0$
Comoving number density; $dn/d\ln M_{\rm HI}(M_{\rm HI})[{\rm Mpc}^{-3}]$
Galaxy HI mass; $M_{\rm HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus

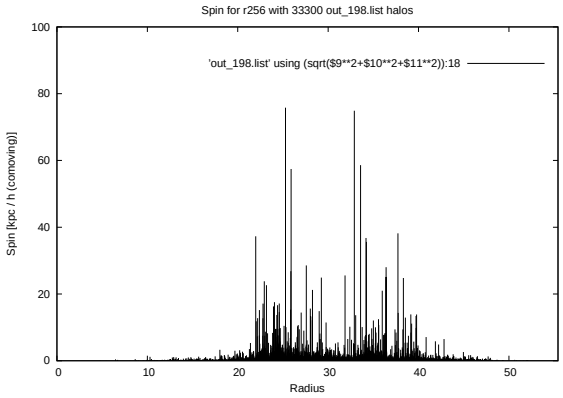

Mvir for drdx_3_r256 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for drdx_3_r256 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for drdx_3_r256 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for drdx_3_r256 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius





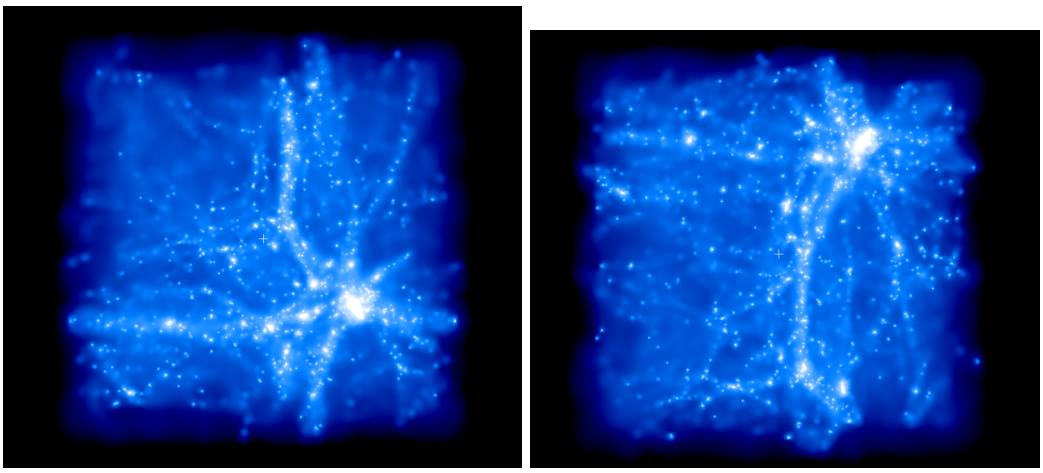
GALACTICUSSED $\surd$
$\rightarrow$ fixed in revision 709

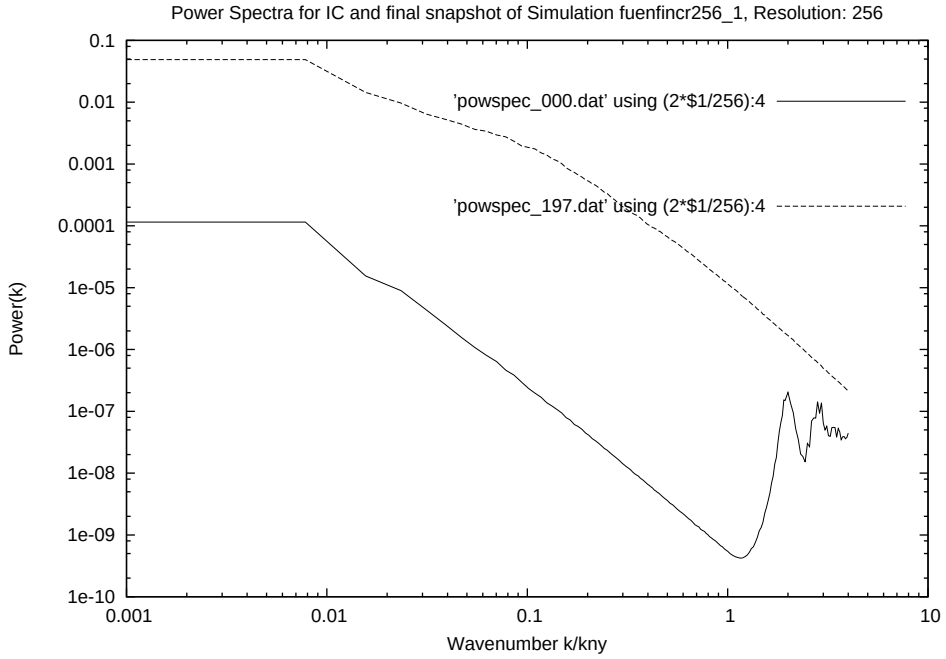
GALACTICUS REV708:

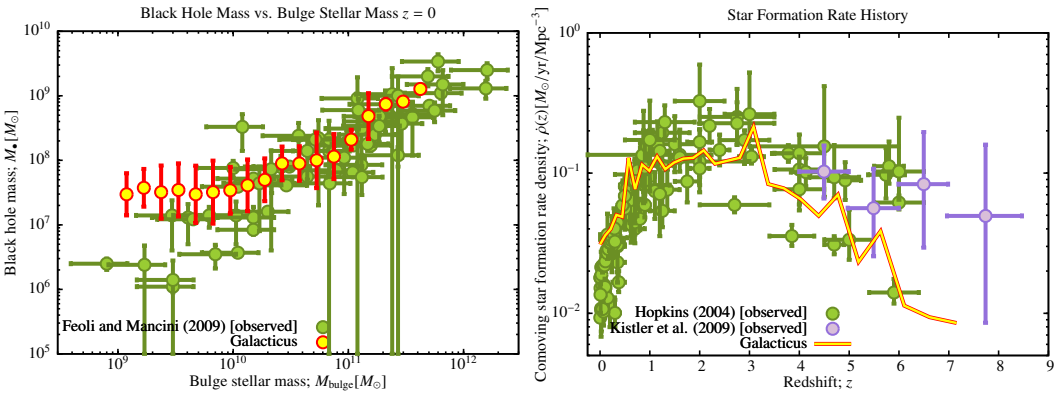
```
#4  0x301763648F
#5  0x49B1B8 in __merger_tree_read_MOD_build_descendent_pointers at merger_trees.construc
#6  0x49FF70 in __merger_tree_read_MOD_merger_tree_read_do at merger_trees.construct.read
#7  0x4923BE in __merger_tree_construction_MOD_merger_tree_create at merger_trees.constru
#8  0x4800C6 in __galacticus_tasks_evolve_tree_MOD_galacticus_task_evolve_tree._omp_fn.0
#9  0x2AC099B4F829
#10  0x3017A07CD0
#11  0x30176DFD3C
#12  0xFFFFFFFFFFFFFFFF
/sge-root/sge/AMD64/spool/astro13/job_scripts/83594: line 22: 13318 Aborted
```

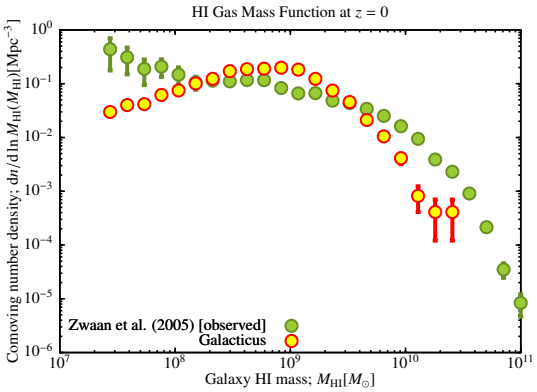
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$
is being rockstarred on `astro-x4600-03`
This run is a test if r256 and r128 (`drdx_3`) are comparable $\rightarrow$ see pictures.

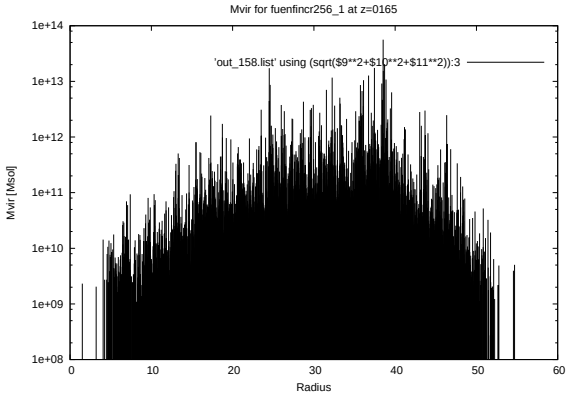
fuenfincr256_1

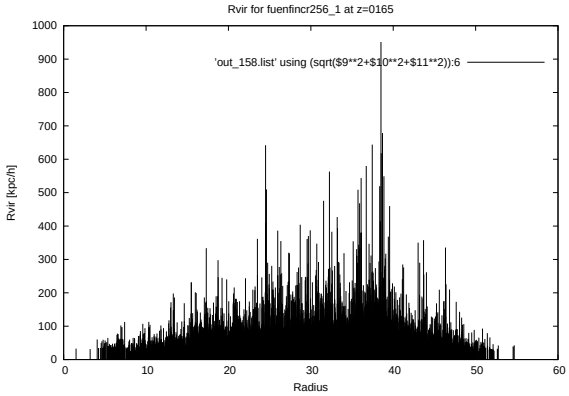


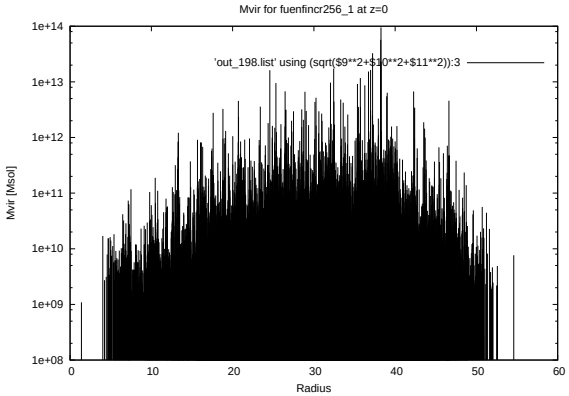


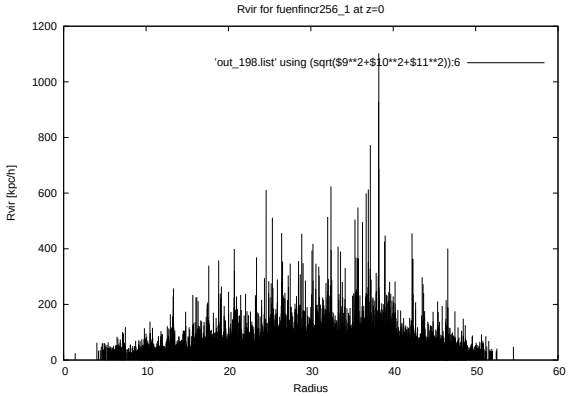


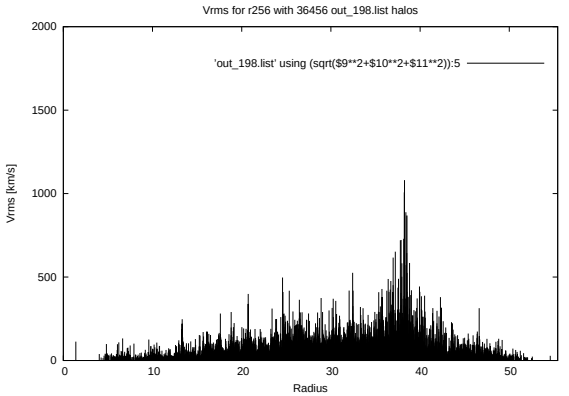

HI Gas Mass Function at $z = 0$
Comoving number density; $dn/d\ln M_{HI}(M_{HI})[Mpc^{-3}]$
Galaxy HI mass; $M_{HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus

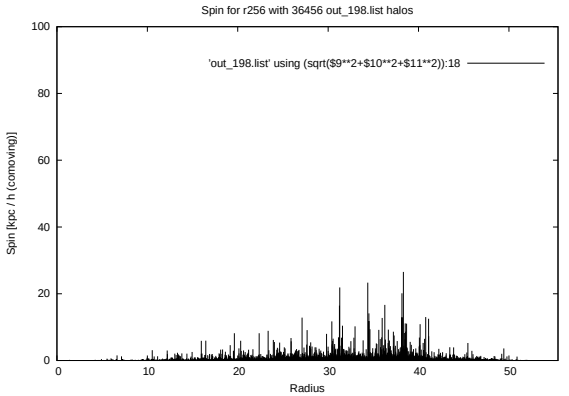

Mvir for fuenfincr256_1 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for fuenfincr256_1 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for fuenfincr256_1 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for fuenfincr256_1 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Vrms for r256 with 36456 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius


Spin for r256 with 36456 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

GALACTICUSSED $\surd$
→ re-galacticussing with rev708
GALACTICUS: rev707 exited without error but not finished
GALACTICUSSED $\surd$ BUT:

```
[3:46:48 PM CEST] Markus Haider: der fuenfincr256_1 hat a problem
[3:46:52 PM CEST] Markus Haider: der hat keine output gruppe
[3:46:58 PM CEST] Markus Haider: also keinen output
[3:47:30 PM CEST] Markus Haider: btw schon einen output
[3:47:34 PM CEST] Markus Haider: aber es scheint was zu fehlen
```

→ E-Mail to Andrew
→ re-converted with bugfixed converter

```
 Running model.......
  Reading data for metallicity log10(Z/Z_Solar) = 0.198
   Found 188 ages in the file
  Found 1963 wavelengths in the file
gsl: ../../../../roots/brent.c:57: ERROR: function value is not finite
Default GSL error handler invoked.
```

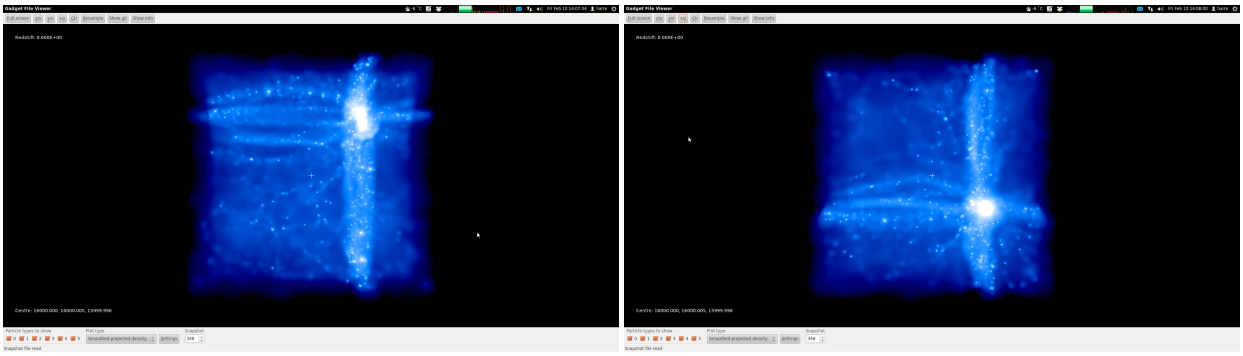
tree copied to markus transfer

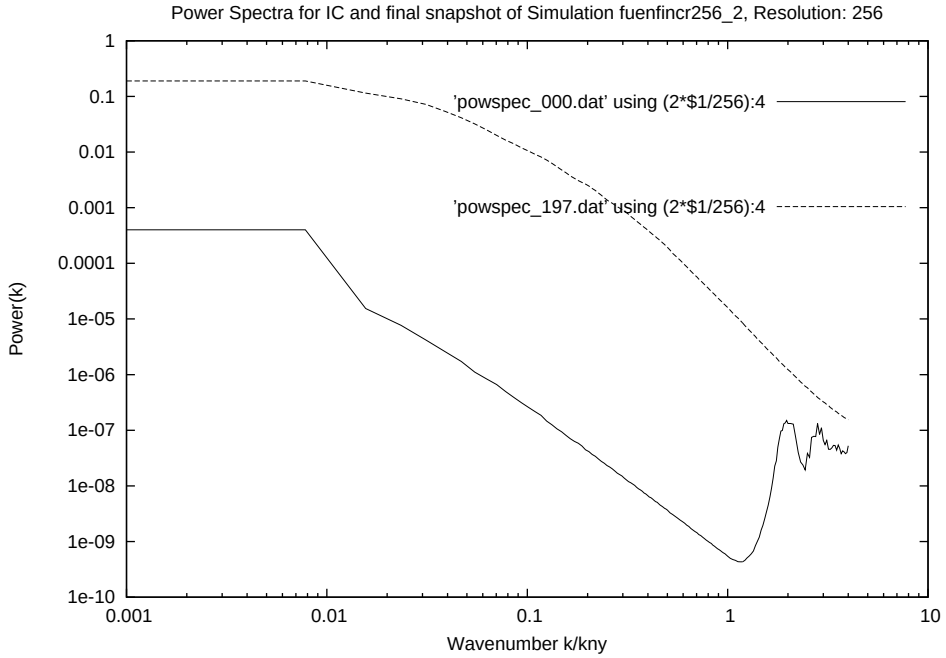
GALACTICUS:

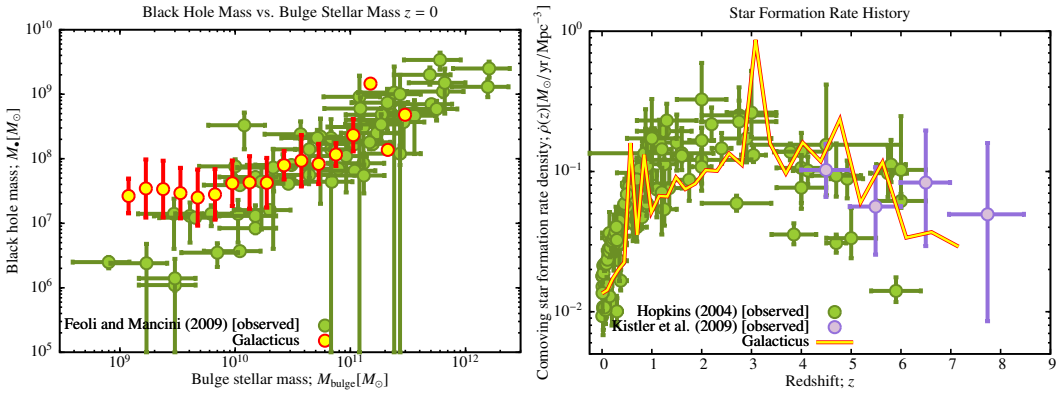
```
Fatal error in Build_Descendent_Pointers():
failed to find descendent node: 12048576 of 12014628
galacticus.sh: line 67:  5751 Aborted
```

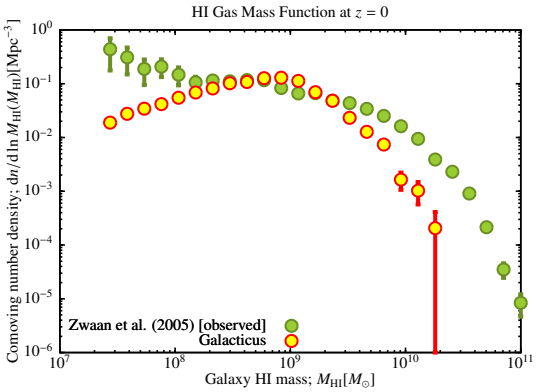
ROCKSTARRED $\surd$
CONSISTENTTREED $\surd$

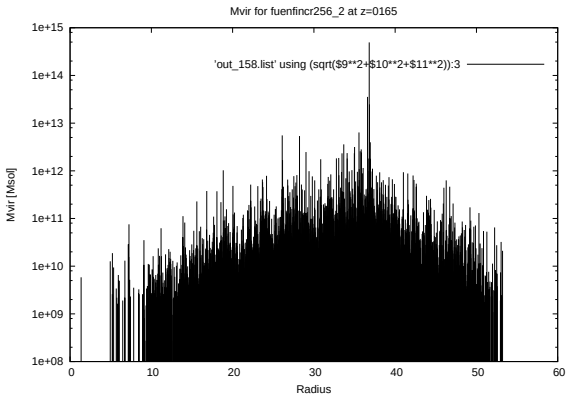
fuenfincr256_2 → dump!

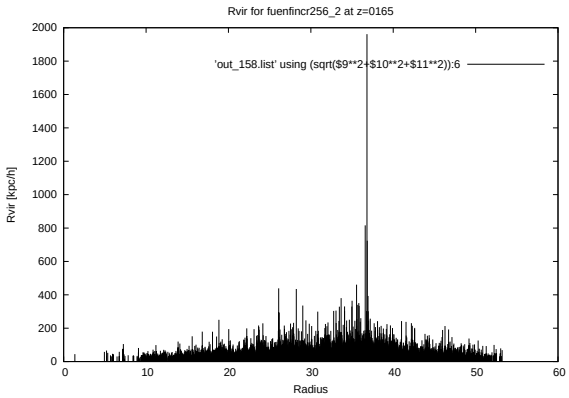


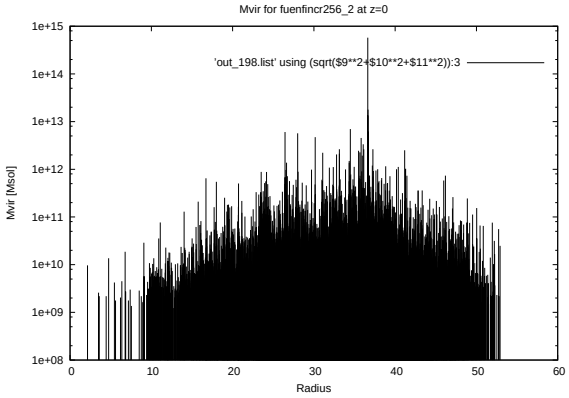


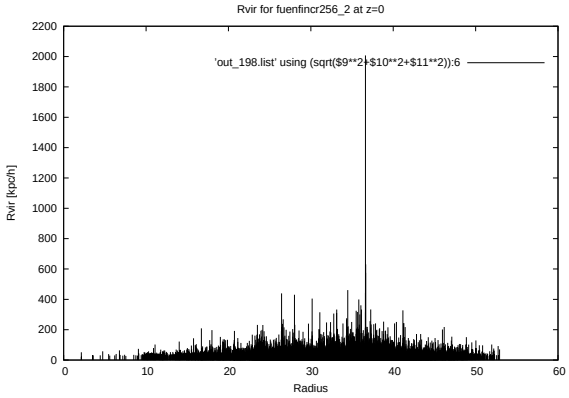


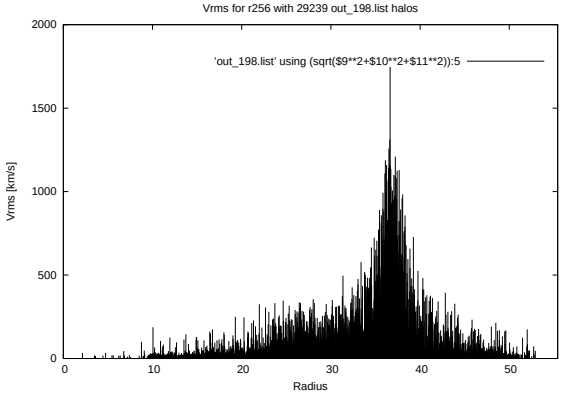

HI Gas Mass Function at $z = 0$
Comoving number density; $dn/d\ln M_{HI}(M_{HI})[Mpc^{-3}]$
Galaxy HI mass; $M_{HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus

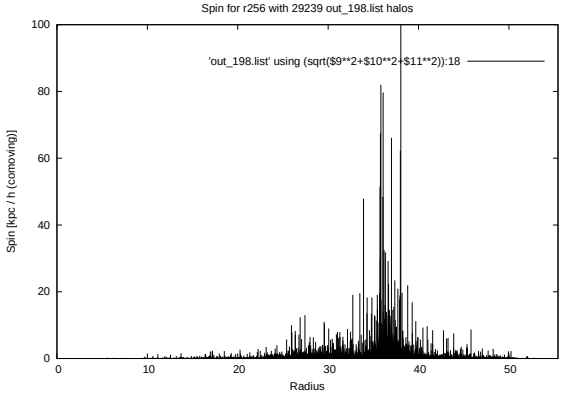

Mvir for fuenfincr256_2 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for fuenfincr256_2 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for fuenfincr256_2 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for fuenfincr256_2 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Vrms for r256 with 29239 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

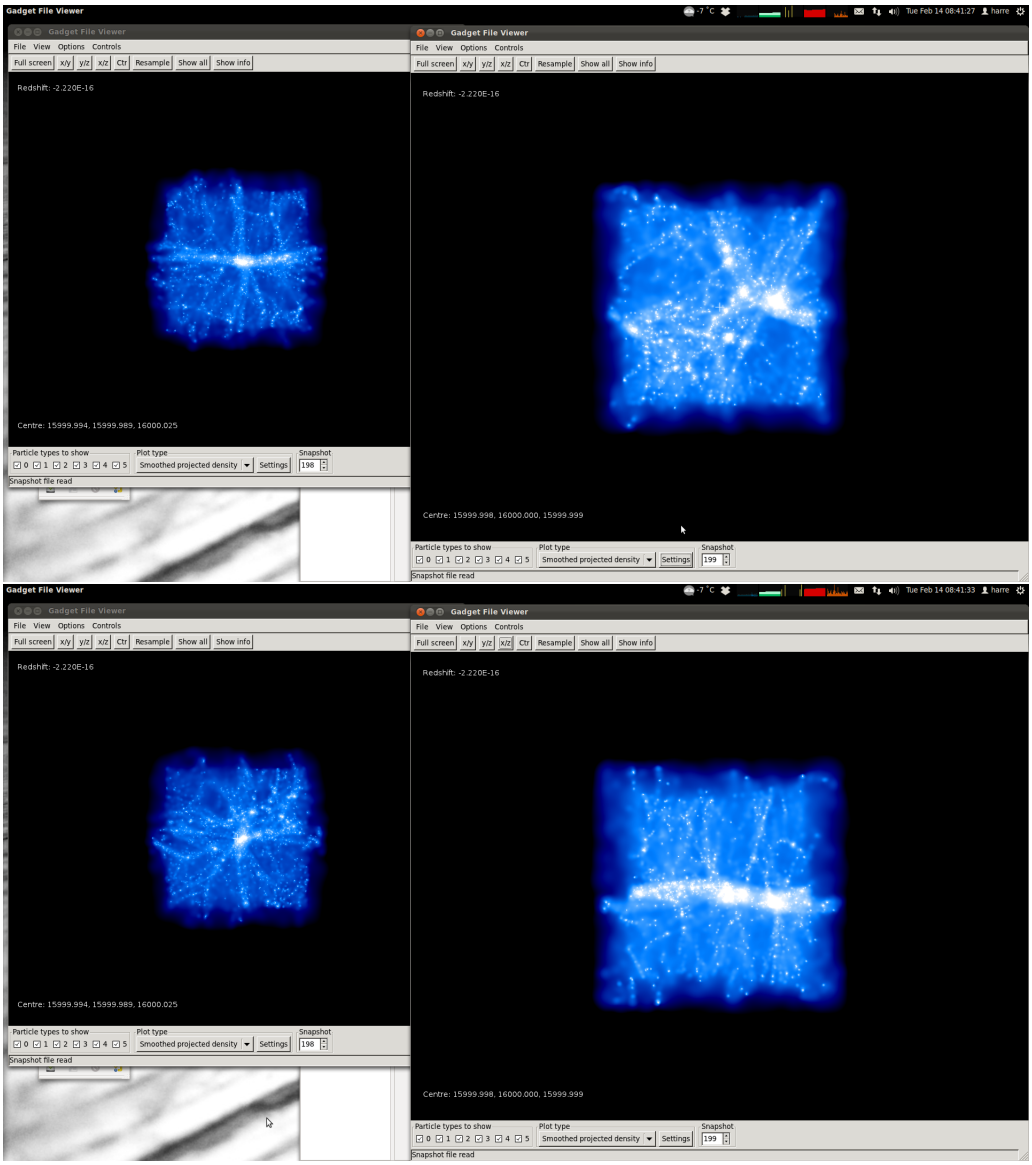

Spin for r256 with 29239 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

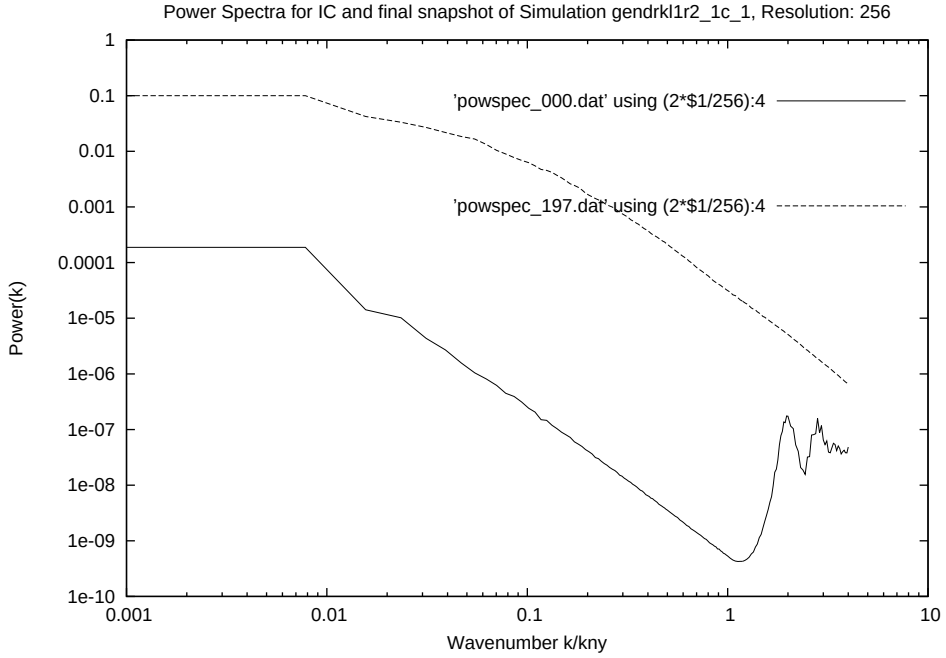
GALACTICUSSED $\surd$ → gadgetviewer: simulation has "artificial" cross on right upper corner
→ DUMP IT ?
→ re-converted with bugfixed converter (v0.3)
galacticus running on SGE
is being galacticussed → job seems to run!
GALACTICUS:

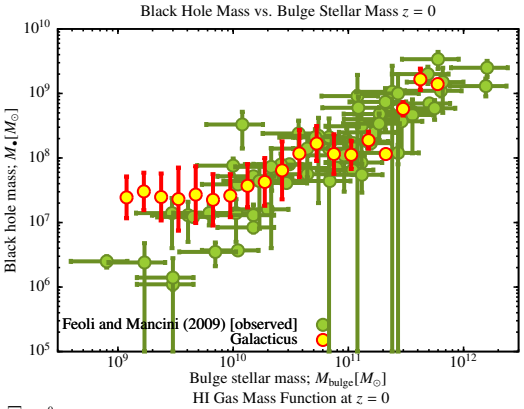
```
Fatal error in Build_Descendent_Pointers():
failed to find descendent node
```

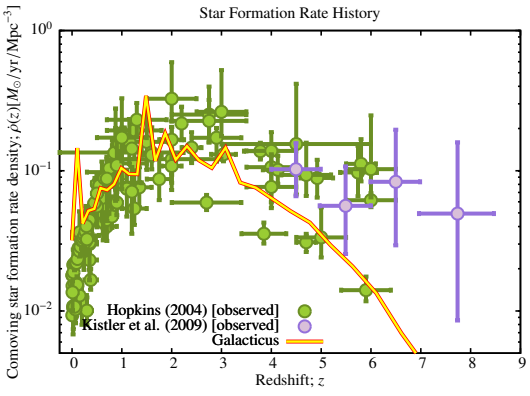
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$ (lasted about 9000minutes)

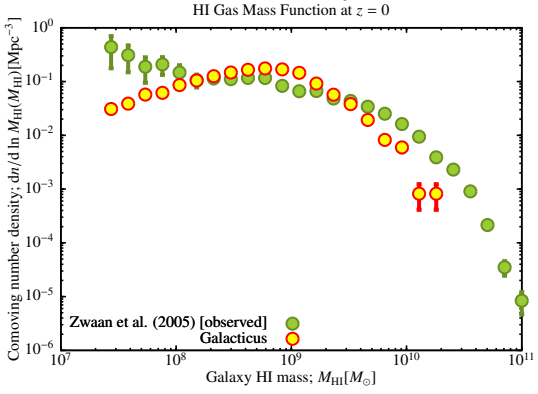
gendrkl1r2_1c_1

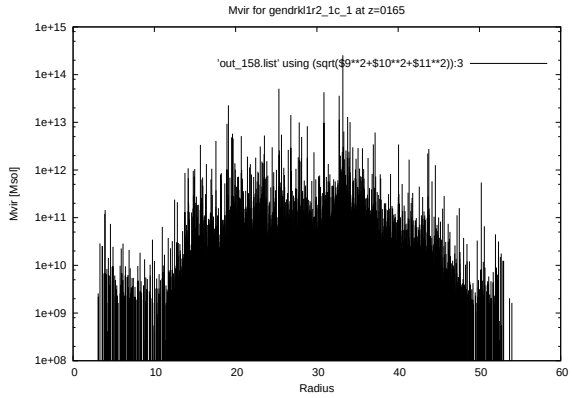


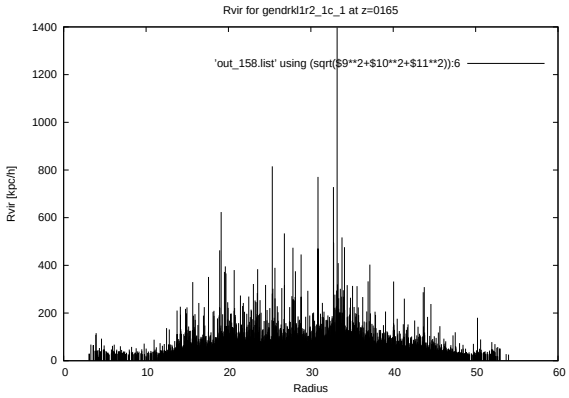

Power Spectra for IC and final snapshot of Simulation gendrkl1r2_1c_1, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
1
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
0.001
0.01
0.1
1
10

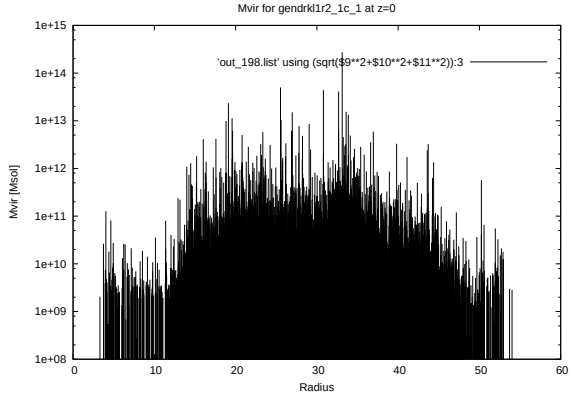

Black Hole Mass vs. Bulge Stellar Mass $z = 0$
Black hole mass; $M_\bullet[M_\odot]$
Bulge stellar mass; $M_{\rm bulge}[M_\odot]$
Feoli and Mancini (2009) [observed]
Galacticus

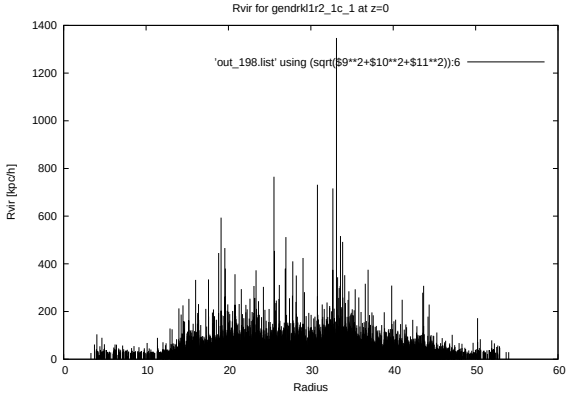

Star Formation Rate History
Comoving star formation rate density; $\dot{\rho}(z)[M_\odot/{\rm yr}/{\rm Mpc}^3]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus

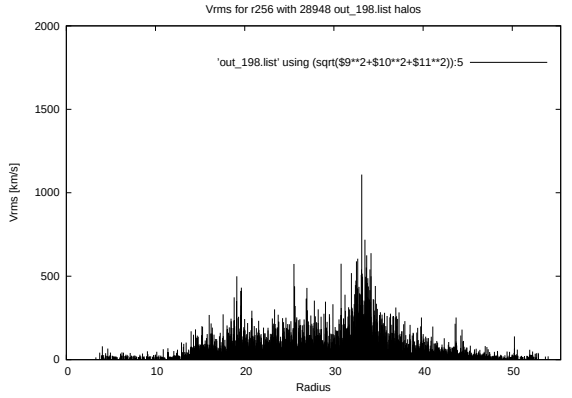

HI Gas Mass Function at $z = 0$
Comoving number density; $dn/(d\ln M_{\rm HI}(M_{\rm HI})[{\rm Mpc}^{-3}]$
Galaxy HI mass; $M_{\rm HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus

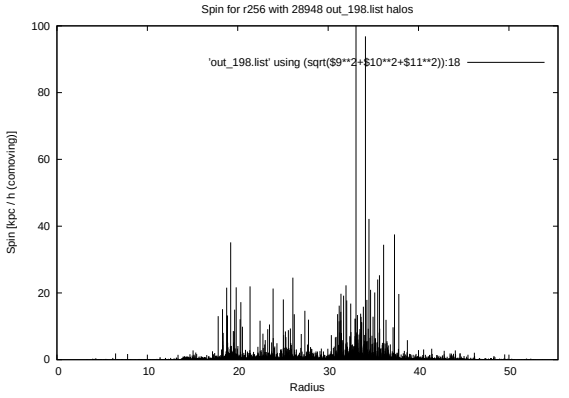












GALACTICUSSED WITH REVISION 709 $\surd$ CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$
is being rockstarred on `astro-x4600-03`

E-Mail sent to Bertschinger

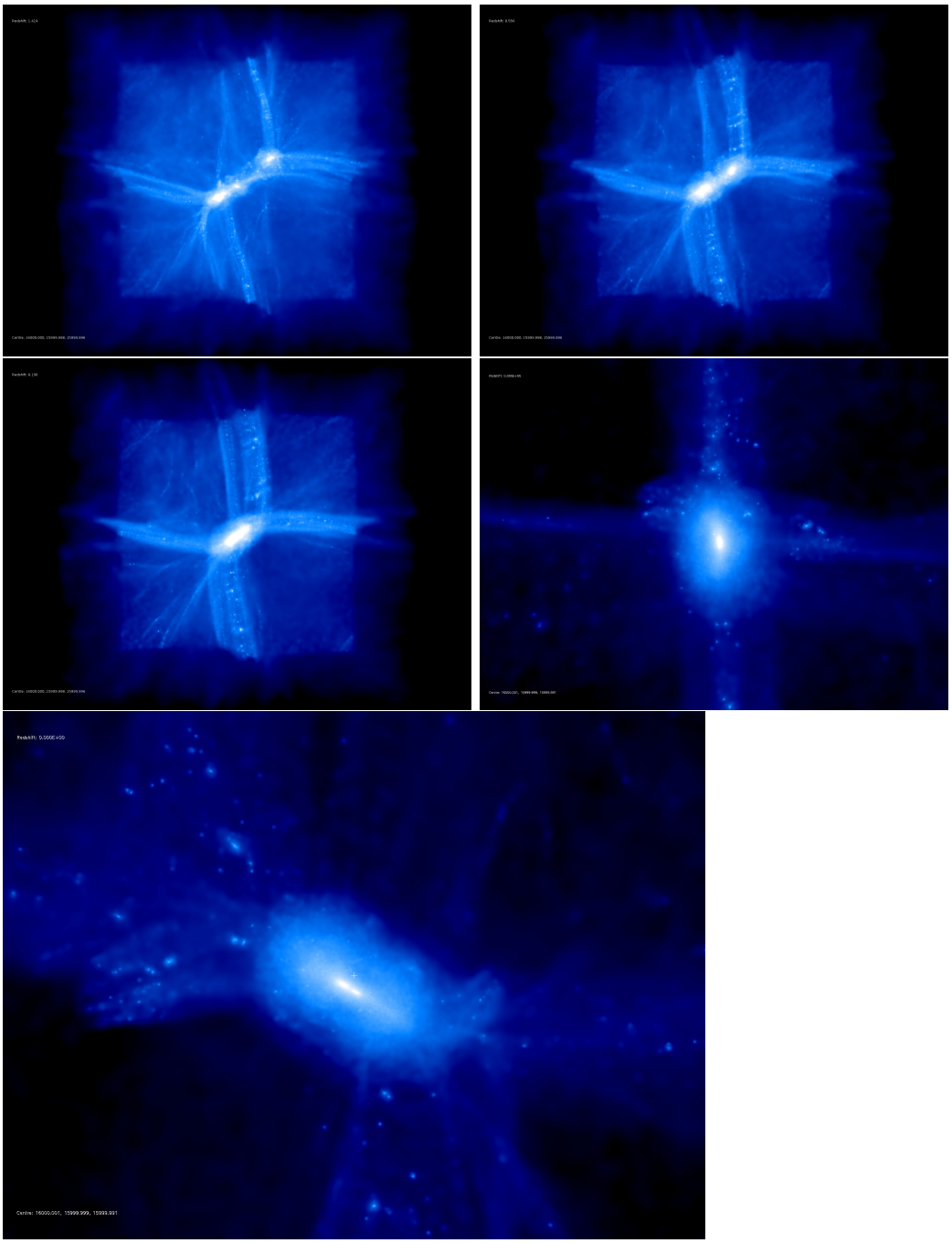
```
$ diff drkt+3c+sl5_1+r2/constraints_drkt+3c+sl5_1+r2.f
r128/h100/gendrkl1_1c_1/constraints_gendrkl1_1c_1.f

$ diff gendrkl1r2_1c_1/grafic_inc_gendrkl1r2_1c_1.f
r128/h100/gendrkl1_1c_1/grafic_inc_gendrkl1_1c_1.f
```

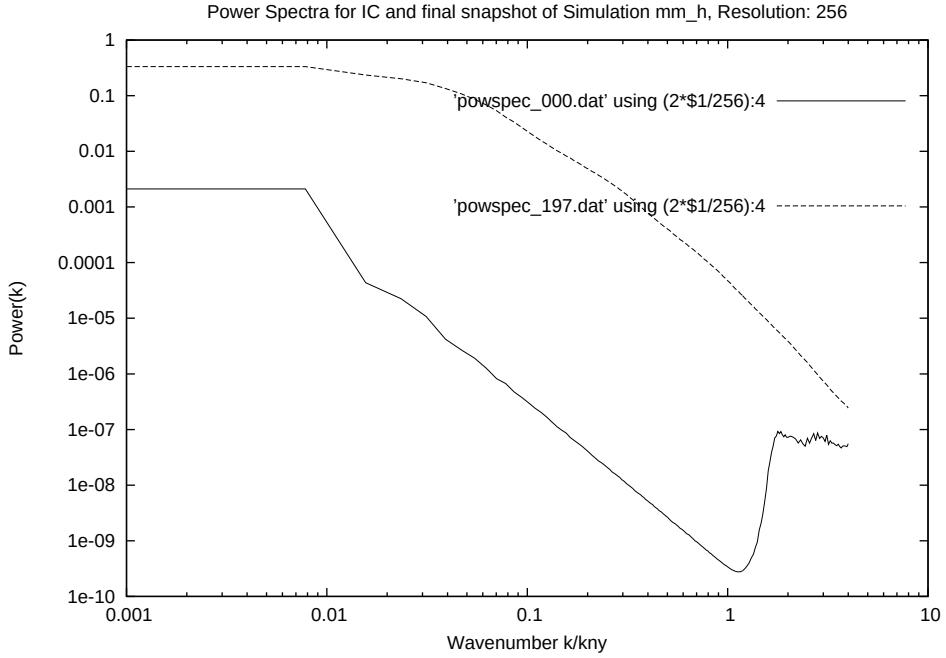
```
5c5
<  parameter (np1=256,np2=256,np3=256,ncon=1)
---
>  parameter (np1=128,np2=128,np3=128,ncon=1)
diff gendrkl1r2_1c_1/graficIO_gendrkl1r2_1c_1.out r128/h100/gendrkl1_1c_1/graficIO_gendrk
23c23
<  Particle lattice size: np1,np2,np3=         256         256         256
---
>  Particle lattice size: np1,np2,np3=         128         128         128
25,27c25,27
<  chosen:  0.12500000       0.0000000      5.00000007E-02
<  npart, L_x, L_y, L_z= 16777216    32.00    32.00    32.00 Mpc
<  Particle mass= .1447E+09 solar masses
---
>  chosen:  0.25000000       0.0000000      5.00000007E-02
>  npart, L_x, L_y, L_z=  2097152    32.00    32.00    32.00 Mpc
>  Particle mass= .1158E+10 solar masses
37c37
<           ak,akmax=   16.100662       16.000005475554534
---
>           ak,akmax=   16.068306       16.000005475554534
40,41c40,41
<       Mean sigma_delta, sigma_psi=   4.8100653       4.7177238      Mpc
<       Chisq, dof, nu=   16781832.        16777215  0.79710007
---
>       Mean sigma_delta, sigma_psi=   4.1531582       4.7162638      Mpc
>       Chisq, dof, nu=   2095840.0         2097151 -0.64012647
43c43
<  Constraint   1:  Sampled, desired= 0.28453870E-02 0.25000000E-01
---
>  Constraint   1:  Sampled, desired=-0.64672055E-02 0.25000000E-01
46c46
<       Sampled, desired=  0.21657717       16.718990
---
>       Sampled, desired=   1.1184790       16.713776
49c49
<  Constraint   1:  Final= 0.25000000E-01
---
>  Constraint   1:  Final= 0.25000002E-01
52,54c52,54
<       sigma_delta, sigma_psi=   4.9692168       7.6522889      Mpc
<       Chisq, dof=   16781832.        16777214
<       Maximum delta, displacement=   27.548712       17.026833      Mpc
---
>       sigma_delta, sigma_psi=   4.2376528       6.6093922      Mpc
>       Chisq, dof=   2095838.9         2097150
>       Maximum delta, displacement=   22.542503       14.168747      Mpc
56c56
<  Scaling density and displacements to a=  2.75129788E-02
---
>  Scaling density and displacements to a=  3.36233079E-02
58,59c58,59
```

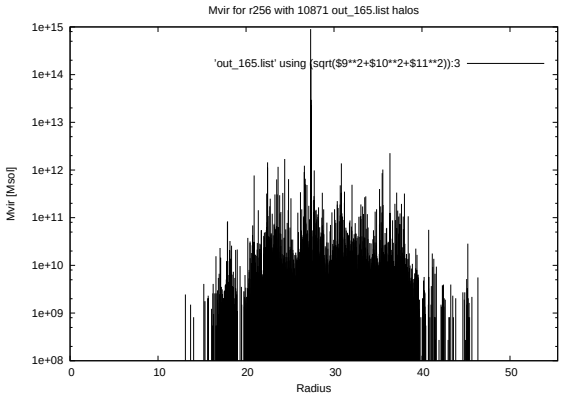
```
<  For a=astart: linear sigma, delmax=  0.18037927      0.99999994
<  RMS, max. 3-D displacement=  0.27777302      0.61806273      Mpc
---
>  For a=astart: linear sigma, delmax=  0.18798503       1.0000000
>  RMS, max. 3-D displacement=  0.29319692      0.62853473      Mpc
```

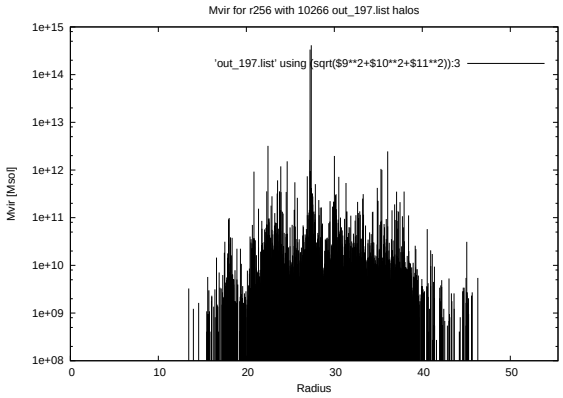
This run is a test if r256 and r128 (`gendrkl_1c_1`) are comparable → see pictures. Sims are not only different in resolution!

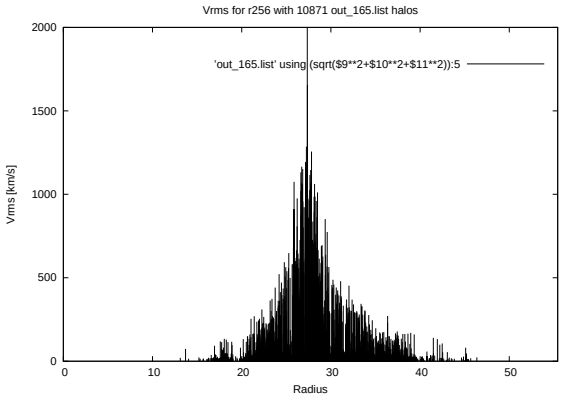
mm_h (major merger H comparison)

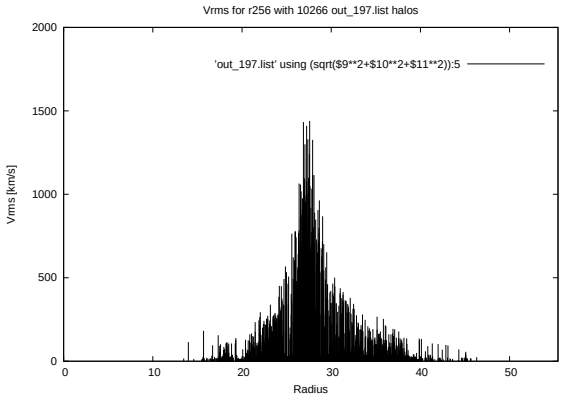



Power Spectra for IC and final snapshot of Simulation mm_h, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
1
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
0.001
0.01
0.1
1
10

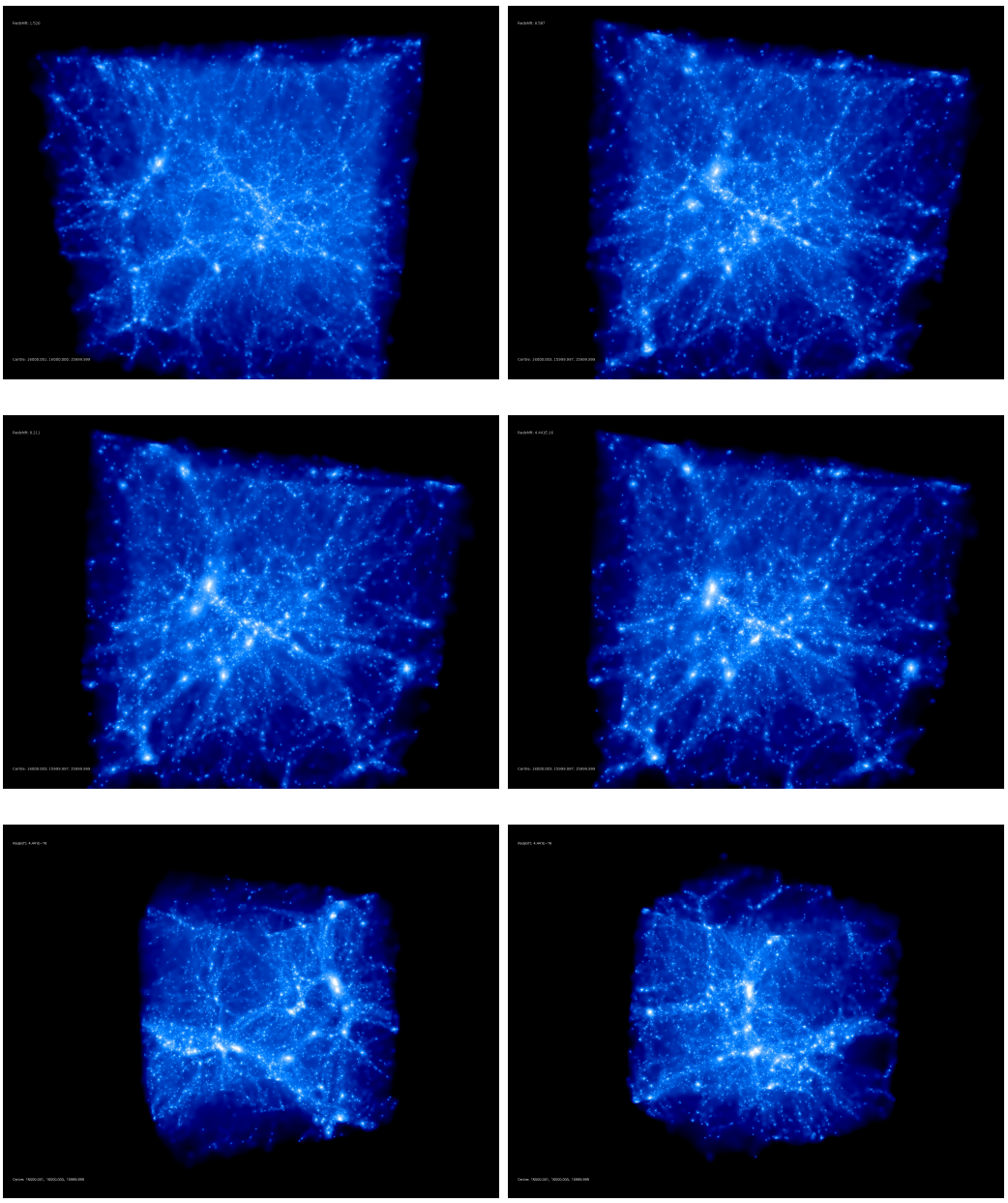

Mvir for r256 with 10871 out_165.list halos
'out_165.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius

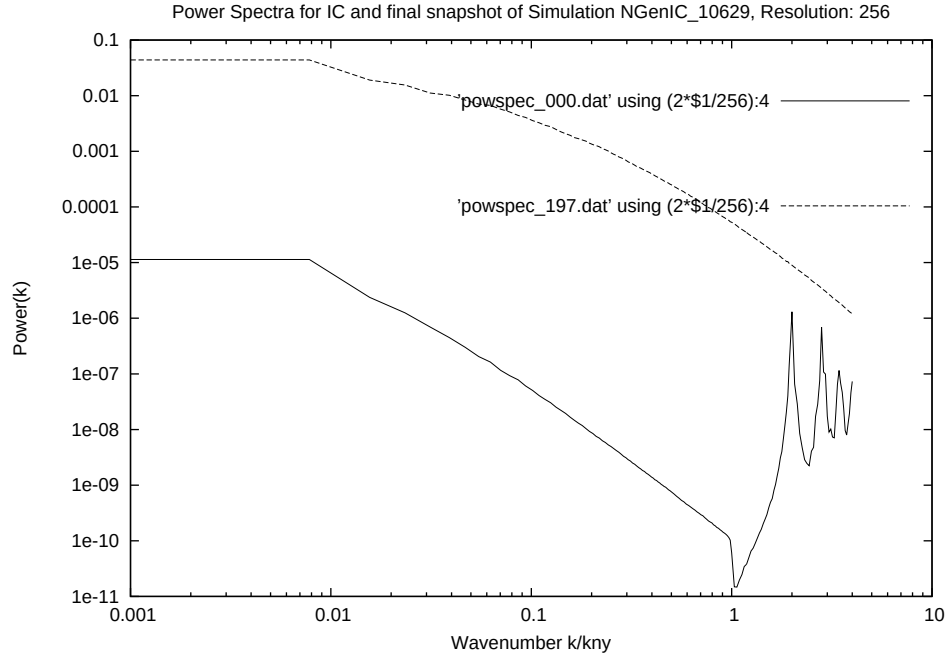

Mvir for r256 with 10266 out_197.list halos
'out_197.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius

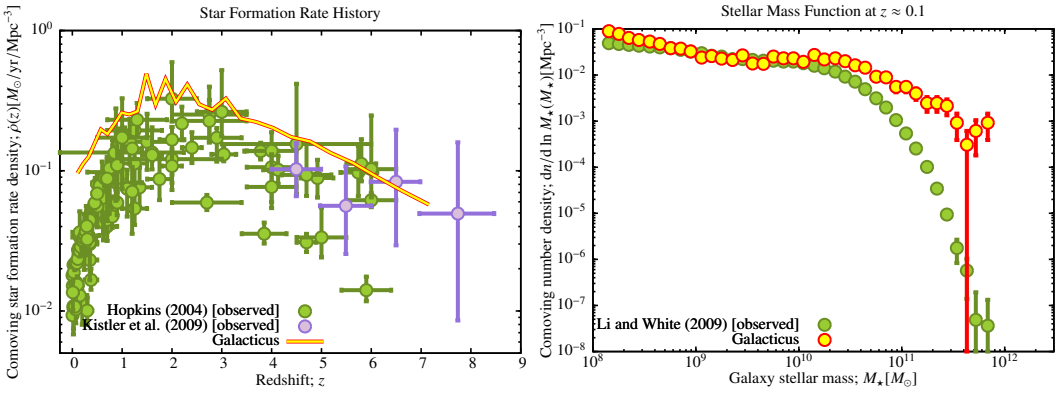

Vrms for r256 with 10871 out_165.list halos
'out_165.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

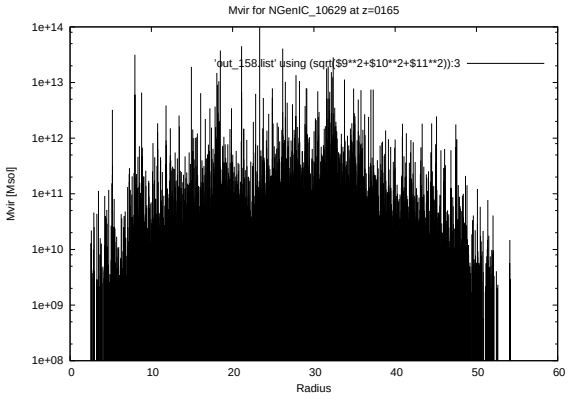

Vrms for r256 with 10266 out_197.list halos
'out_197.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

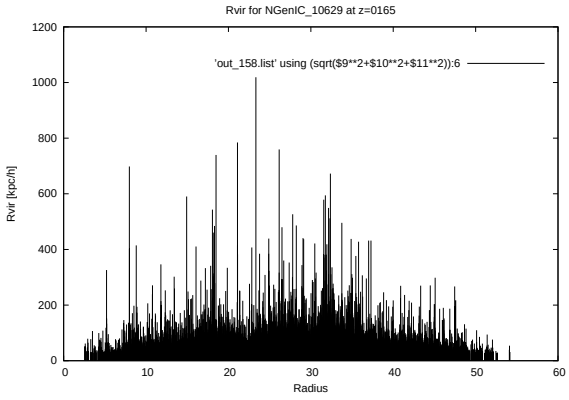
NGenIC_10629

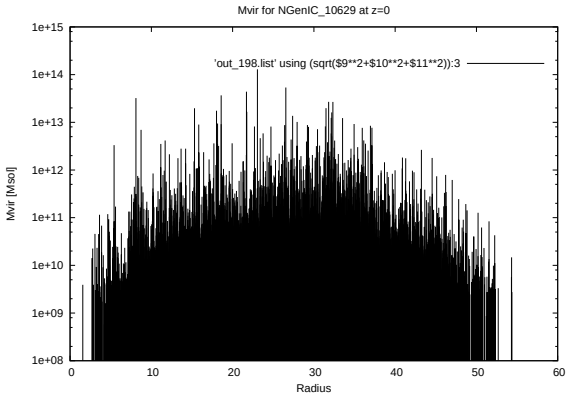


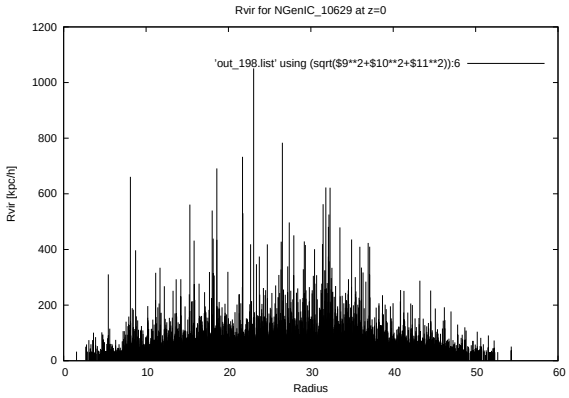

Power Spectra for IC and final snapshot of Simulation NGenIC_10629, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
1e-11
0.001
0.01
0.1
1
10

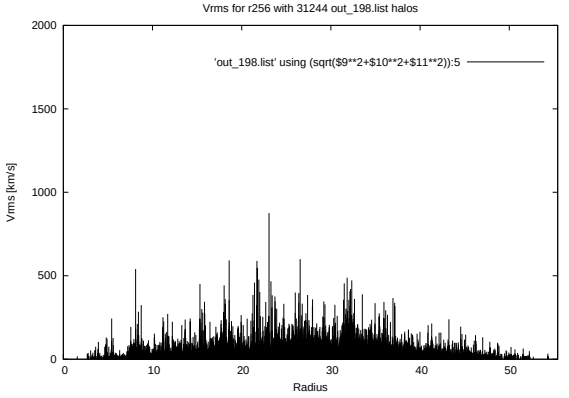

Star Formation Rate History
Comoving star formation rate density; $\dot{\rho}(z)[M_\odot/\mathrm{yr}/\mathrm{Mpc}^{-3}]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus
Stellar Mass Function at $z \approx 0.1$
Comoving number density; $\mathrm{d}n/\mathrm{d}\ln M_\star(M_\star)[\mathrm{Mpc}^{-3}]$
Galaxy stellar mass; $M_\star[M_\odot]$
Li and White (2009) [observed]
Galacticus

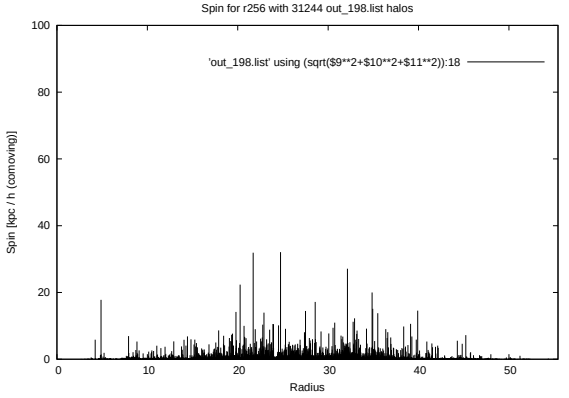

Mvir for NGenIC_10629 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for NGenIC_10629 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius

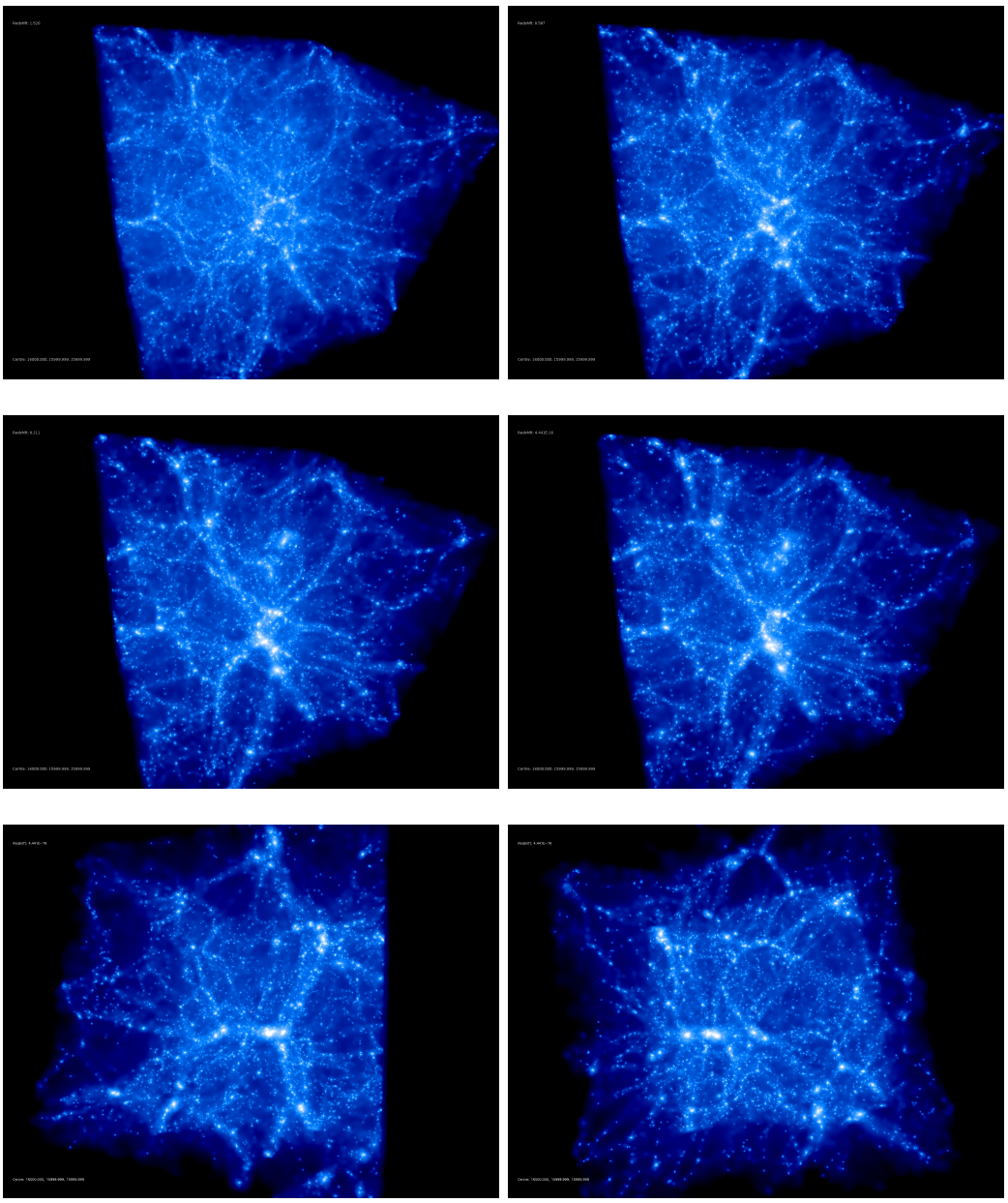

Mvir for NGenIC_10629 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius
1e+15
1e+14
1e+13
1e+12
1e+11
1e+10
1e+09
1e+08
0
10
20
30
40
50
60

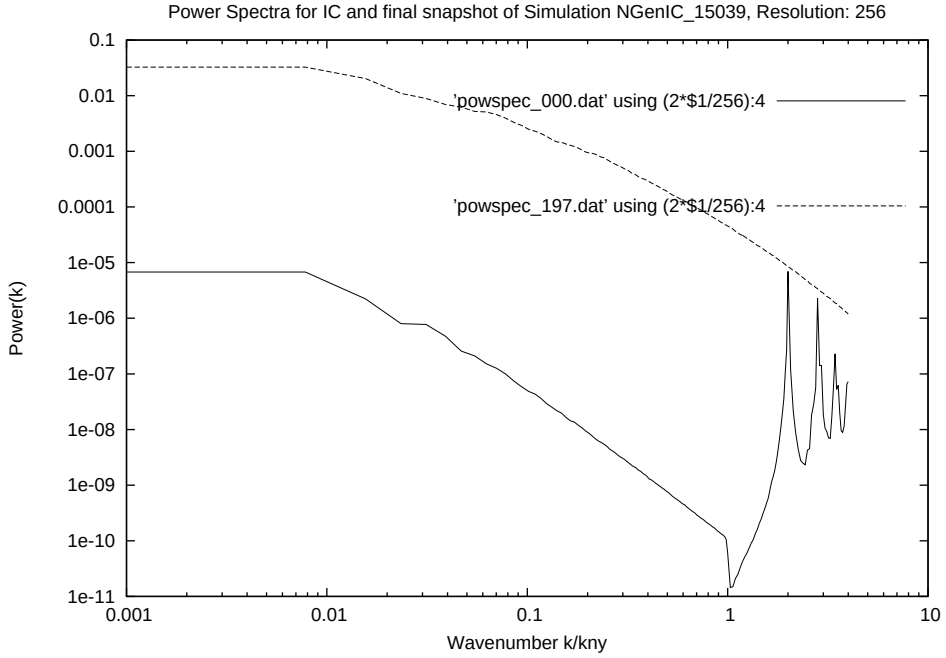

Rvir for NGenIC_10629 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60

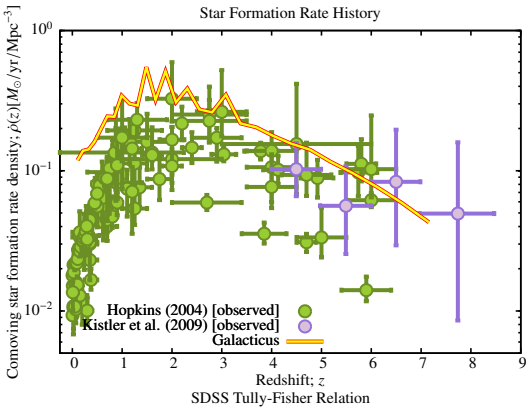

Vrms for r256 with 31244 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius
2000
1500
1000
500
0
0
10
20
30
40
50

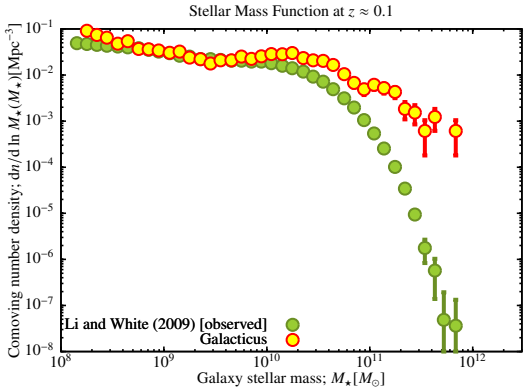

Spin for r256 with 31244 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius
100
80
60
40
20
0
0
10
20
30
40
50

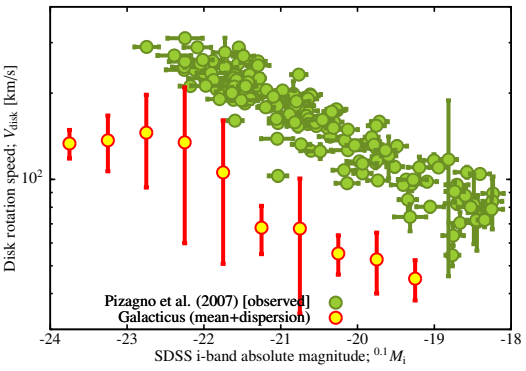
NGenIC_15039

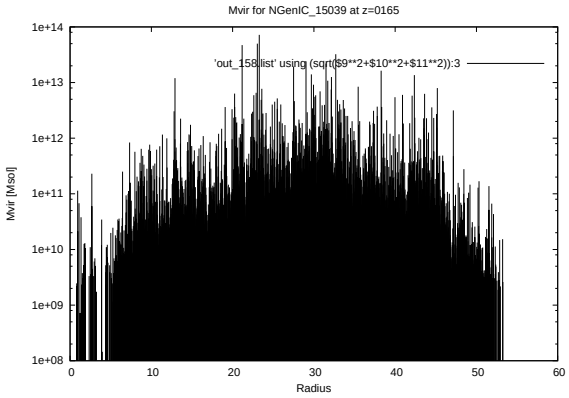


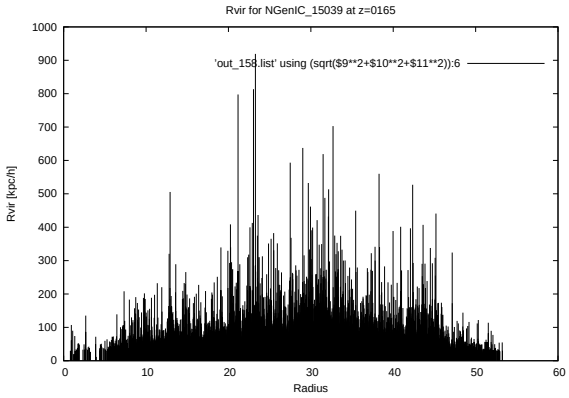

Power Spectra for IC and final snapshot of Simulation NGenIC_15039, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
1e-11
0.001
0.01
0.1
1
10

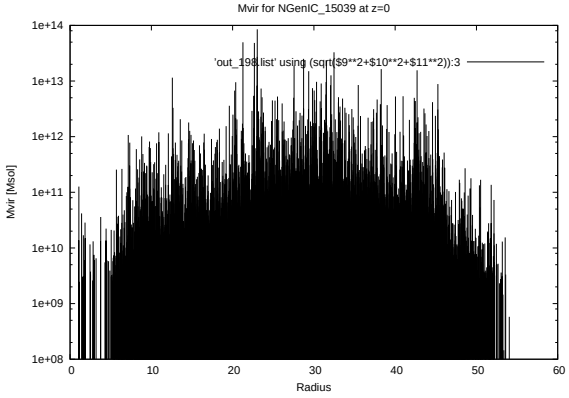

Star Formation Rate History
Comoving star formation rate density; $\dot{\rho}(z)[M_\odot/\mathrm{yr}/\mathrm{Mpc}^3]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus

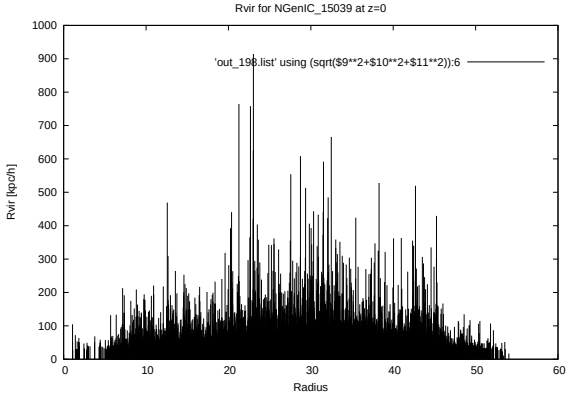

Stellar Mass Function at $z \approx 0.1$
Comoving number density; $\mathrm{d}n/\mathrm{d}\ln M_\star(M_\star)[\mathrm{Mpc}^{-3}]$
Galaxy stellar mass; $M_\star[M_\odot]$
Li and White (2009) [observed]
Galacticus

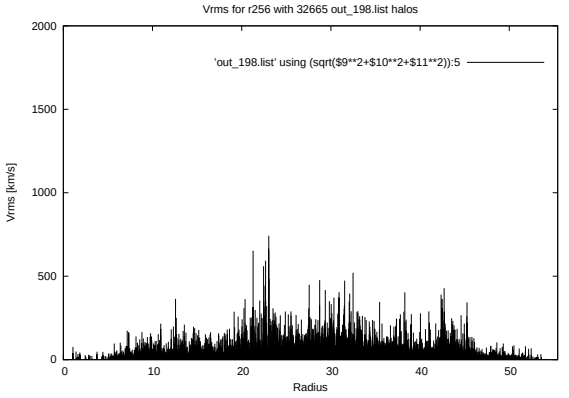

SDSS Tully-Fisher Relation
Disk rotation speed; V_{disk} [km/s]
SDSS i-band absolute magnitude; $^{0.1}M_i$
Pizagno et al. (2007) [observed]
Galacticus (mean+dispersion)

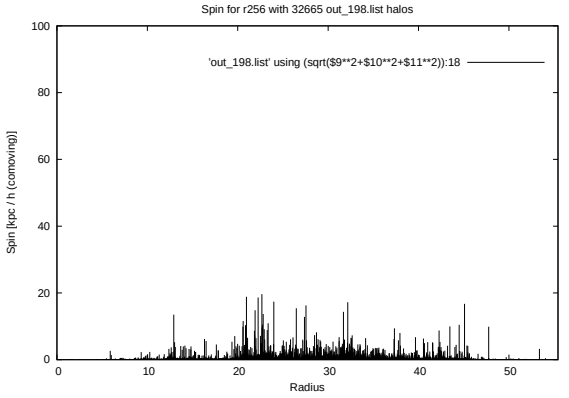

Mvir for NGenIC_15039 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for NGenIC_15039 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius

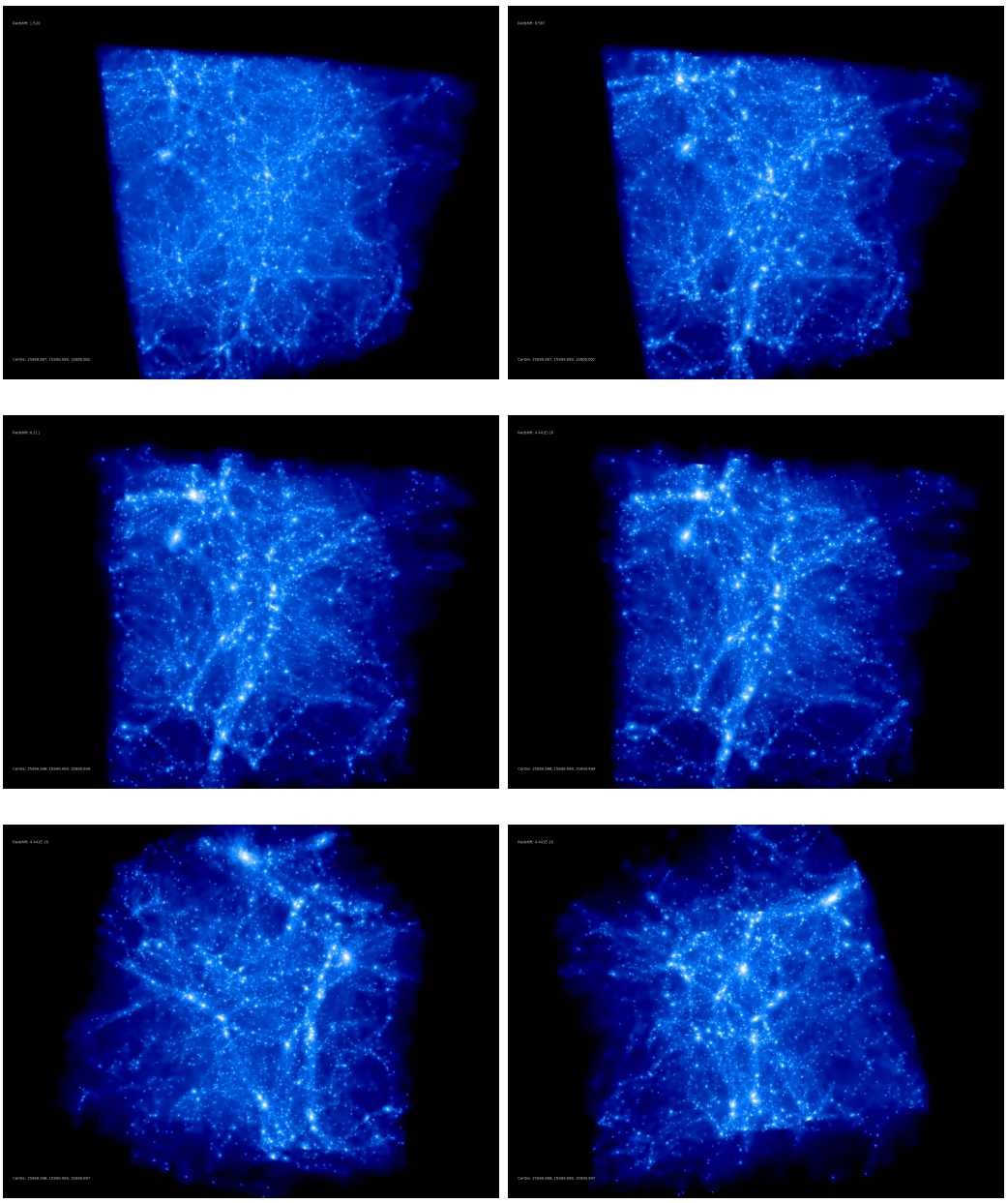

Mvir for NGenIC_15039 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius

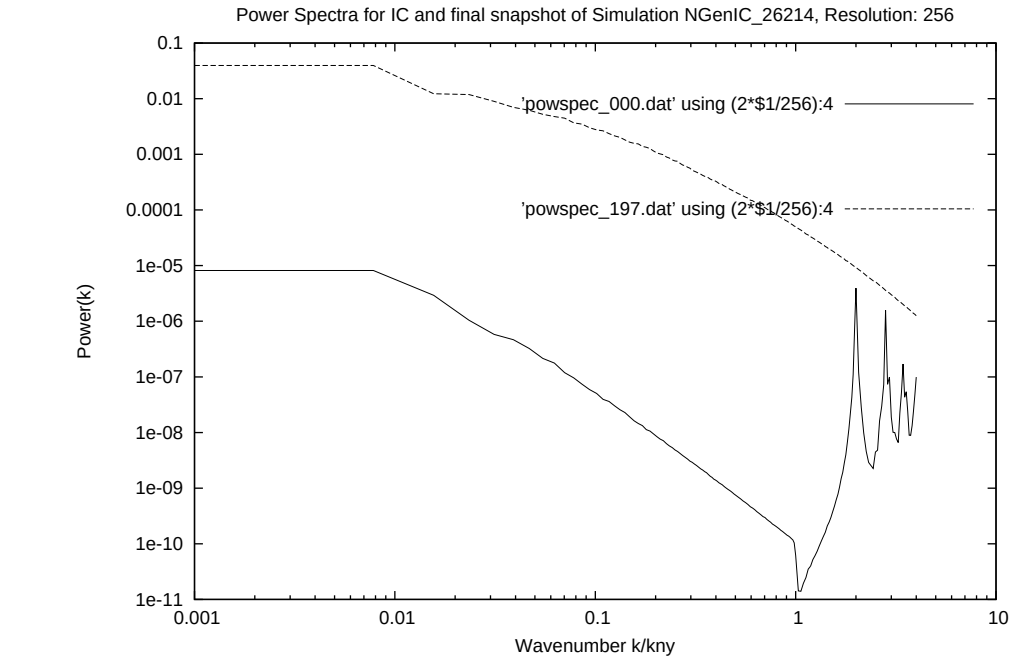

Rvir for NGenIC_15039 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius

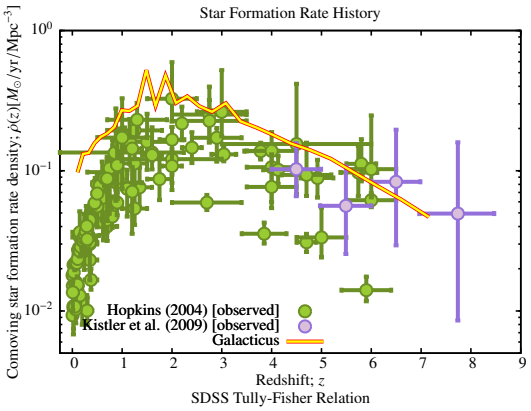

Vrms for r256 with 32665 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

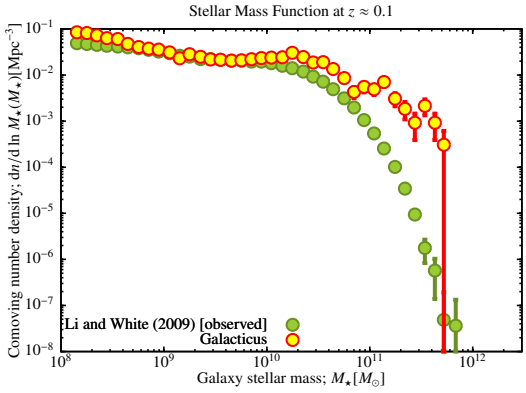

Spin for r256 with 32665 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

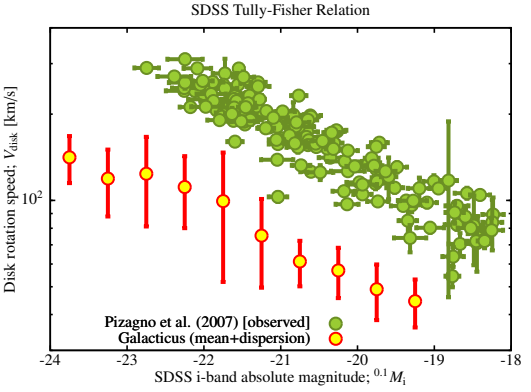
NGenIC_26214

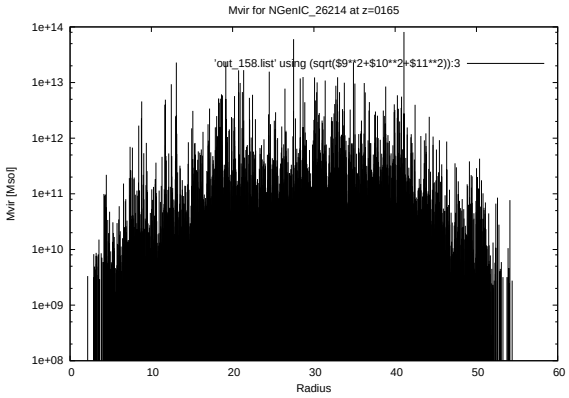


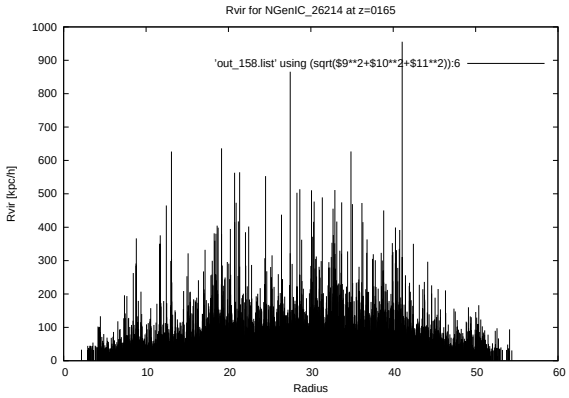

Power Spectra for IC and final snapshot of Simulation NGenIC_26214, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
1e-11
0.001
0.01
0.1
1
10

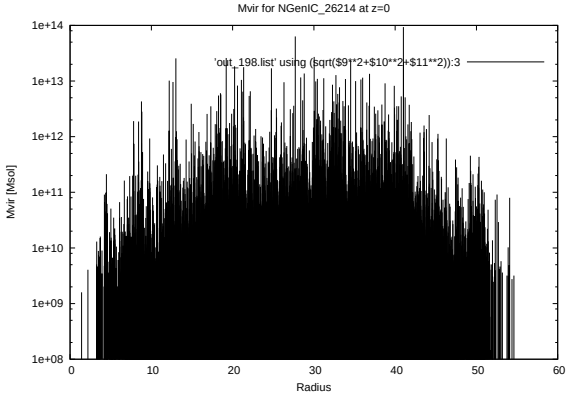

Star Formation Rate History
Comoving star formation rate density; $\dot{\rho}(z)[M_\odot/\mathrm{yr}/\mathrm{Mpc}^3]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus

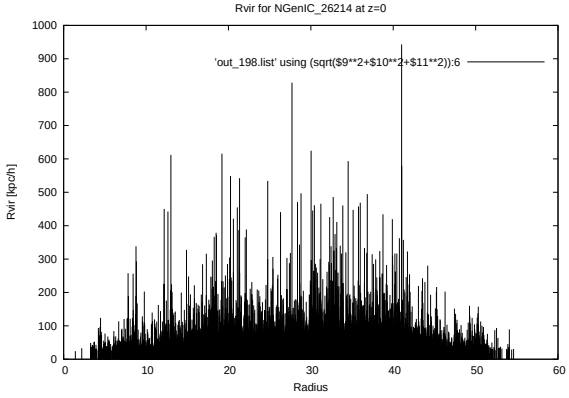

Stellar Mass Function at $z \approx 0.1$
Comoving number density; $\mathrm{d}n/\mathrm{d}\ln M_\star(M_\star)[\mathrm{Mpc}^{-3}]$
Galaxy stellar mass; $M_\star[M_\odot]$
Li and White (2009) [observed]
Galacticus

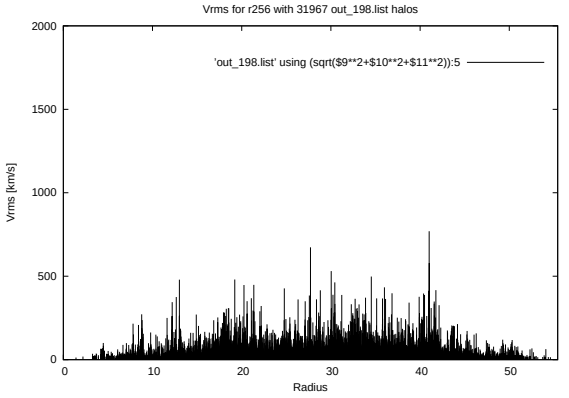

SDSS Tully-Fisher Relation
Disk rotation speed; V_{disk} [km/s]
SDSS i-band absolute magnitude; $^{0.1}M_i$
Pizagno et al. (2007) [observed]
Galacticus (mean+dispersion)

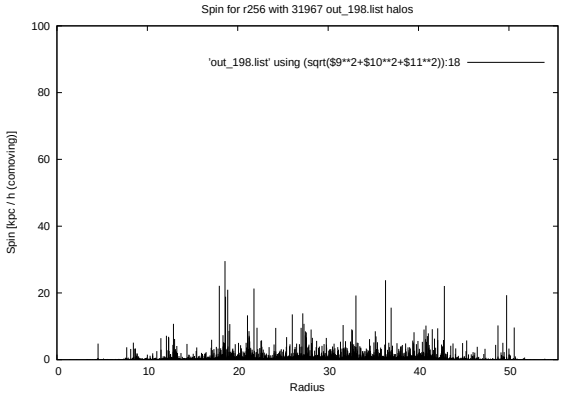

Mvir for NGenIC_26214 at z=0165
'out_158.list' using (sqrt($9*r2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for NGenIC_26214 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius

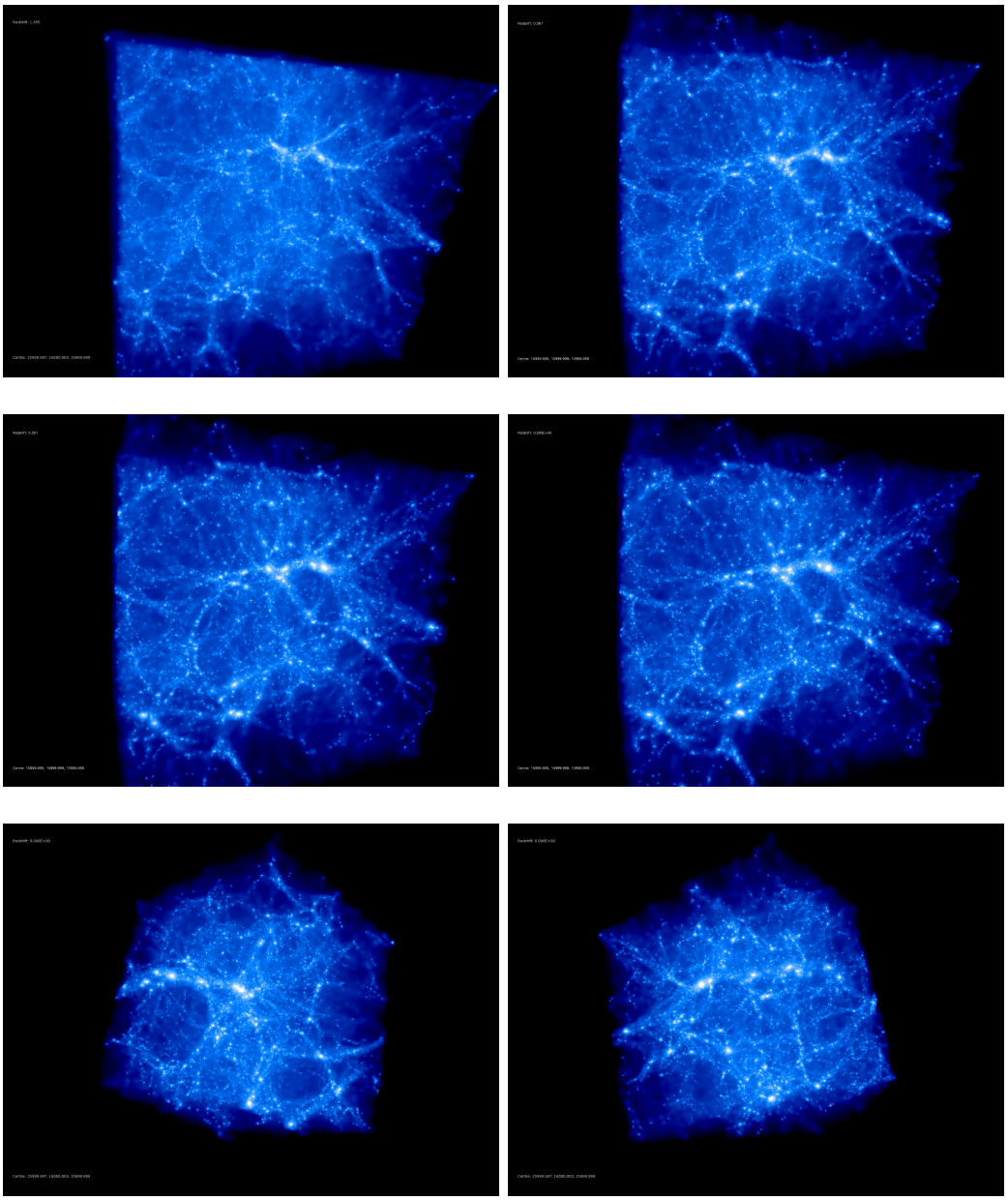

Mvir for NGenIC_26214 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius

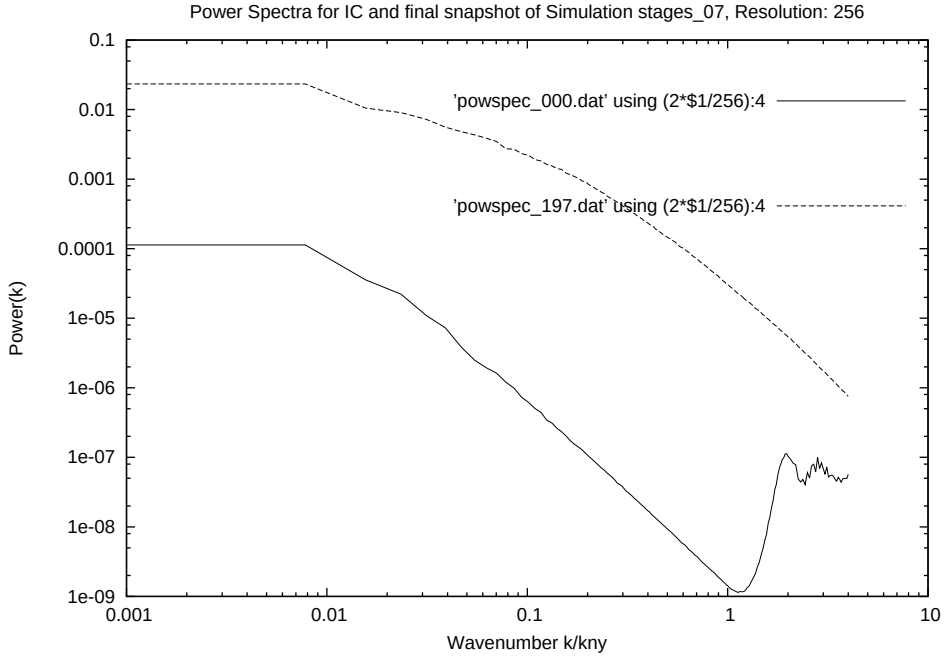

Rvir for NGenIC_26214 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius

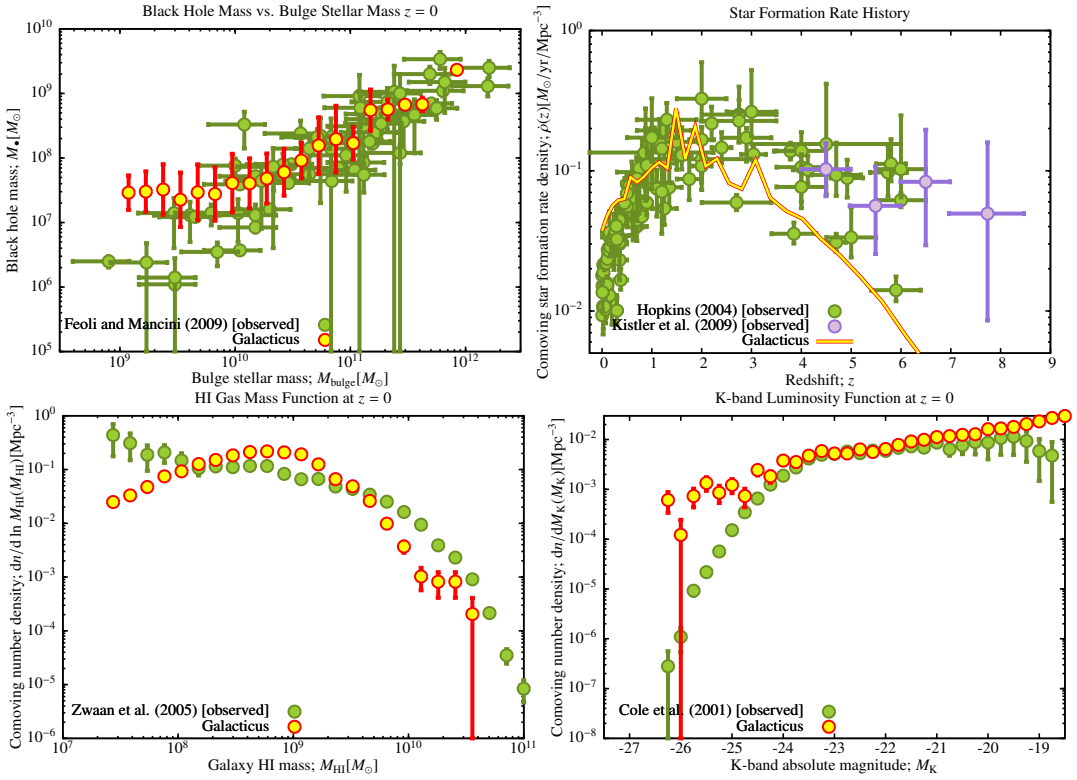

Vrms for r256 with 31967 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

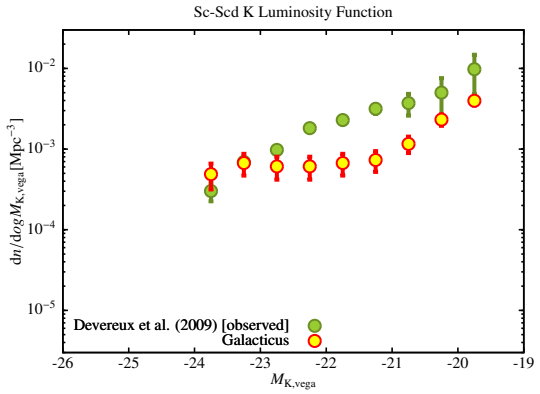

Spin for r256 with 31967 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

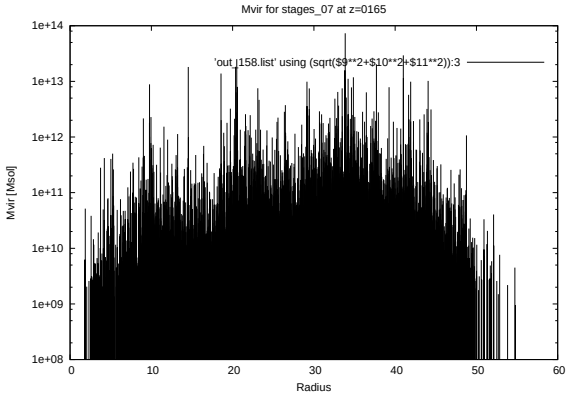
stages_07

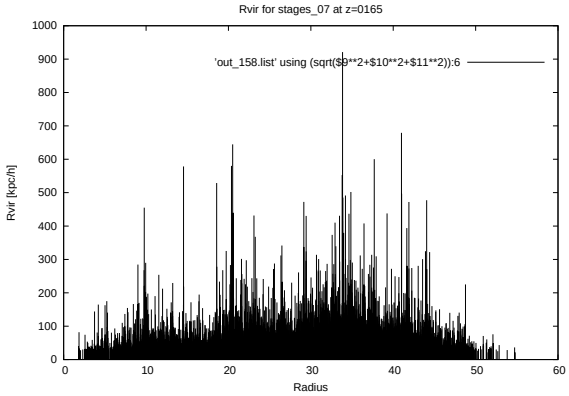


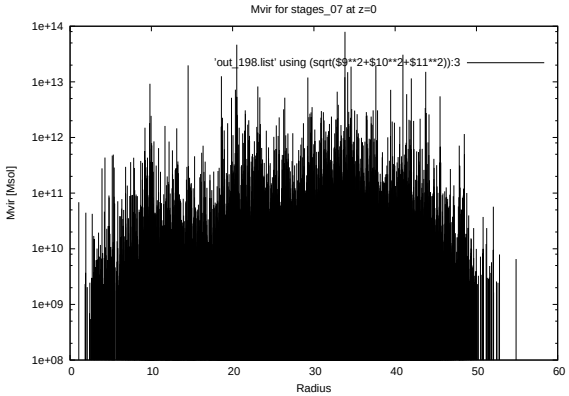

Power Spectra for IC and final snapshot of Simulation stages_07, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
0.001
0.01
0.1
1
10

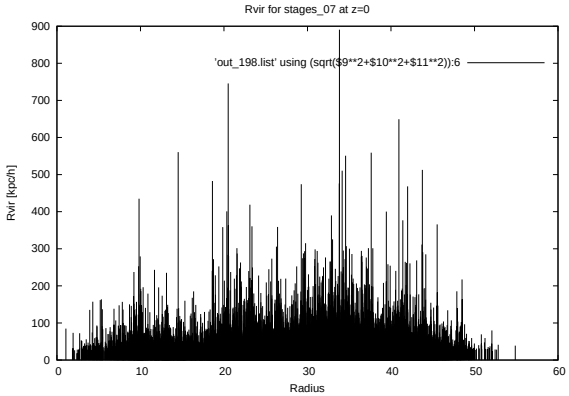

Black Hole Mass vs. Bulge Stellar Mass z = 0
Black hole mass; $M_\bullet[M_\odot]$
Bulge stellar mass; $M_{\rm bulge}[M_\odot]$
Feoli and Mancini (2009) [observed]
Galacticus
Star Formation Rate History
Comoving star formation rate density; $\dot{\rho}(z)[M_\odot/{\rm yr}/{\rm Mpc}^3]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus
HI Gas Mass Function at z = 0
Comoving number density; $dn/d\ln M_{\rm HI}(M_{\rm HI})[{\rm Mpc}^{-3}]$
Galaxy HI mass; $M_{\rm HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus
K-band Luminosity Function at z = 0
Comoving number density; $dn/(dM_{\rm K}(M_{\rm K})[{\rm Mpc}^{-3}]$
K-band absolute magnitude; $M_{\rm K}$
Cole et al. (2001) [observed]
Galacticus

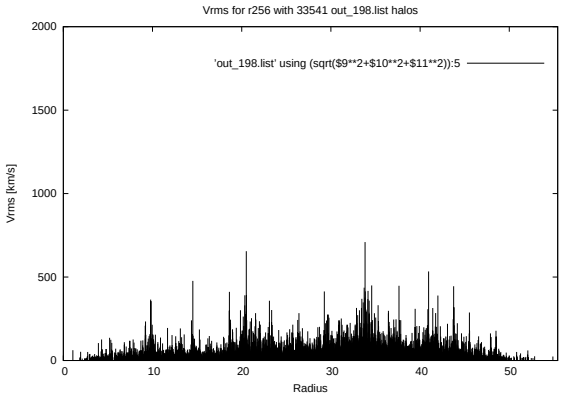

Sc-Scd K Luminosity Function
Devereux et al. (2009) [observed]
Galacticus
$M_{K,vega}$
$dn/d\sigma g M_{K,vega}$ [Mpc^{-3}]

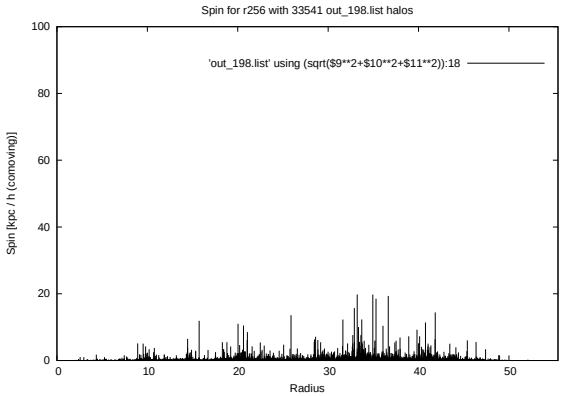

Mvir for stages_07 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for stages_07 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for stages_07 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius

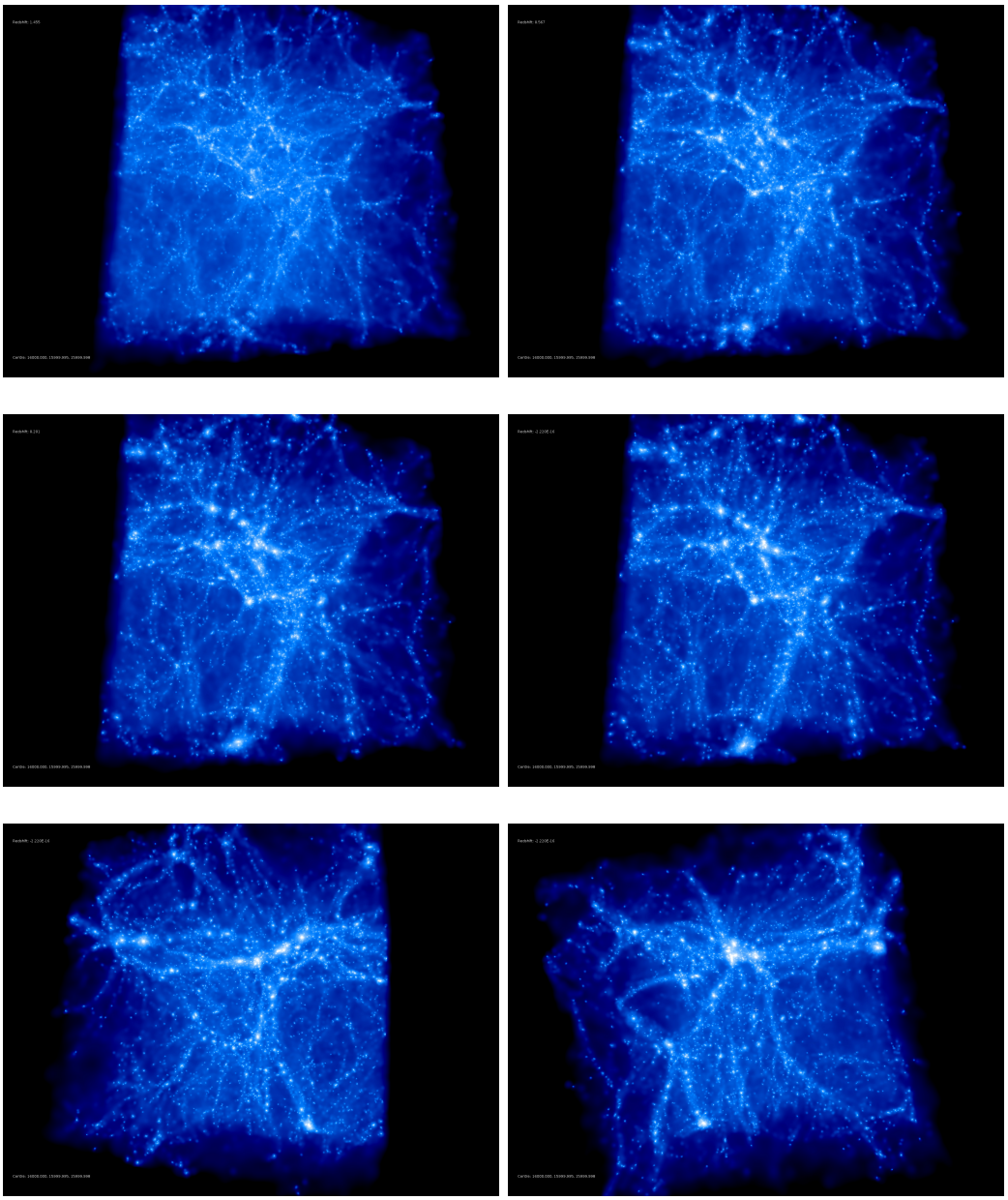

Rvir for stages_07 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius

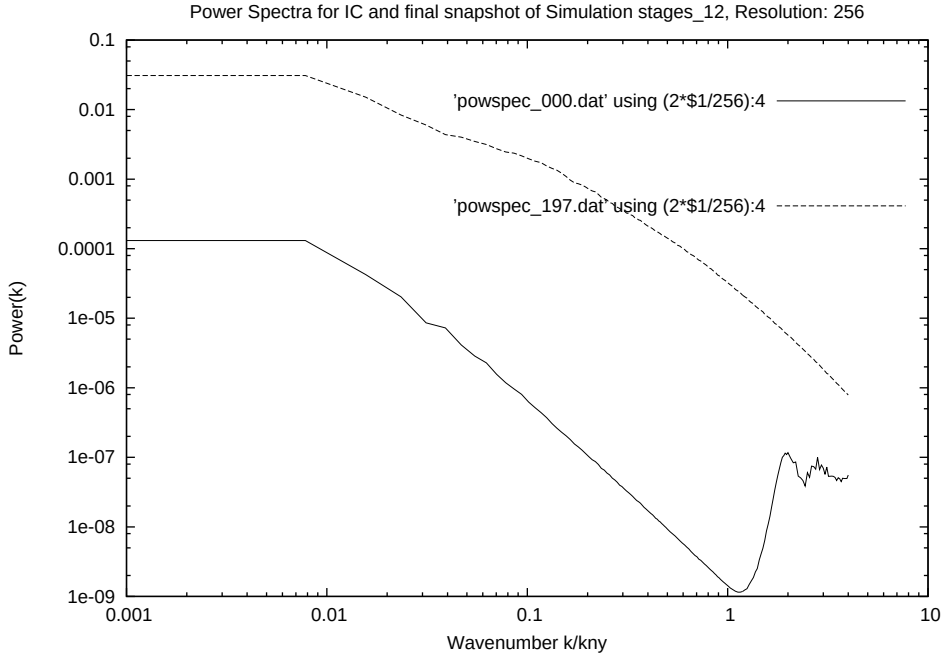

Vrms for r256 with 33541 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

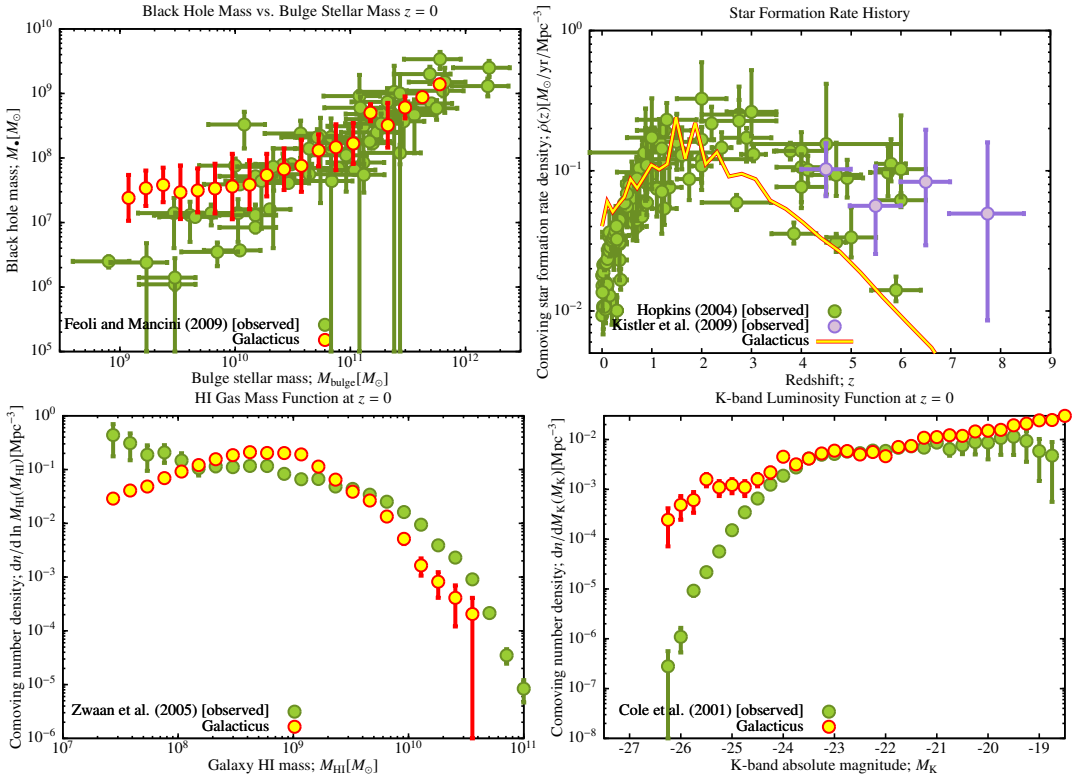

Spin for r256 with 33541 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

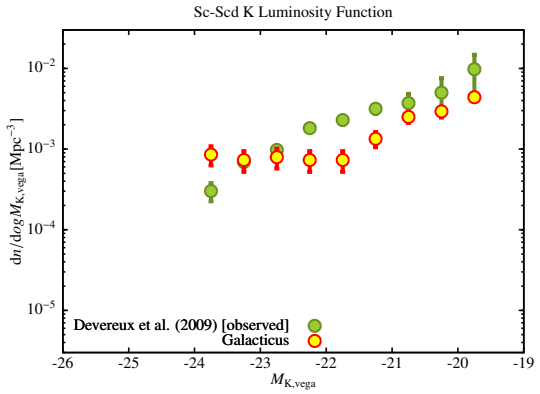
GALACTICUSSED $\surd$ CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

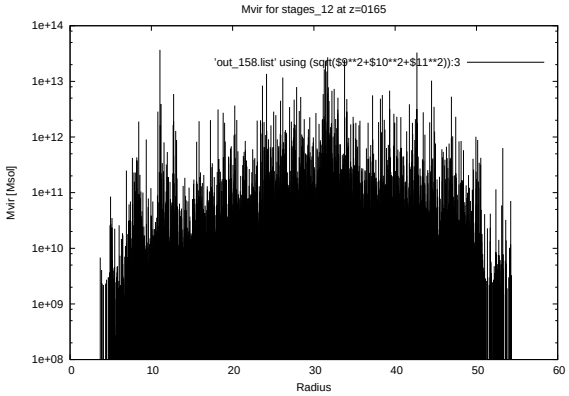
stages_12

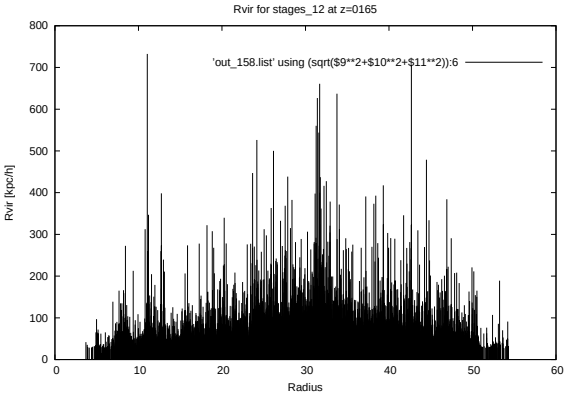


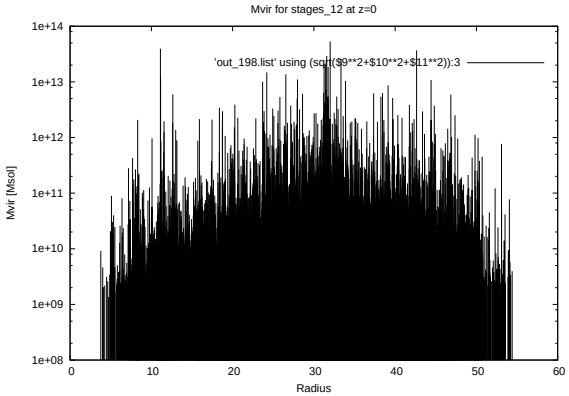

Power Spectra for IC and final snapshot of Simulation stages_12, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
0.001
0.01
0.1
1
10

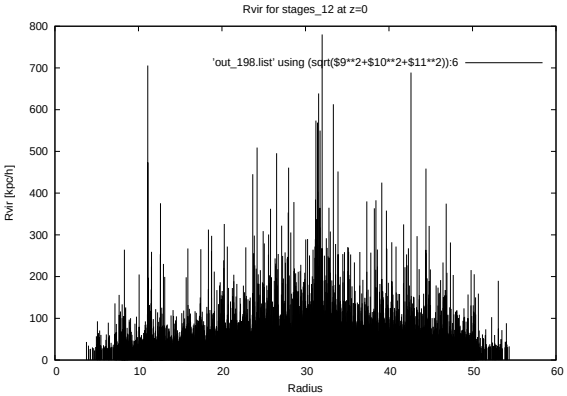

Black Hole Mass vs. Bulge Stellar Mass z = 0
Black hole mass; $M_\bullet[M_\odot]$
Bulge stellar mass; $M_{\rm bulge}[M_\odot]$
Feoli and Mancini (2009) [observed]
Galacticus
Star Formation Rate History
Comoving star formation rate density; $\dot{\rho}(z)[M_\odot/{\rm yr}/{\rm Mpc}^3]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus
HI Gas Mass Function at z = 0
Comoving number density; $dn/d\ln M_{\rm HI}(M_{\rm HI})[{\rm Mpc}^{-3}]$
Galaxy HI mass; $M_{\rm HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus
K-band Luminosity Function at z = 0
Comoving number density; $dn/(dM_{\rm K}(M_{\rm K})[{\rm Mpc}^{-3}]$
K-band absolute magnitude; $M_{\rm K}$
Cole et al. (2001) [observed]
Galacticus

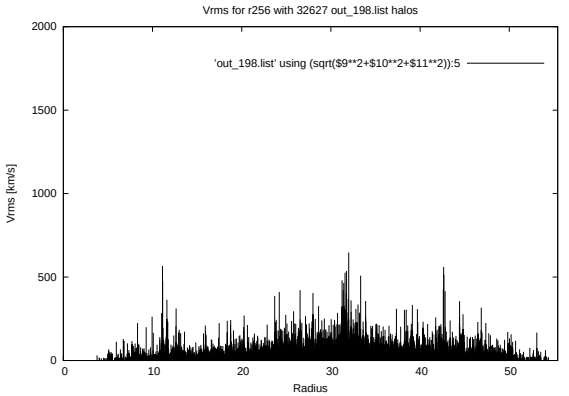

Sc-Scd K Luminosity Function
Devereux et al. (2009) [observed]
Galacticus
$M_{K,vega}$
$dn/d\sigma g M_{K,vega}$ [Mpc^{-3}]

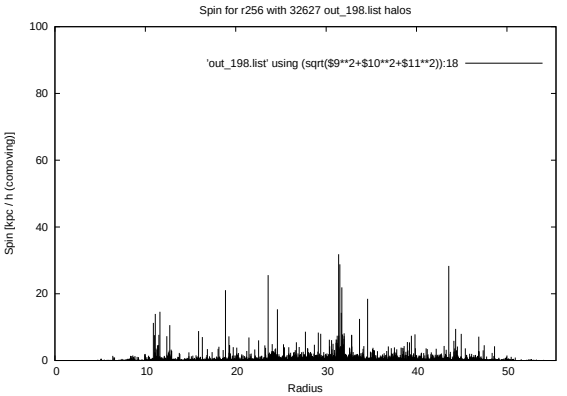

Mvir for stages_12 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for stages_12 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for stages_12 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for stages_12 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Vrms for r256 with 32627 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

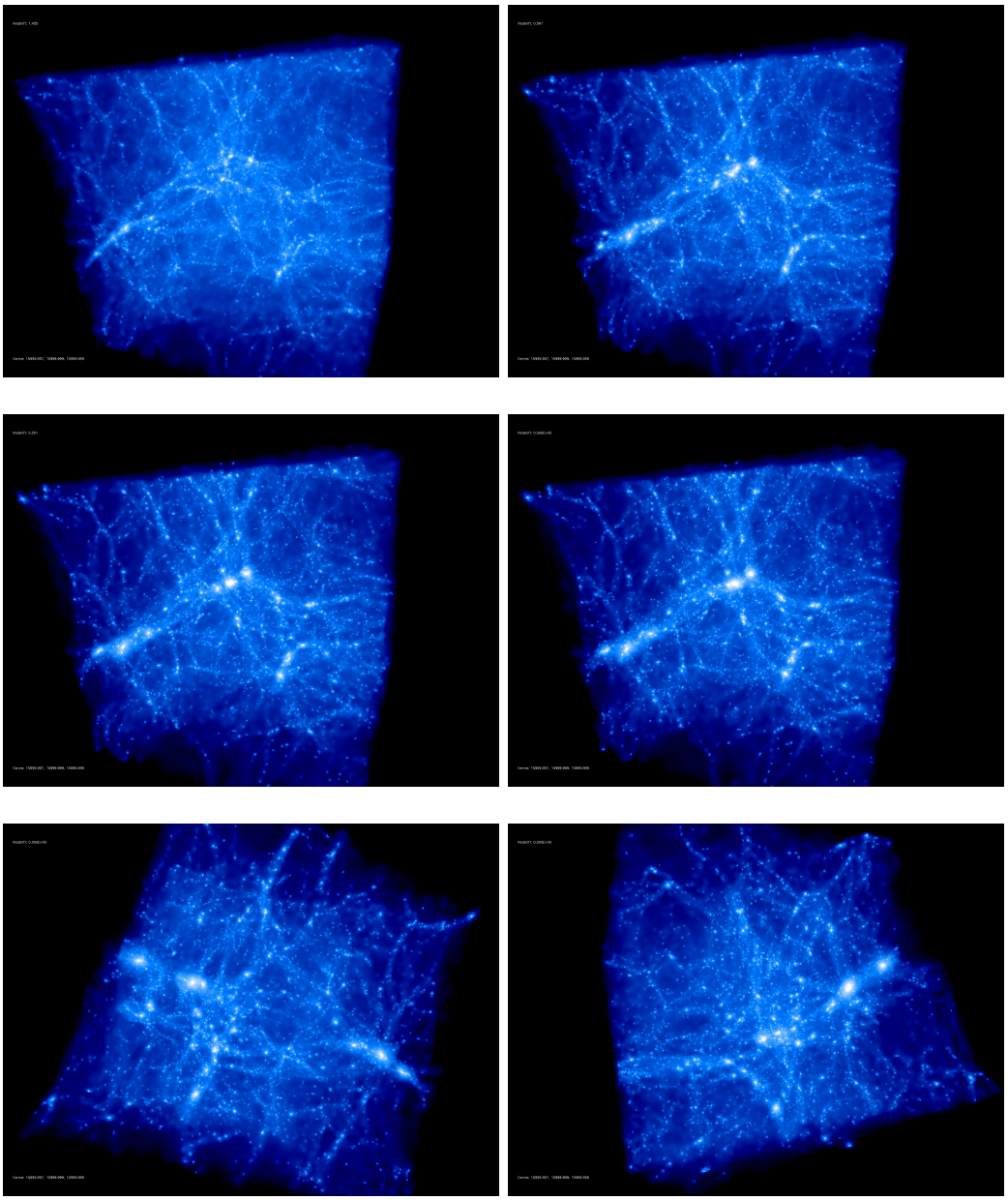

Spin for r256 with 32627 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

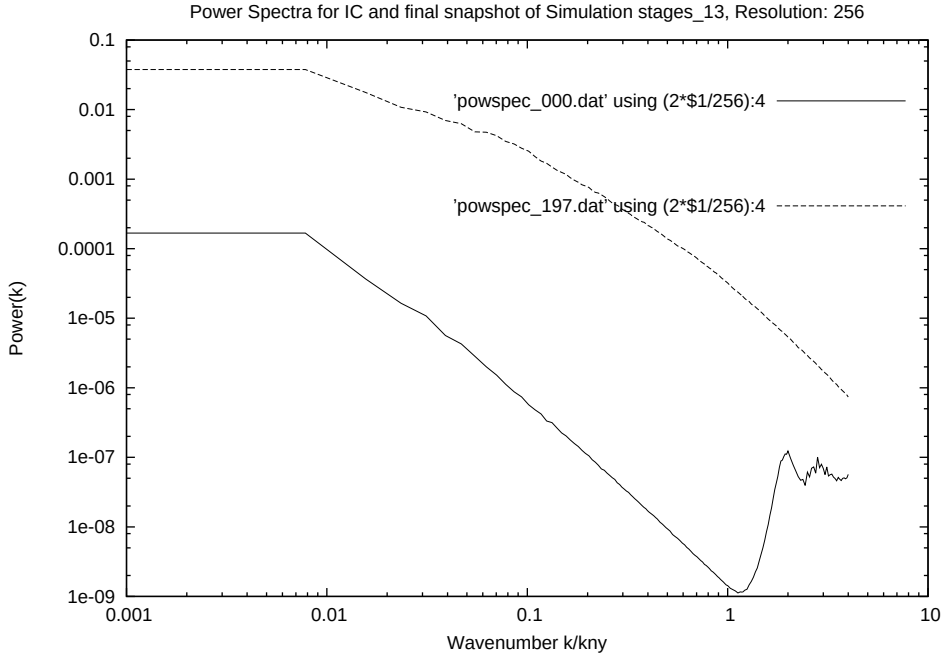
after Markus converter update is being galacticussed again
galacticus strange error:

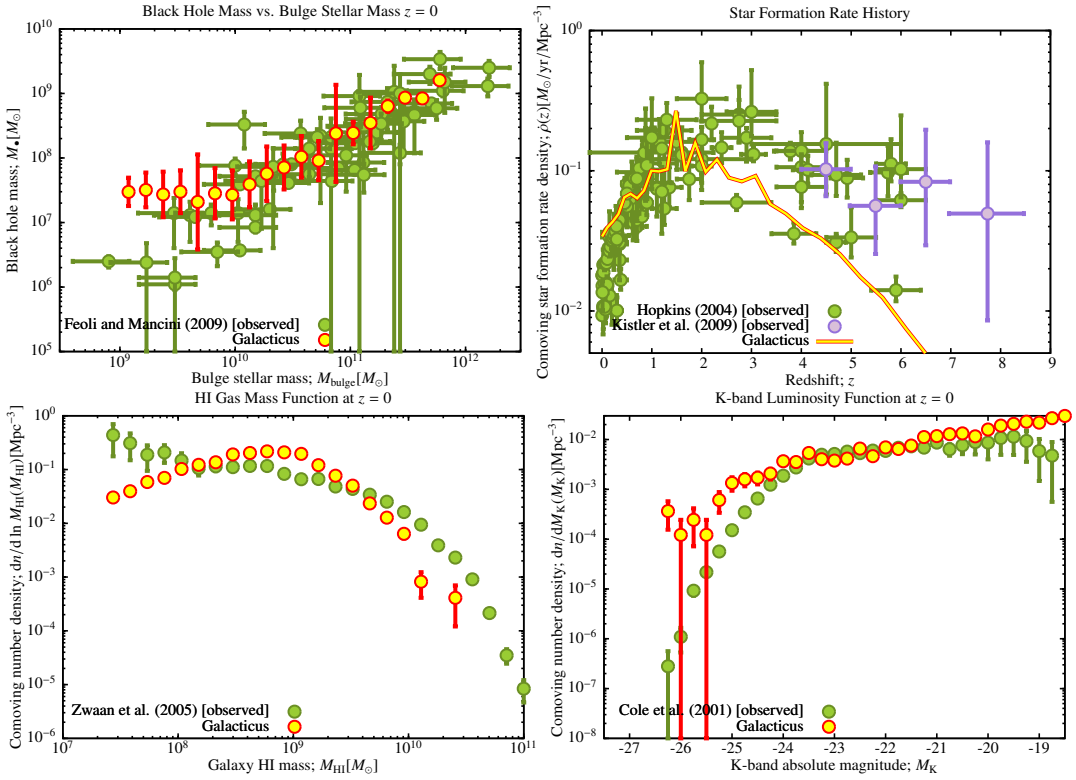
```
Fatal error in Cosmology_Age_Matter_Lambda():
expansion factor is invalid
```

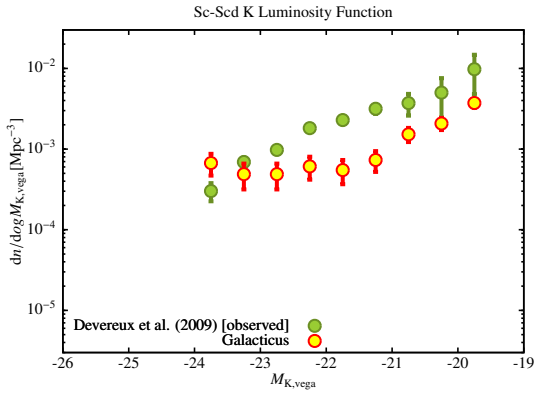
is being galacticussed
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

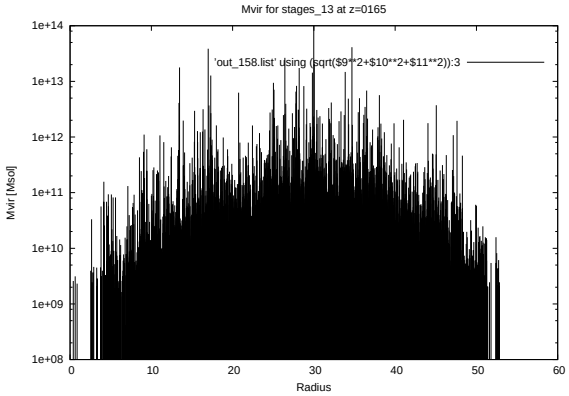
stages_13

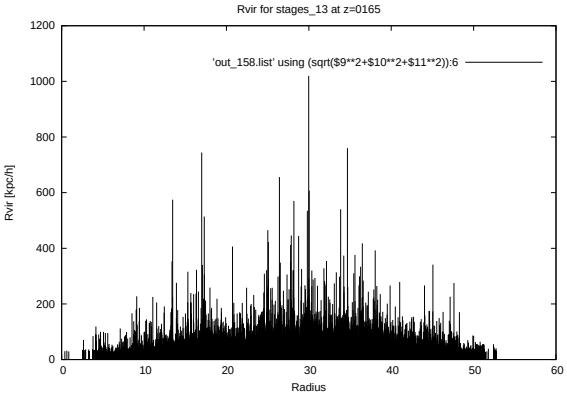


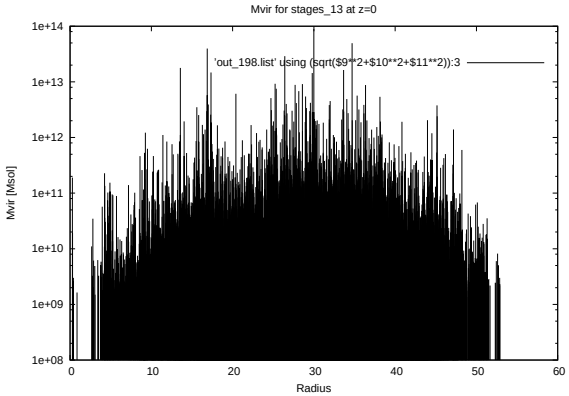

Power Spectra for IC and final snapshot of Simulation stages_13, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
0.001
0.01
0.1
1
10

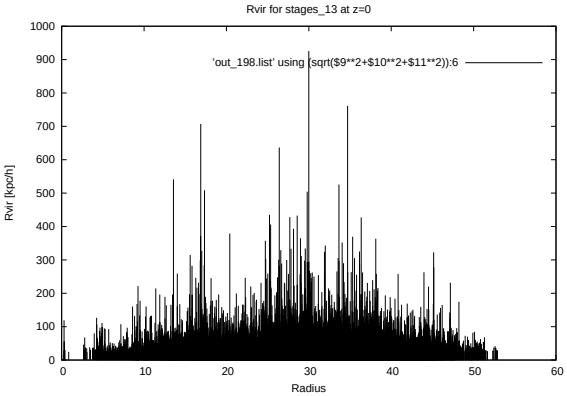

Black Hole Mass vs. Bulge Stellar Mass z = 0
Black hole mass; $M_\bullet[M_\odot]$
Bulge stellar mass; $M_{\rm bulge}[M_\odot]$
Feoli and Mancini (2009) [observed]
Galacticus
Star Formation Rate History
Comoving star formation rate density; $\dot\rho(z)[M_\odot/{\rm yr}/{\rm Mpc}^3]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus
HI Gas Mass Function at z = 0
Comoving number density; $dn/d\ln M_{\rm HI}(M_{\rm HI})[{\rm Mpc}^{-3}]$
Galaxy HI mass; $M_{\rm HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus
K-band Luminosity Function at z = 0
Comoving number density; $dn/(dM_{\rm K}(M_{\rm K})[{\rm Mpc}^{-3}]$
K-band absolute magnitude; $M_{\rm K}$
Cole et al. (2001) [observed]
Galacticus

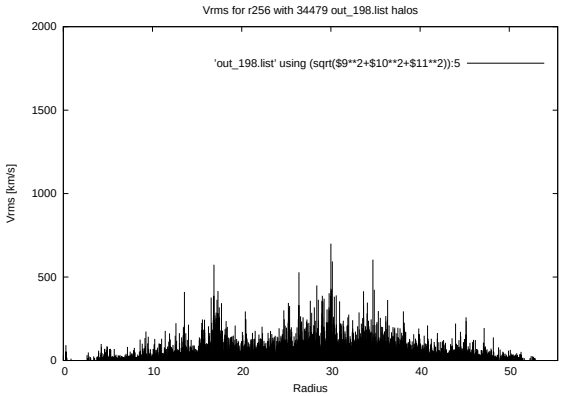

Sc-Scd K Luminosity Function
Devereux et al. (2009) [observed]
Galacticus
$M_{K,vega}$
$dn/d\sigma_g M_{K,vega}$ [Mpc^{-3}]

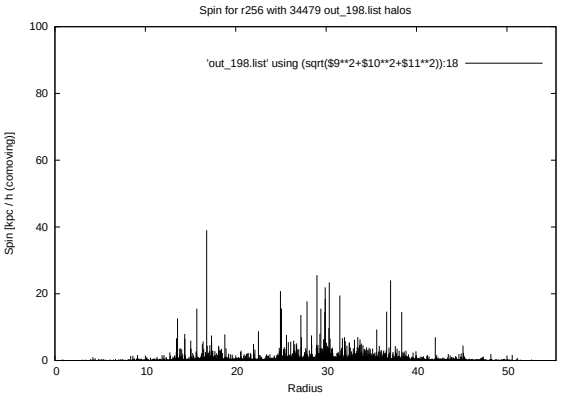

Mvir for stages_13 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for stages_13 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for stages_13 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for stages_13 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Vrms for r256 with 34479 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

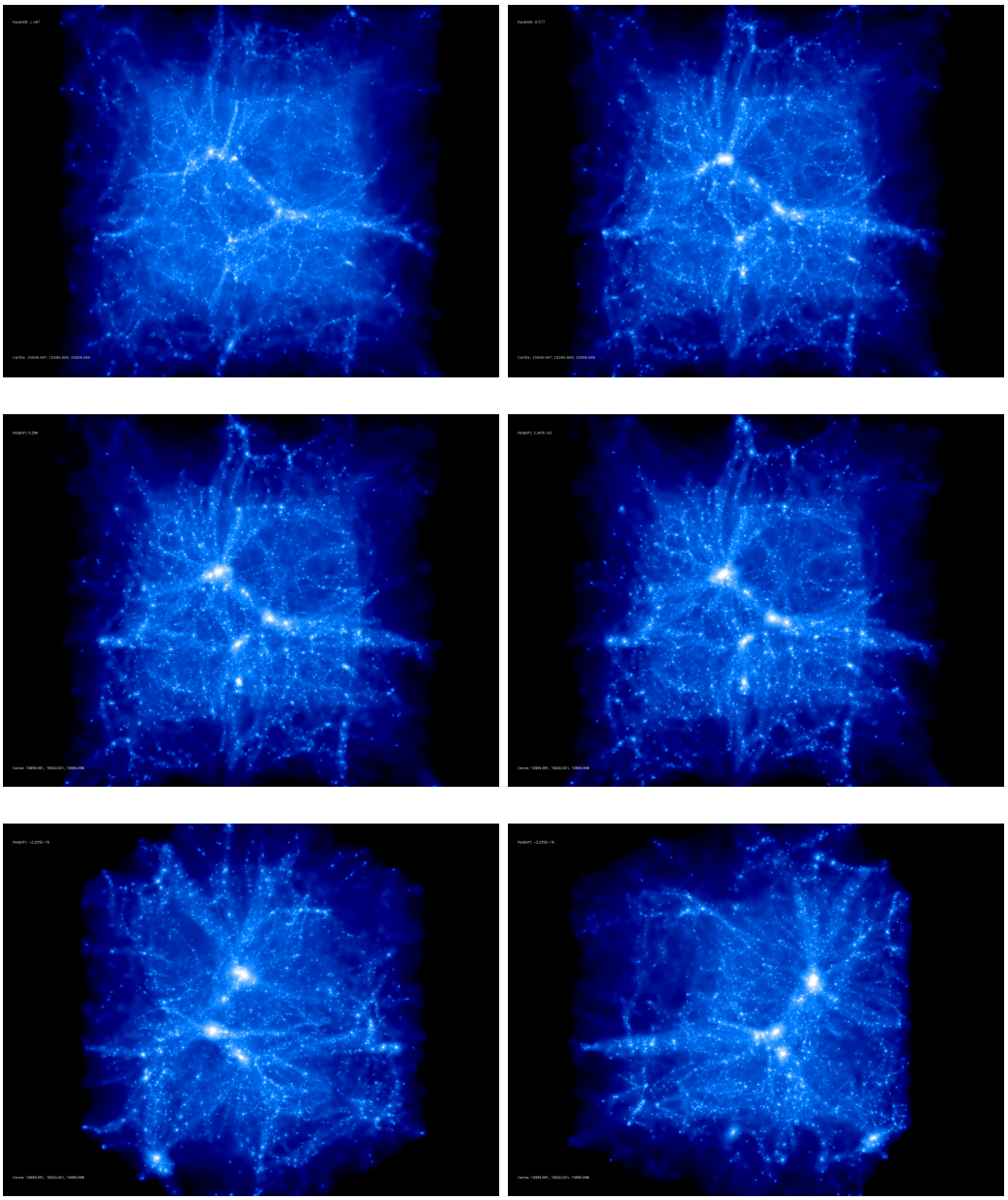

Spin for r256 with 34479 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

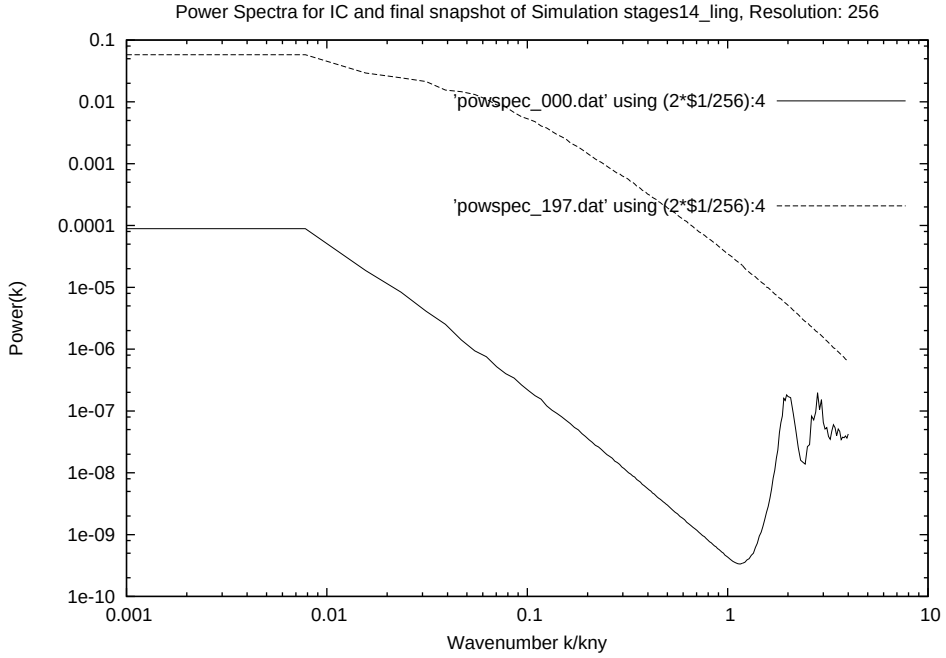
GALACTICUSSED $\surd$
after Markus converter update is being galacticussed again
galacticus strange error:

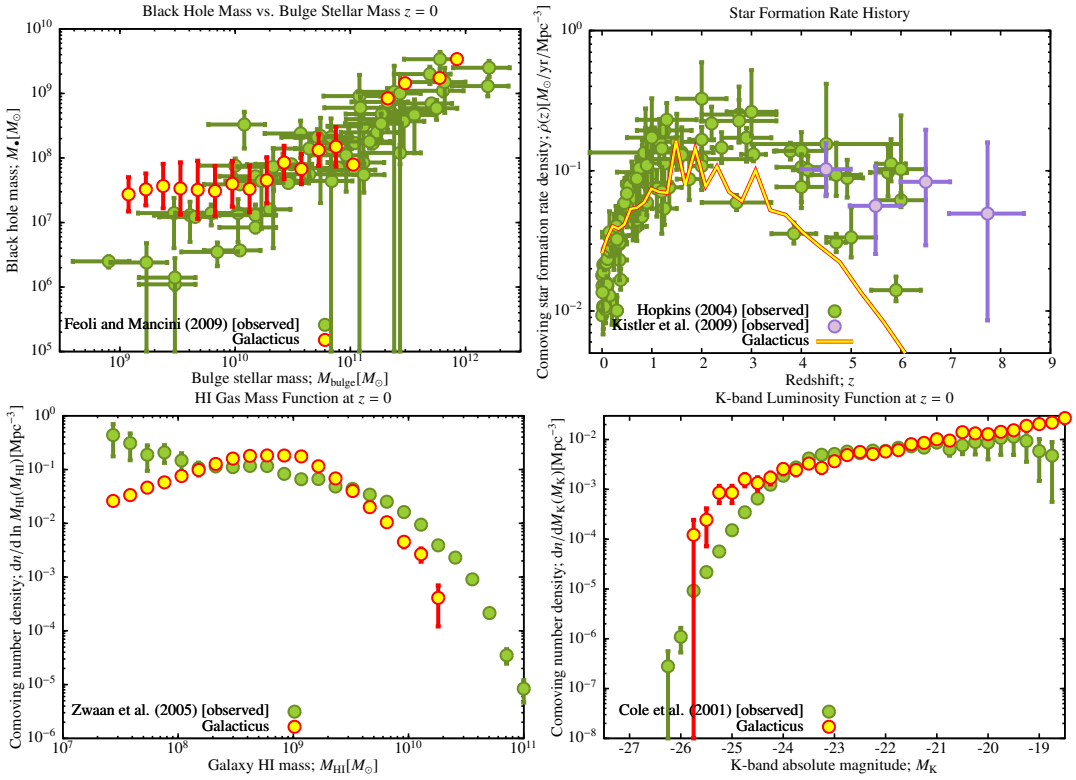
```
Fatal error in Cosmology_Age_Matter_Lambda():
expansion factor is invalid
```

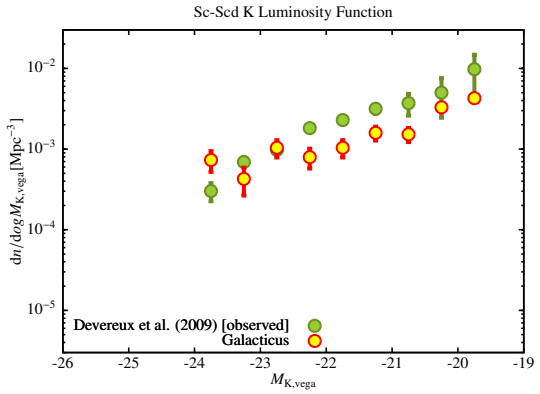
is being galacticussed
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

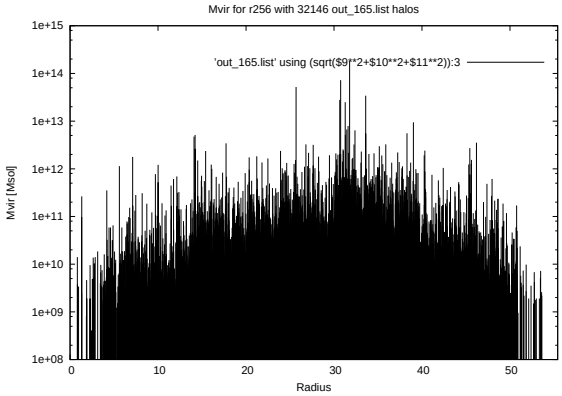
stages14_ling

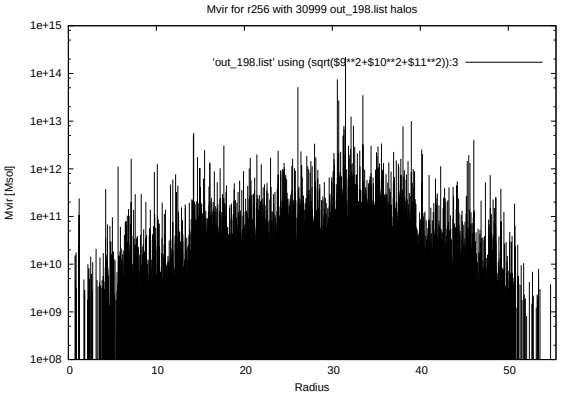


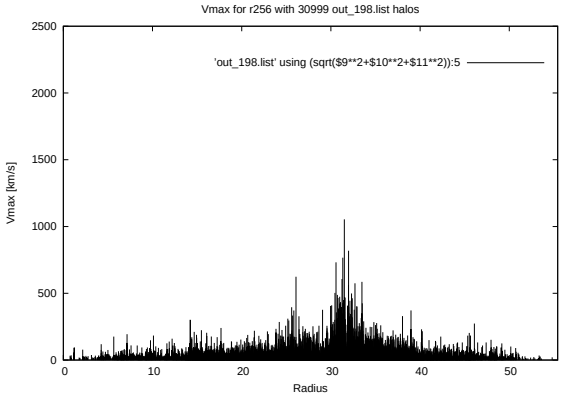

Power Spectra for IC and final snapshot of Simulation stages14_ling, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
0.001
0.01
0.1
1
10

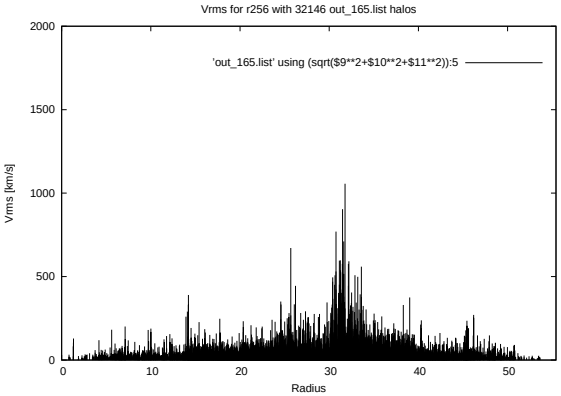

Black Hole Mass vs. Bulge Stellar Mass $z = 0$
Black hole mass; $M_\bullet[M_\odot]$
Bulge stellar mass; $M_{\rm bulge}[M_\odot]$
Feoli and Mancini (2009) [observed]
Galacticus
Star Formation Rate History
Comoving star formation rate density; $\dot{\rho}(z)[M_\odot/{\rm yr}/{\rm Mpc}^3]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus
HI Gas Mass Function at $z = 0$
Comoving number density; ${\rm d}n/{\rm d}\ln M_{\rm HI}(M_{\rm HI})[{\rm Mpc}^{-3}]$
Galaxy HI mass; $M_{\rm HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus
K-band Luminosity Function at $z = 0$
Comoving number density; ${\rm d}n/({\rm d}M_{\rm K}(M_{\rm K})[{\rm Mpc}^{-3}]$
K-band absolute magnitude; $M_{\rm K}$
Cole et al. (2001) [observed]
Galacticus

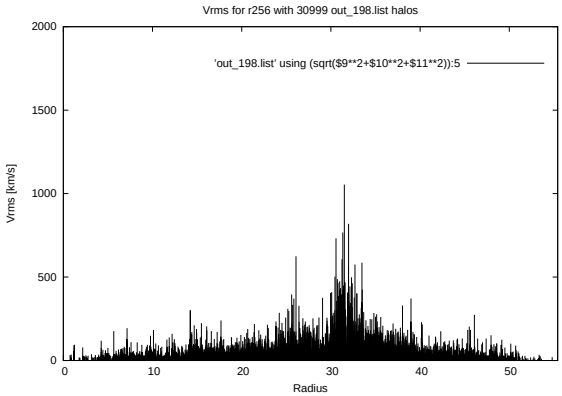

Sc-Scd K Luminosity Function
Devereux et al. (2009) [observed]
Galacticus
$M_{K,vega}$
$dn/d\sigma g M_{K,vega}$ [Mpc^{-3}]

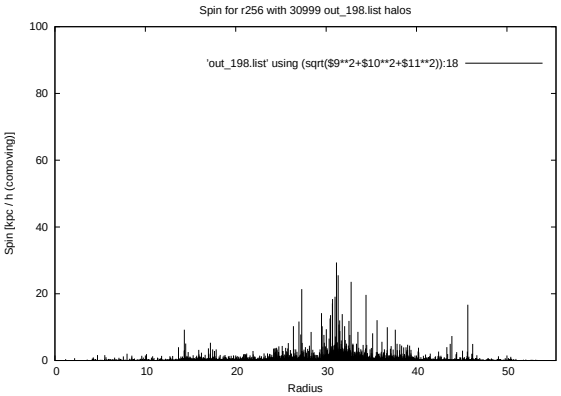

Mvir for r256 with 32146 out_165.list halos
'out_165.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Mvir for r256 with 30999 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Vmax for r256 with 30999 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vmax [km/s]
Radius

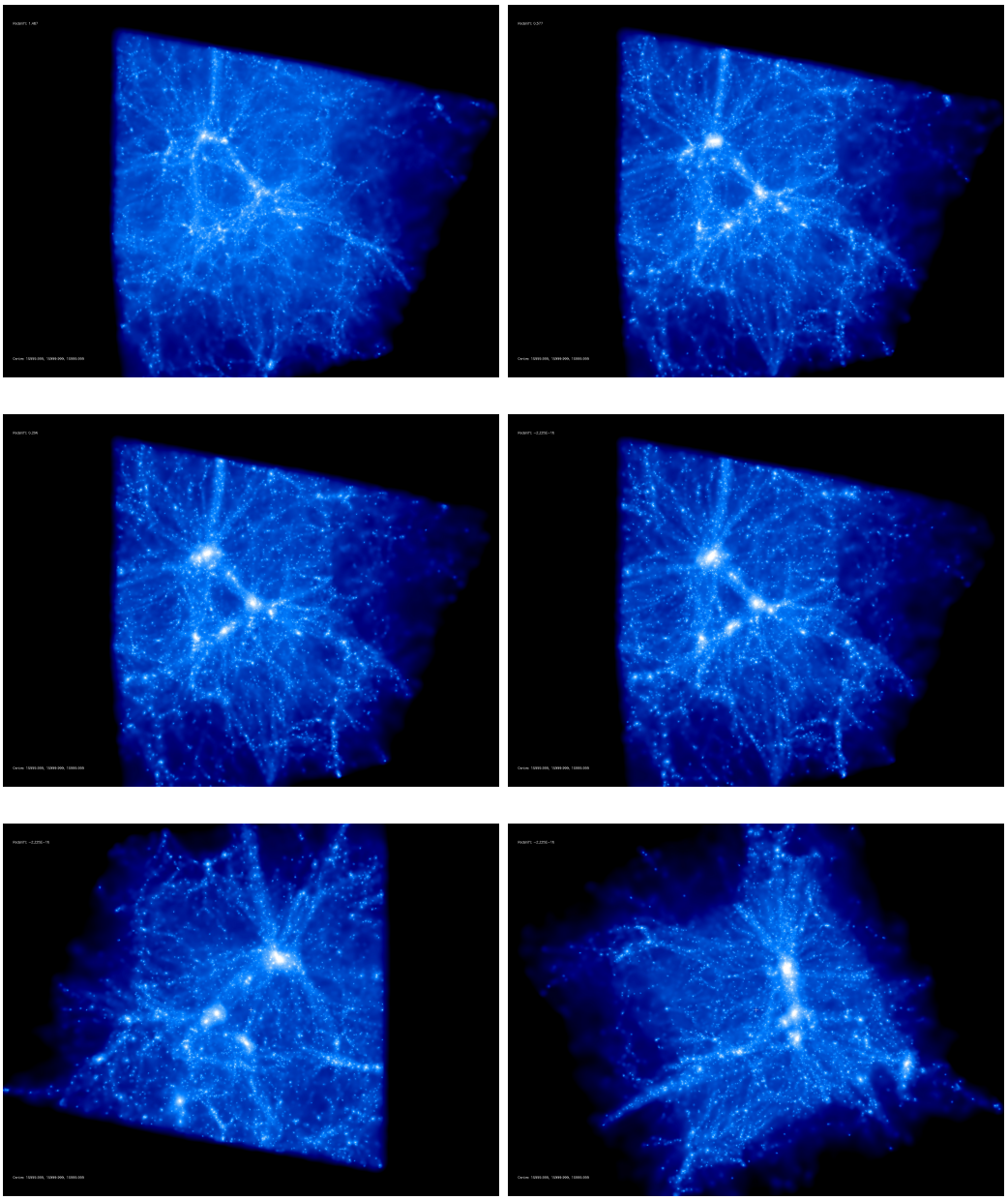

Vrms for r256 with 32146 out_165.list halos
'out_165.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

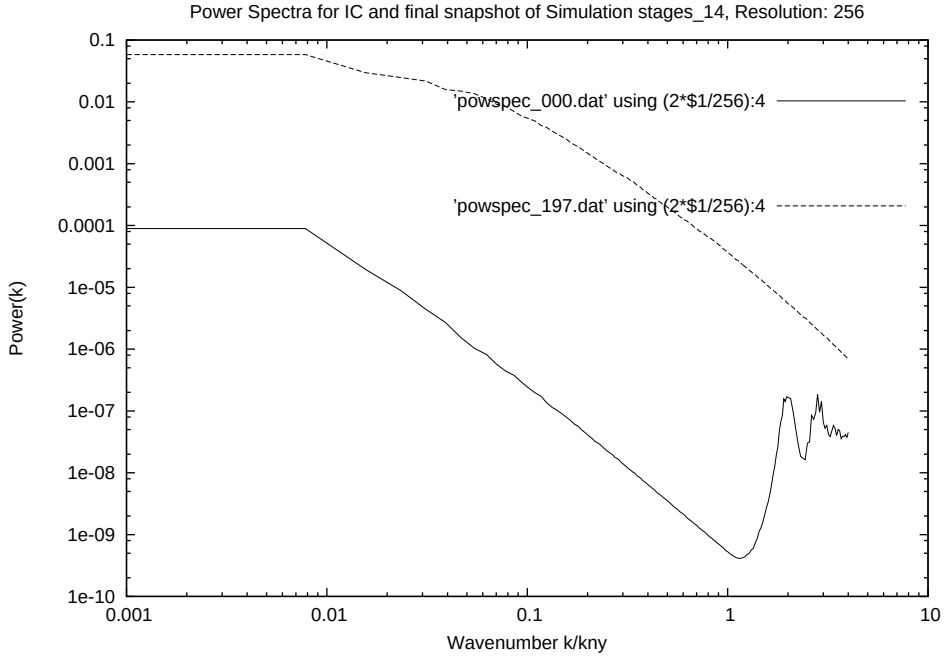

Vrms for r256 with 30999 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

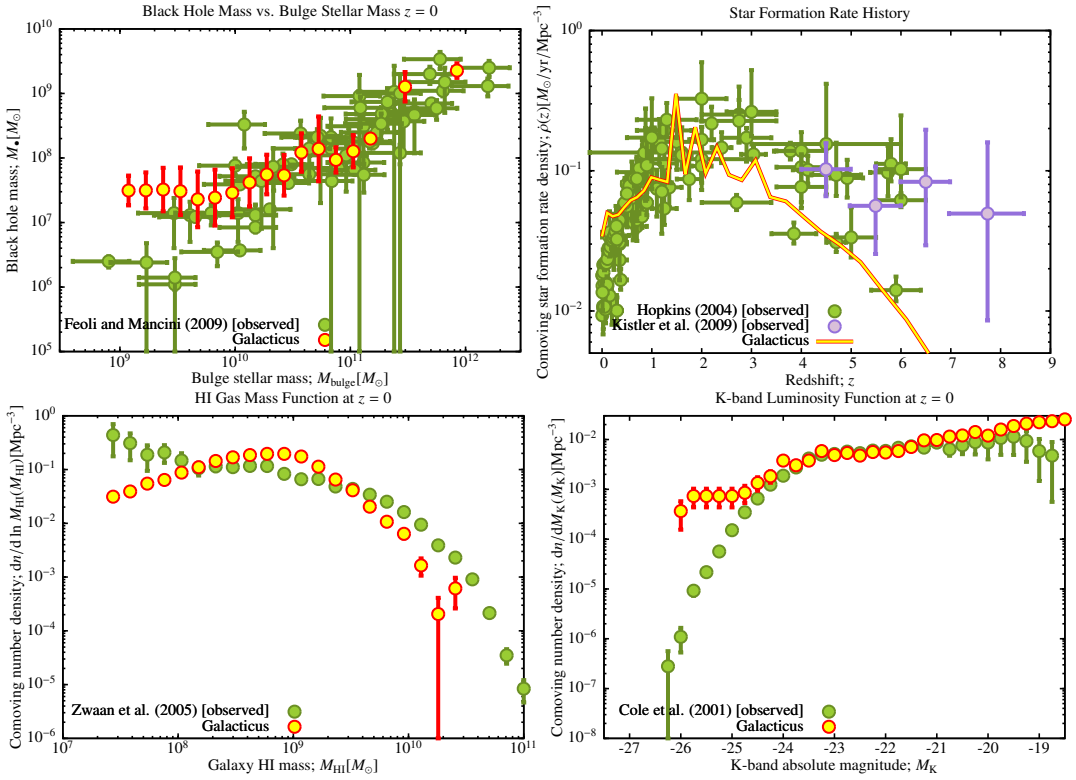

Spin for r256 with 30999 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

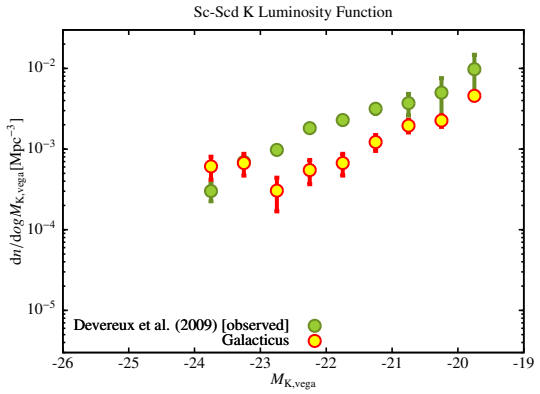
GALACTICUSSED $\surd$
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

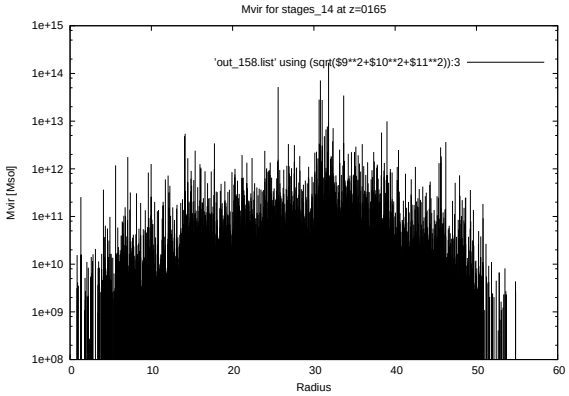
stages_14

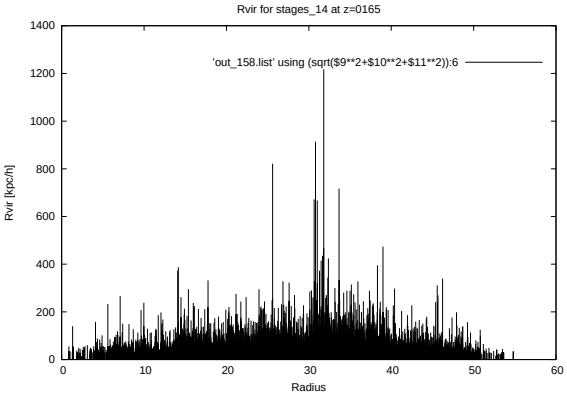


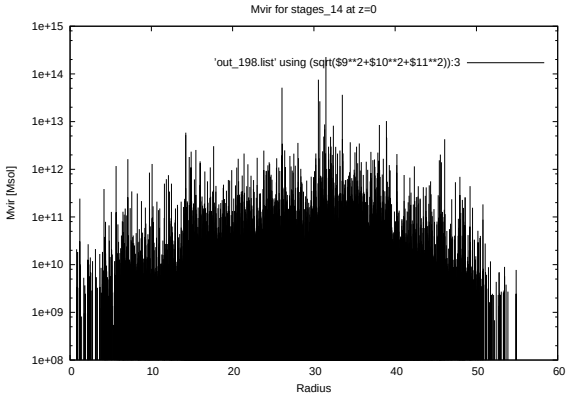

Power Spectra for IC and final snapshot of Simulation stages_14, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
0.001
0.01
0.1
1
10

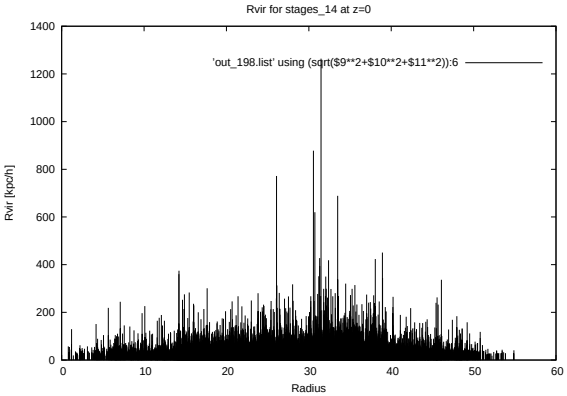

Black Hole Mass vs. Bulge Stellar Mass z = 0
Black hole mass; $M_\bullet[M_\odot]$
Bulge stellar mass; $M_{\rm bulge}[M_\odot]$
Feoli and Mancini (2009) [observed]
Galacticus
Star Formation Rate History
Comoving star formation rate density; $\dot{\rho}(z)[M_\odot/{\rm yr}/{\rm Mpc}^3]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus
HI Gas Mass Function at z = 0
Comoving number density; $dn/d\ln M_{\rm HI}(M_{\rm HI})[{\rm Mpc}^{-3}]$
Galaxy HI mass; $M_{\rm HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus
K-band Luminosity Function at z = 0
Comoving number density; $dn/(dM_{\rm K}(M_{\rm K})[{\rm Mpc}^{-3}]$
K-band absolute magnitude; $M_{\rm K}$
Cole et al. (2001) [observed]
Galacticus

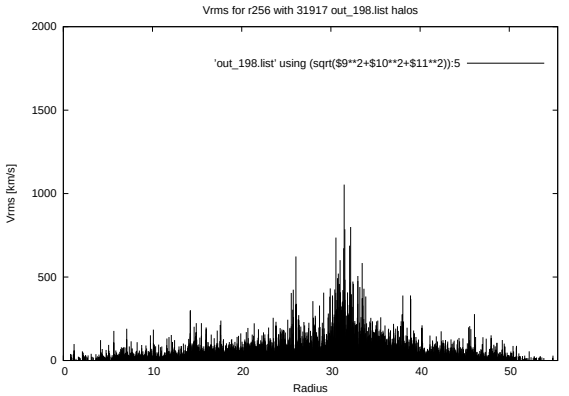

Sc-Scd K Luminosity Function
Devereux et al. (2009) [observed]
Galacticus
$M_{K,vega}$
$dn/d\sigma g M_{K,vega}$ [Mpc^{-3}]

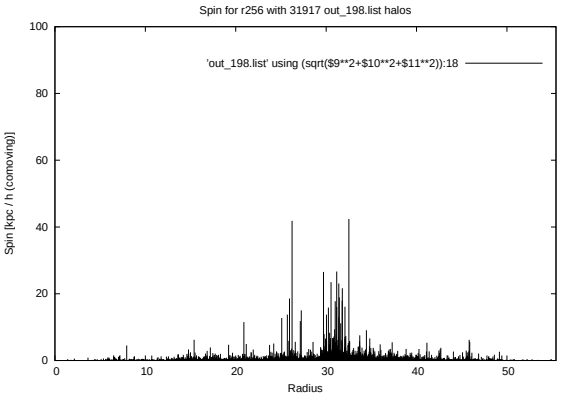

Mvir for stages_14 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for stages_14 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for stages_14 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius

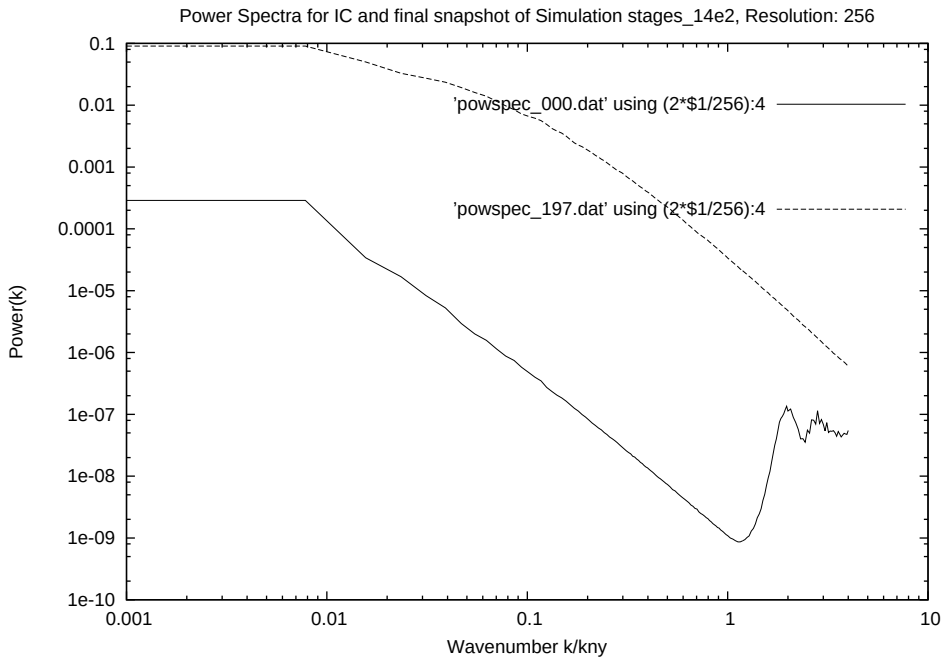

Rvir for stages_14 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Vrms for r256 with 31917 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

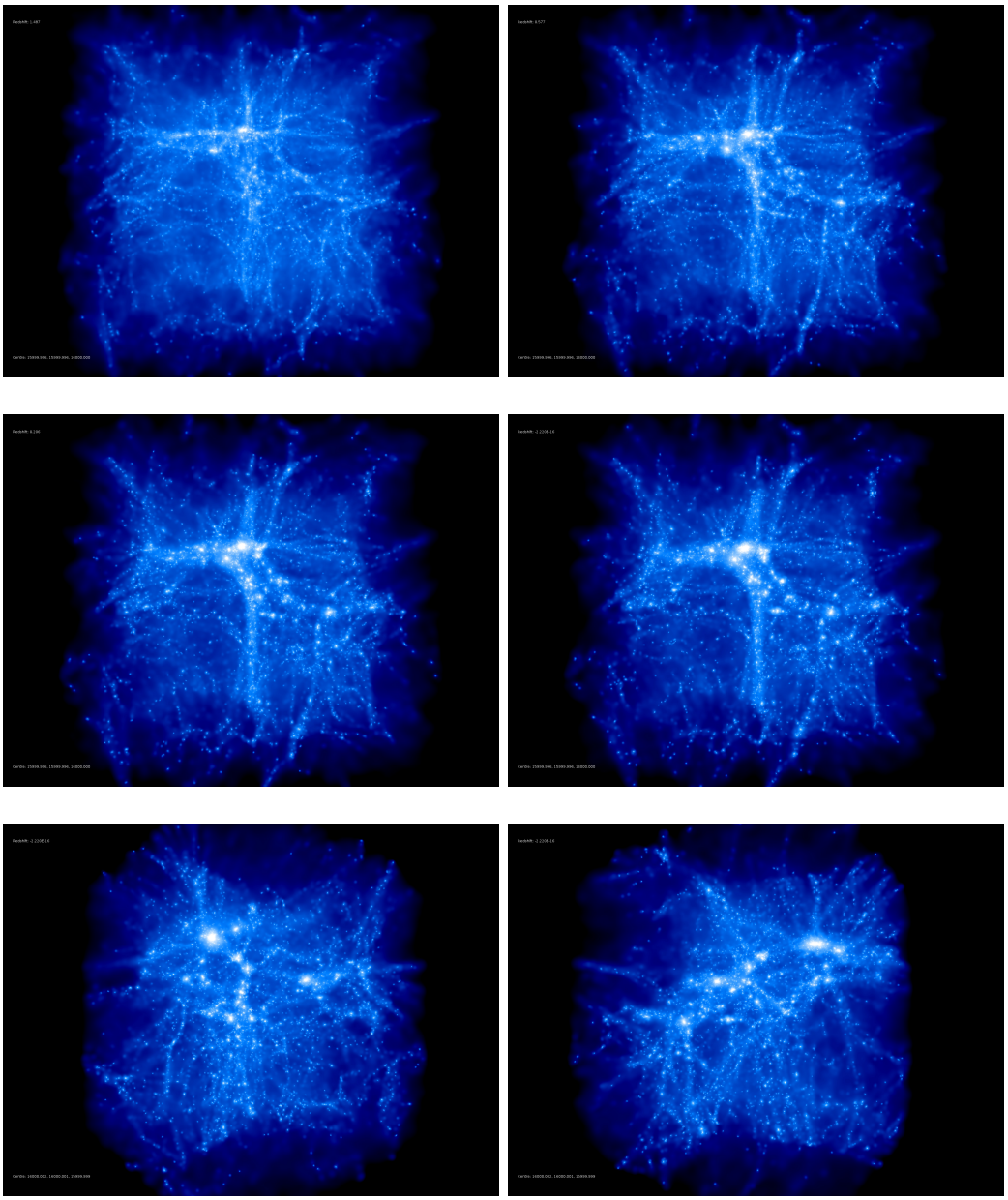

Spin for r256 with 31917 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

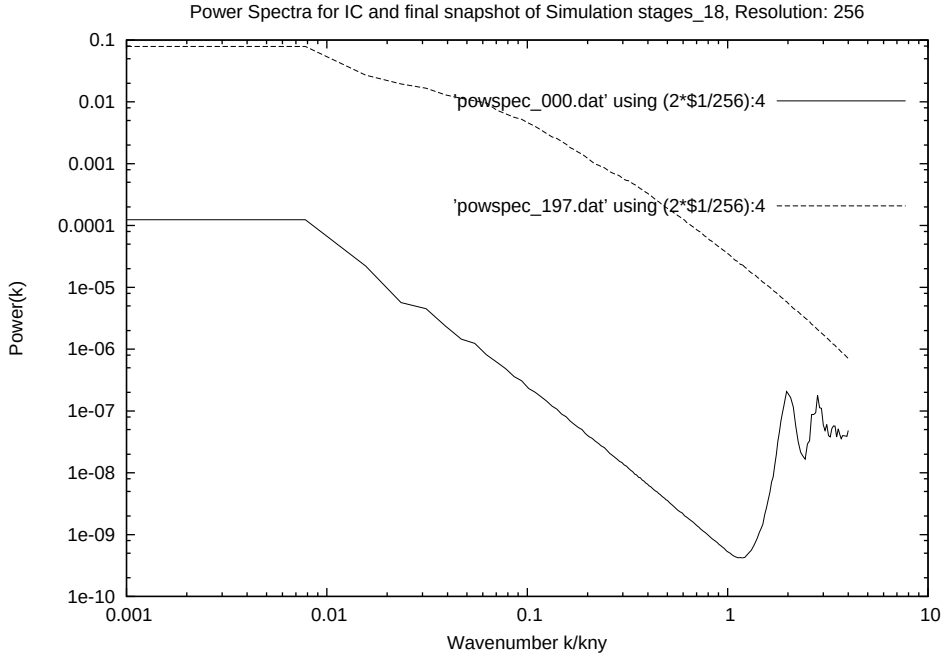
GALACTICUSSED $\surd$
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

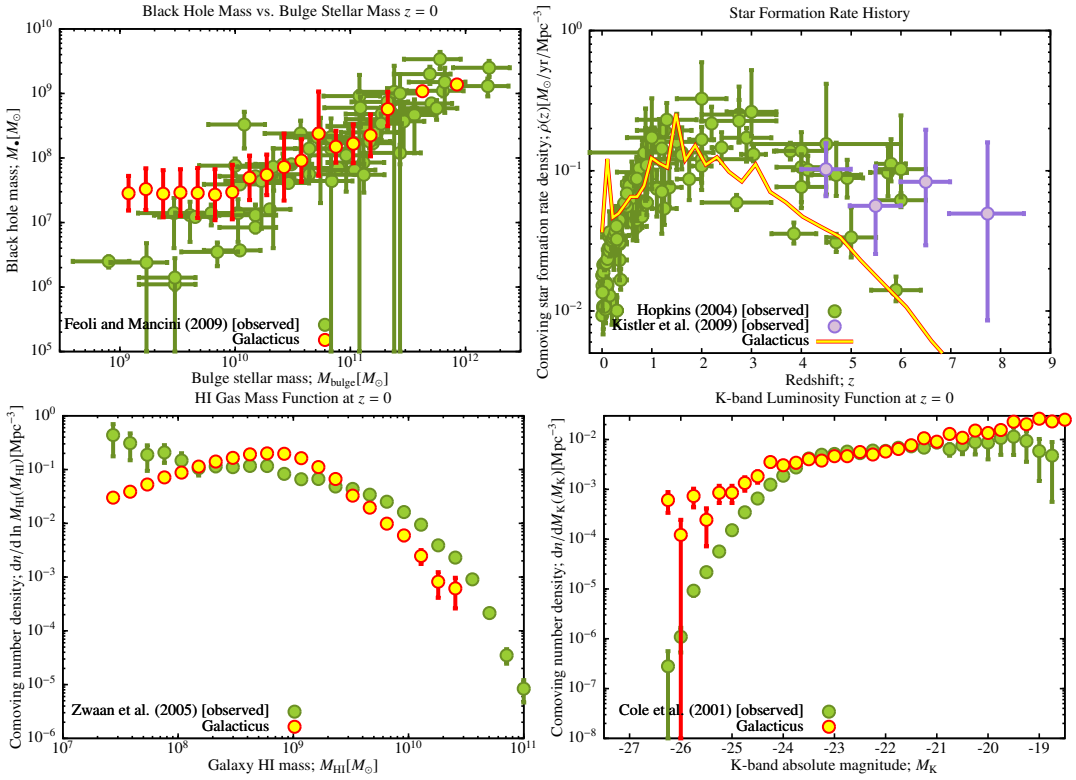
stages_14e

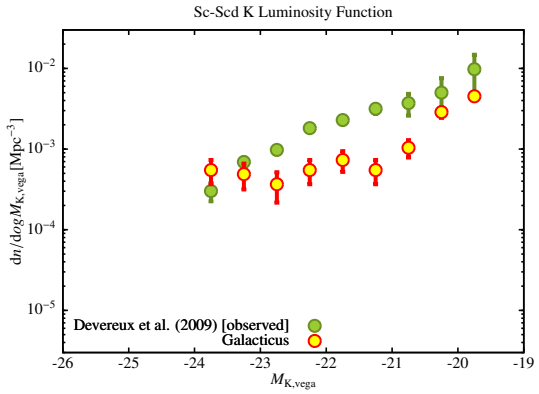

Power Spectra for IC and final snapshot of Simulation stages_14e2, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
0.001
0.01
0.1
1
10

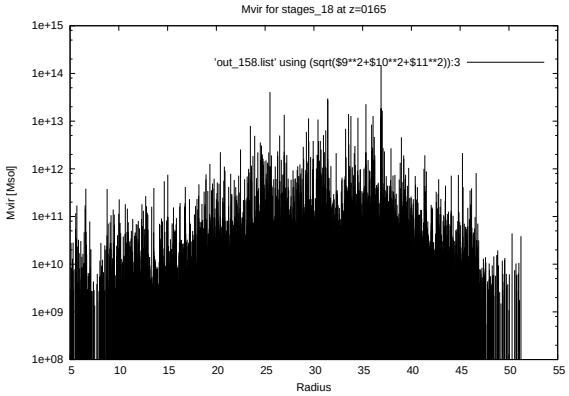
stages_18

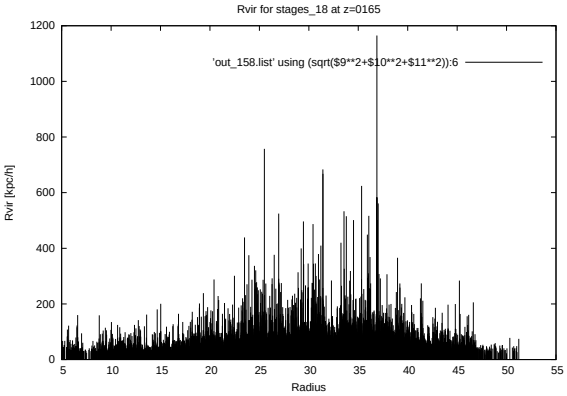


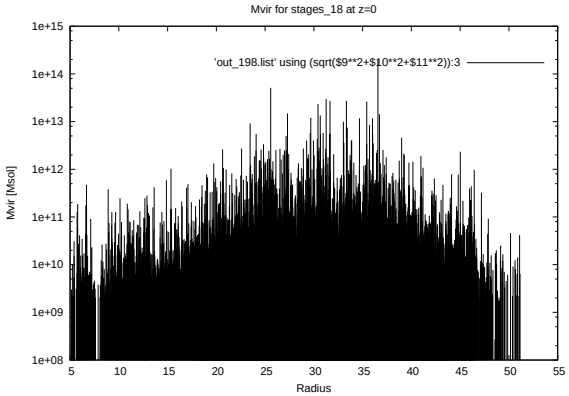

Power Spectra for IC and final snapshot of Simulation stages_18, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
0.001
0.01
0.1
1
10

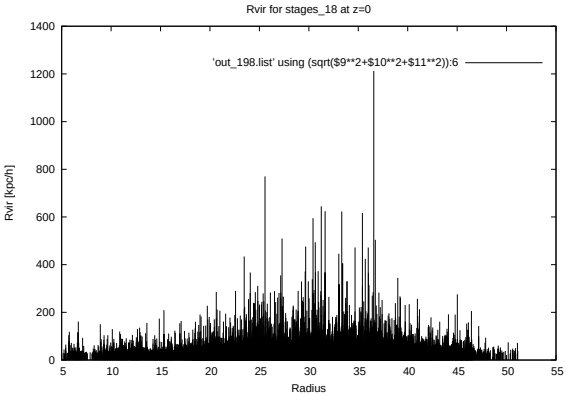

Black Hole Mass vs. Bulge Stellar Mass z = 0
Black hole mass; M•[M⊙]
Bulge stellar mass; Mbulge[M⊙]
Feoli and Mancini (2009) [observed]
Galacticus
Star Formation Rate History
Comoving star formation rate density; ρ̇(z)[M⊙/yr/Mpc3]
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus
HI Gas Mass Function at z = 0
Comoving number density; dn/d ln MHI(MHI)[Mpc−3]
Galaxy HI mass; MHI[M⊙]
Zwaan et al. (2005) [observed]
Galacticus
K-band Luminosity Function at z = 0
Comoving number density; dn/(dMK(MK)[Mpc−3]
K-band absolute magnitude; MK
Cole et al. (2001) [observed]
Galacticus

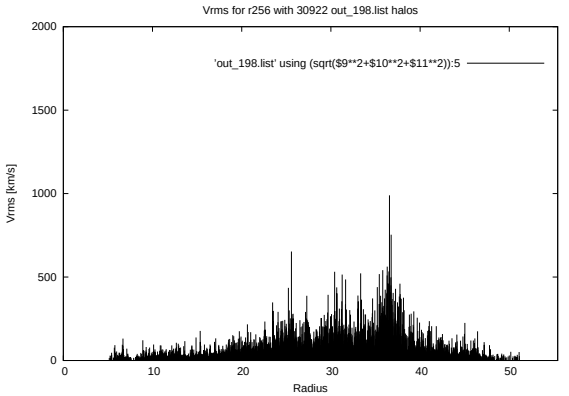

Sc-Scd K Luminosity Function
Devereux et al. (2009) [observed]
Galacticus
$M_{K,vega}$

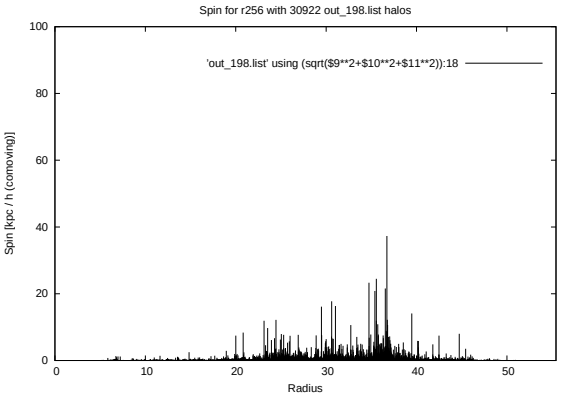

Mvir for stages_18 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for stages_18 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for stages_18 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius

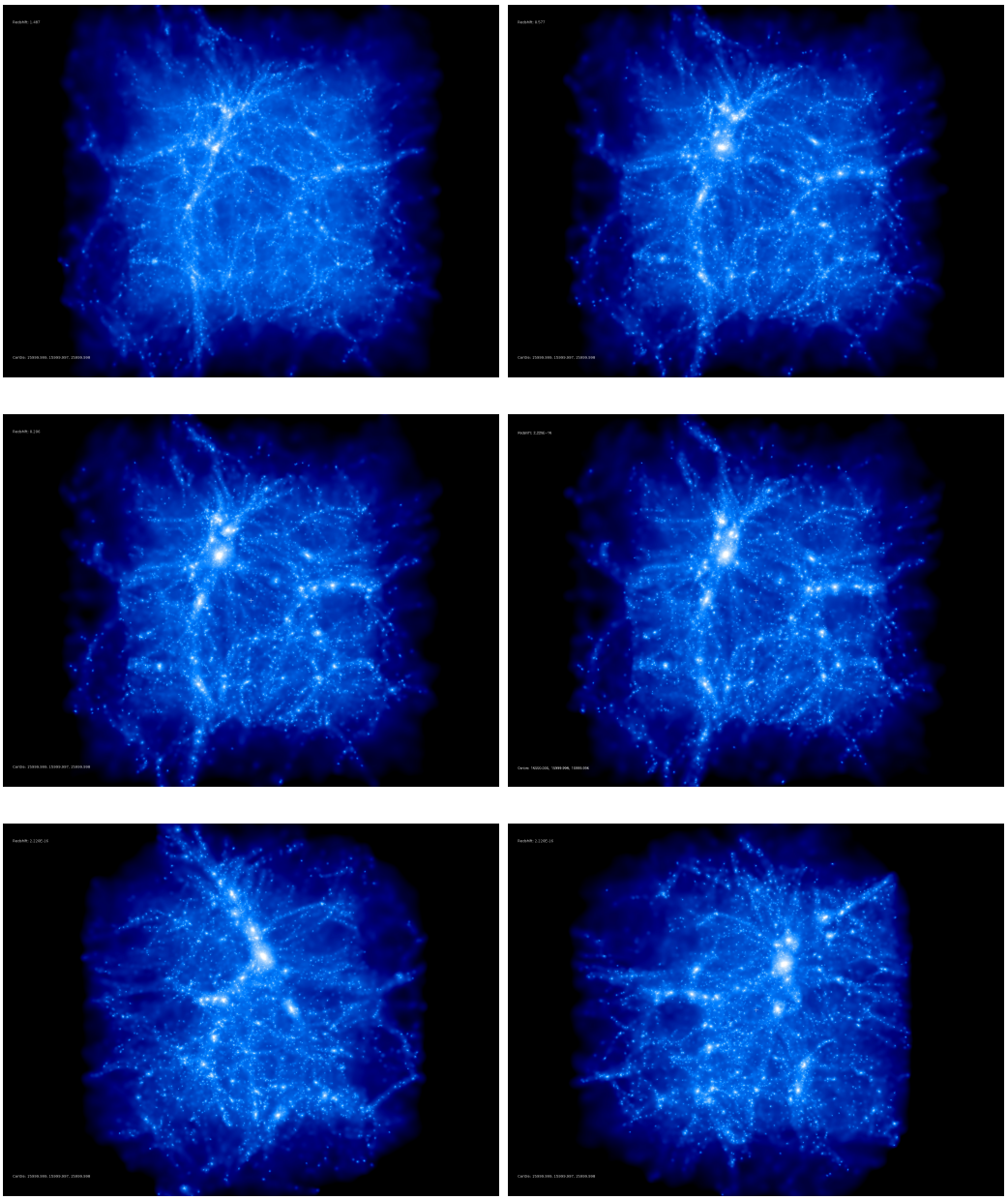

Rvir for stages_18 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius

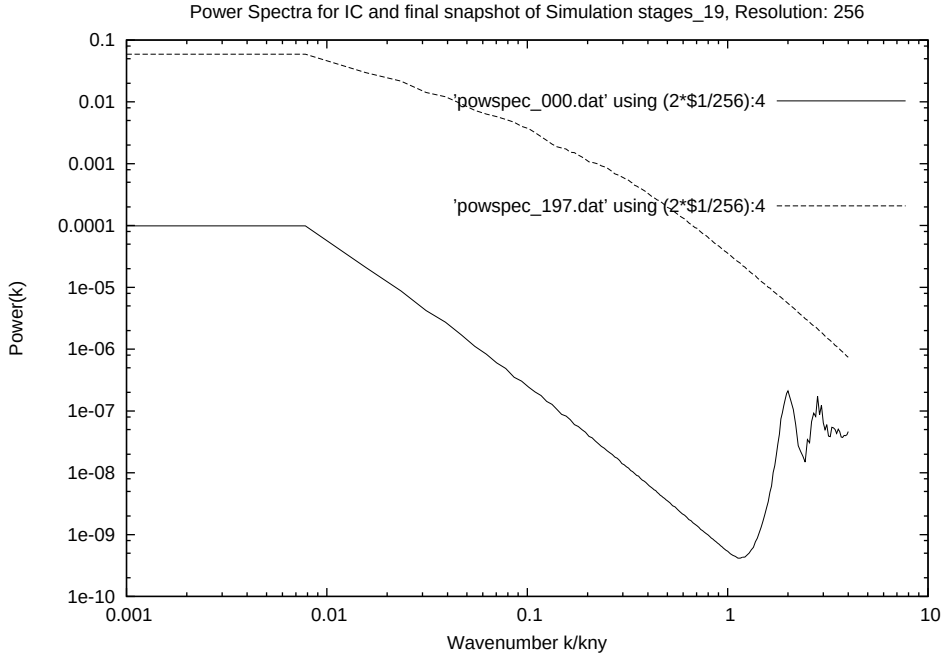

Vrms for r256 with 30922 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

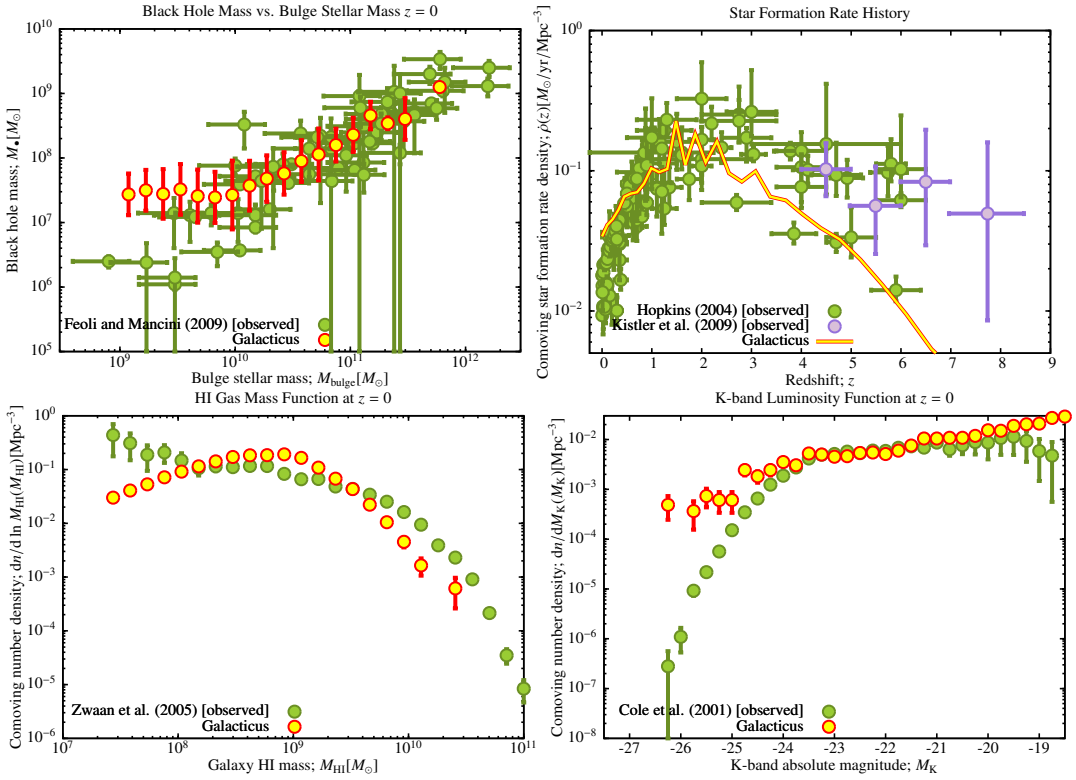

Spin for r256 with 30922 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

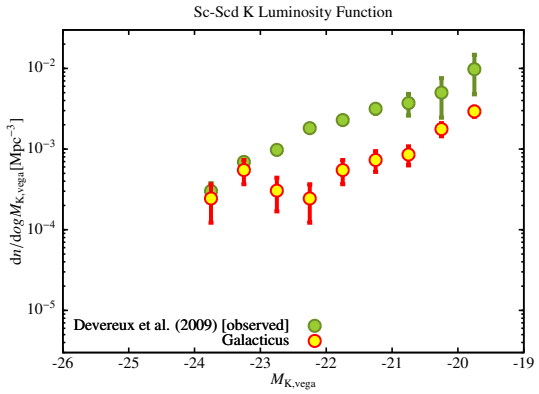
GALACTICUSSED $\surd$
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

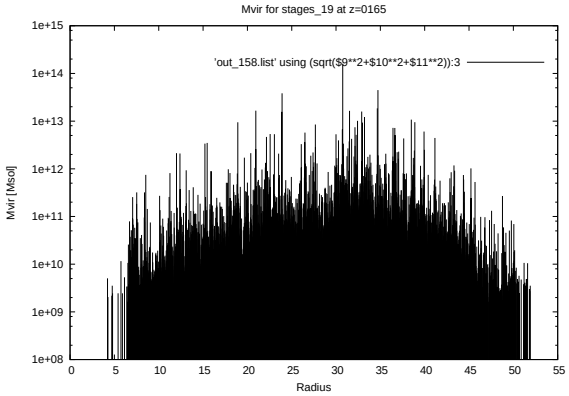
stages_19

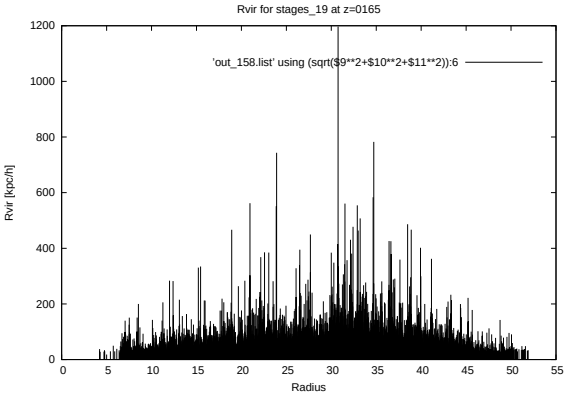


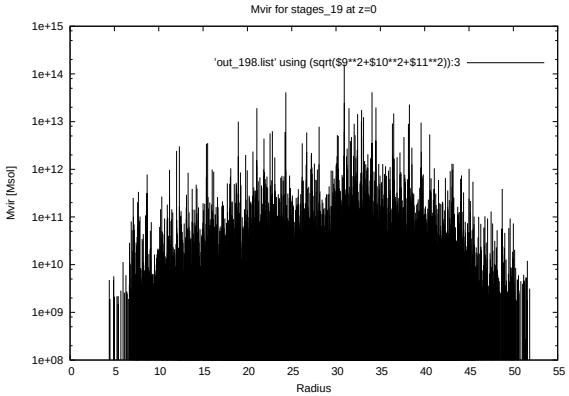

Power Spectra for IC and final snapshot of Simulation stages_19, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
0.001
0.01
0.1
1
10

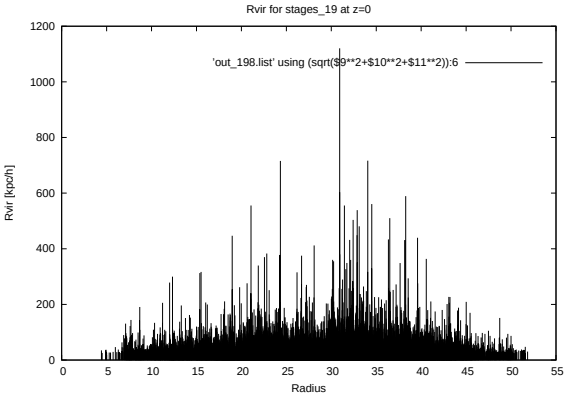

Black Hole Mass vs. Bulge Stellar Mass z = 0
Black hole mass; $M_\bullet[M_\odot]$
Bulge stellar mass; $M_{\rm bulge}[M_\odot]$
Feoli and Mancini (2009) [observed]
Galacticus
Star Formation Rate History
Comoving star formation rate density; $\dot{\rho}(z)[M_\odot/{\rm yr}/{\rm Mpc}^3]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus
HI Gas Mass Function at z = 0
Comoving number density; $dn/d\ln M_{\rm HI}(M_{\rm HI})[{\rm Mpc}^{-3}]$
Galaxy HI mass; $M_{\rm HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus
K-band Luminosity Function at z = 0
Comoving number density; $dn/(dM_{\rm K}(M_{\rm K})[{\rm Mpc}^{-3}]$
K-band absolute magnitude; $M_{\rm K}$
Cole et al. (2001) [observed]
Galacticus





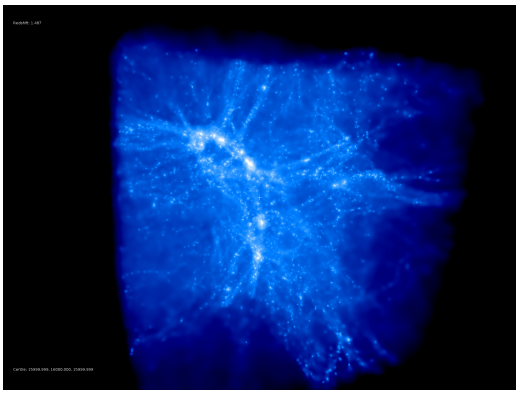
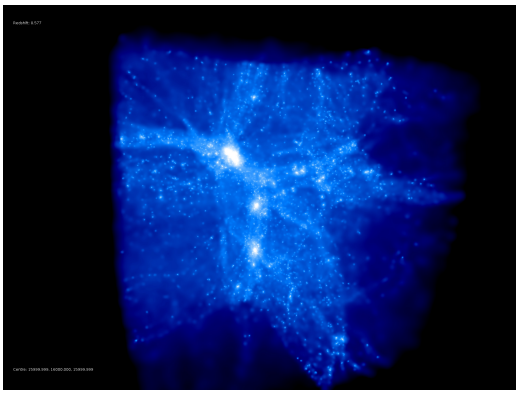
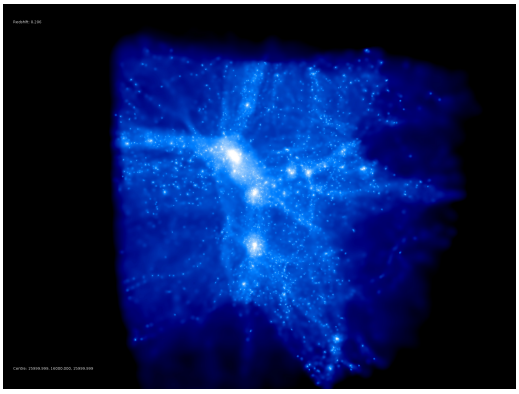
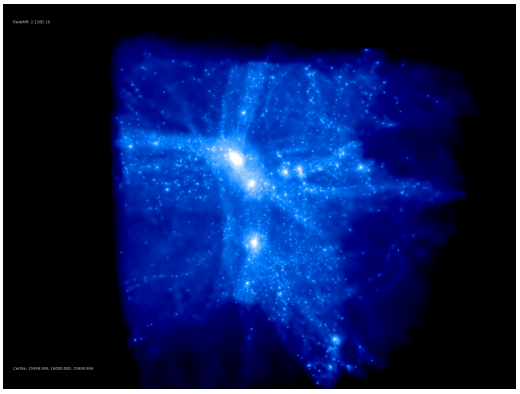
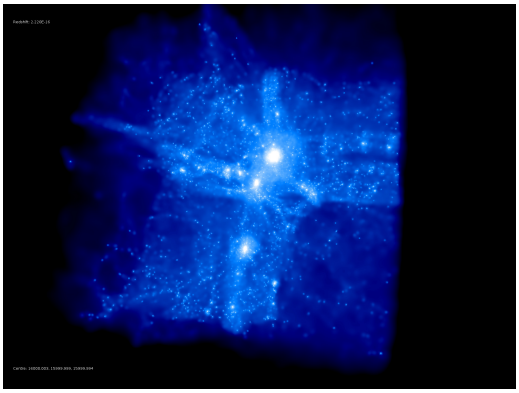
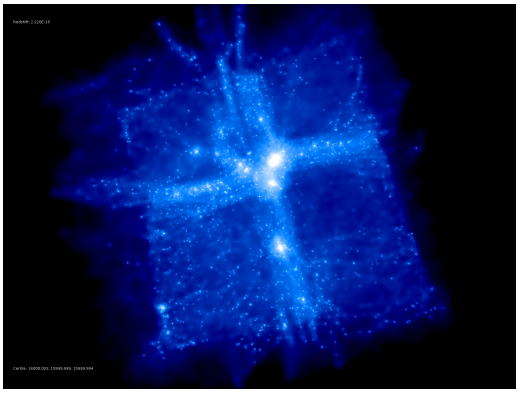


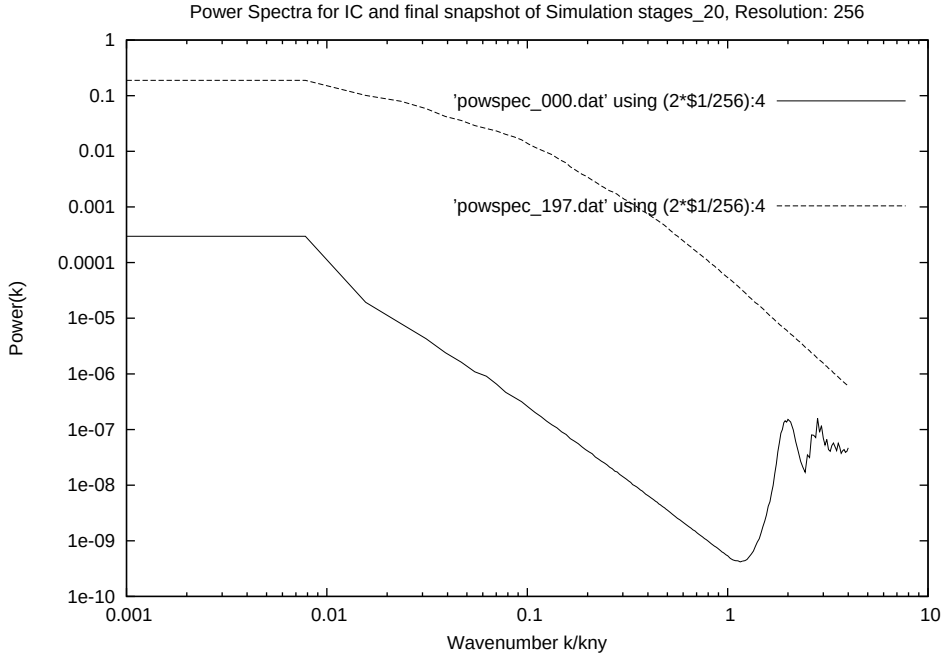


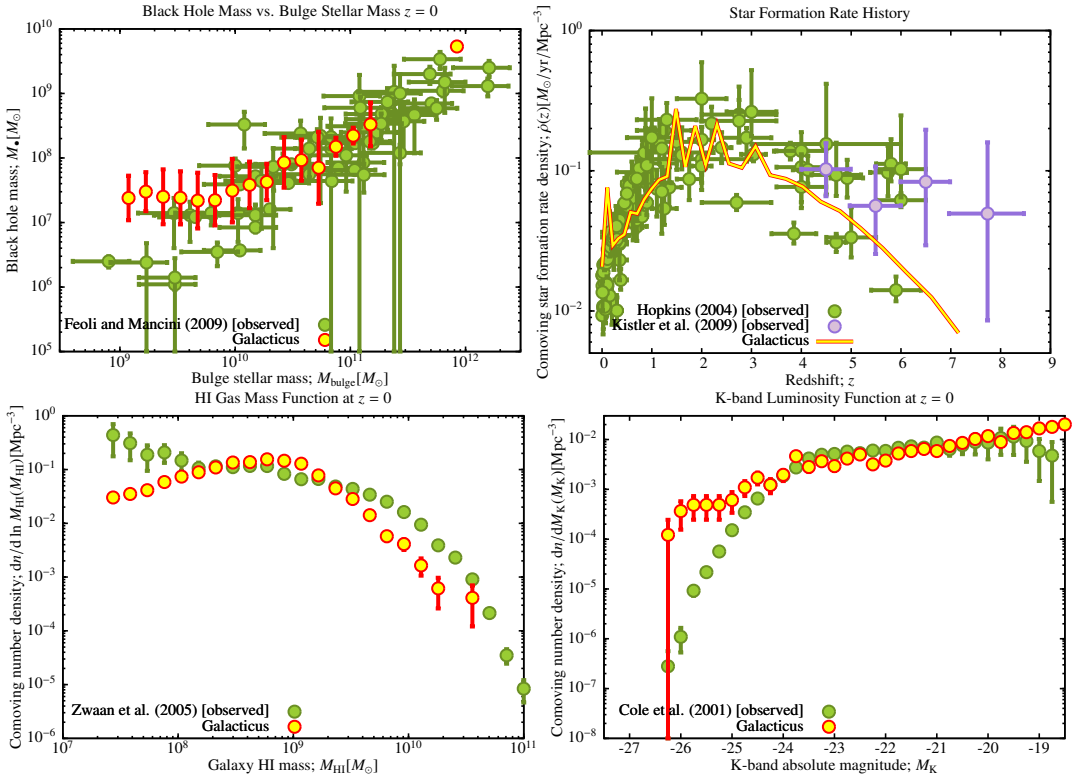


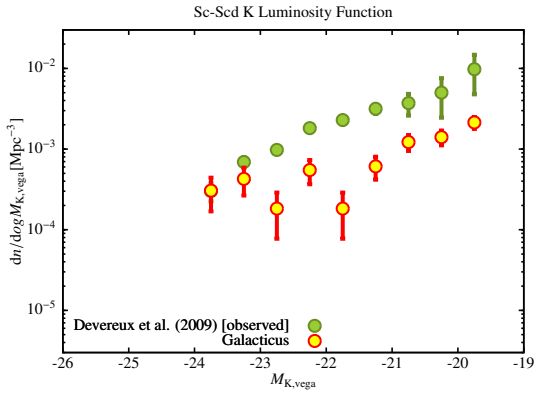
GALACTICUSSED $\surd$
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

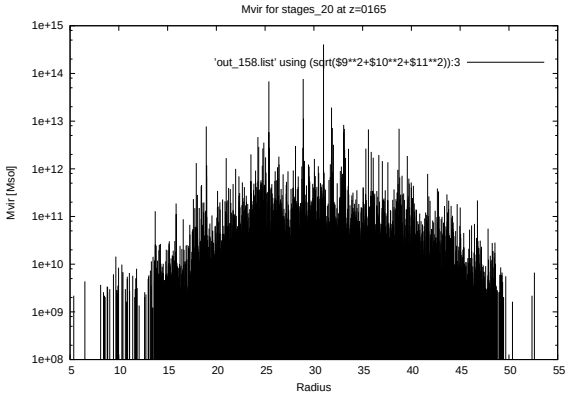
stages_20

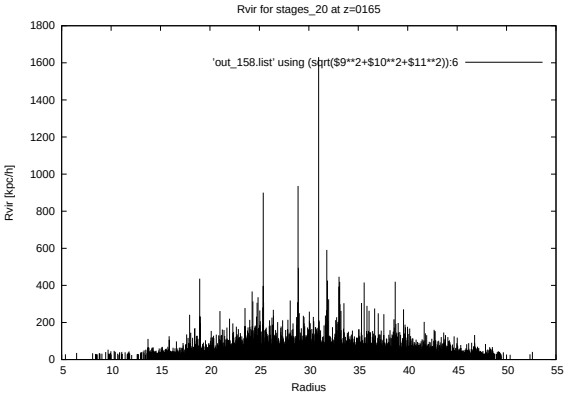







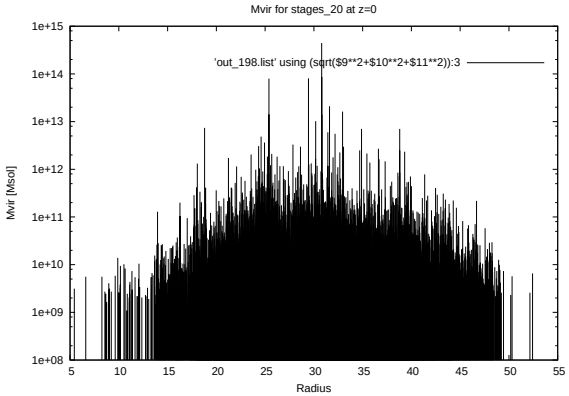

Power Spectra for IC and final snapshot of Simulation stages_20, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny

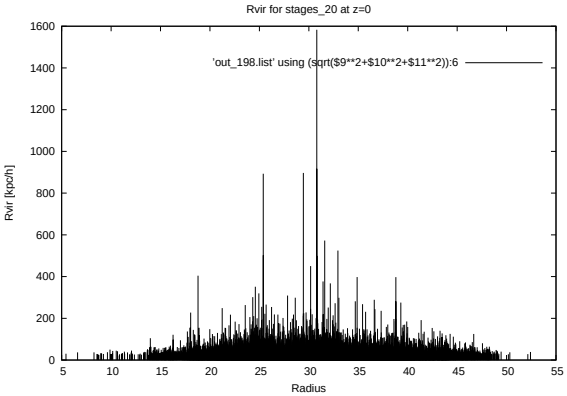

Black Hole Mass vs. Bulge Stellar Mass z = 0
Feoli and Mancini (2009) [observed]
Galacticus
Bulge stellar mass; $M_{bulge}[M_\odot]$
Star Formation Rate History
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus
Redshift; z
HI Gas Mass Function at z = 0
Zwaan et al. (2005) [observed]
Galacticus
Galaxy HI mass; $M_{HI}[M_\odot]$
K-band Luminosity Function at z = 0
Cole et al. (2001) [observed]
Galacticus
K-band absolute magnitude; M_K

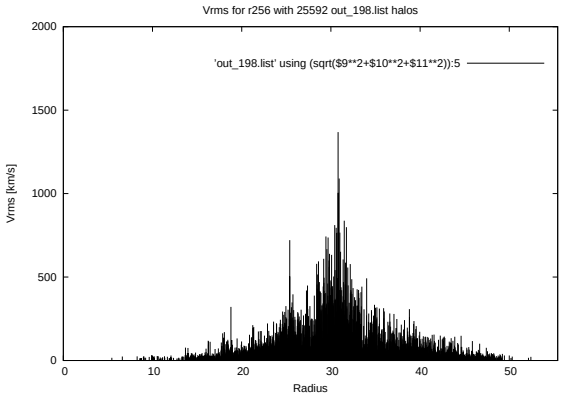

Sc-Scd K Luminosity Function
Devereux et al. (2009) [observed]
Galacticus
$M_{K,vega}$
$dn/d\log M_{K,vega}$ [Mpc^{-3}]

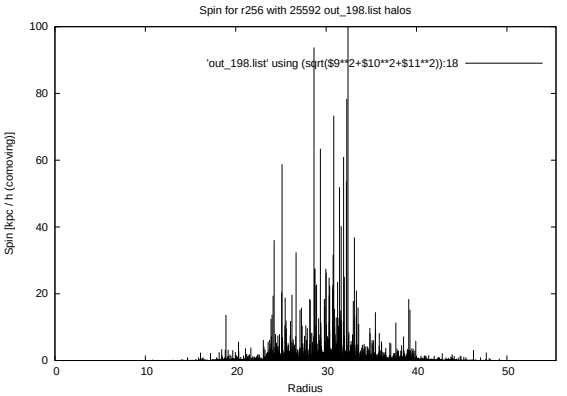

Mvir for stages_20 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for stages_20 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for stages_20 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius

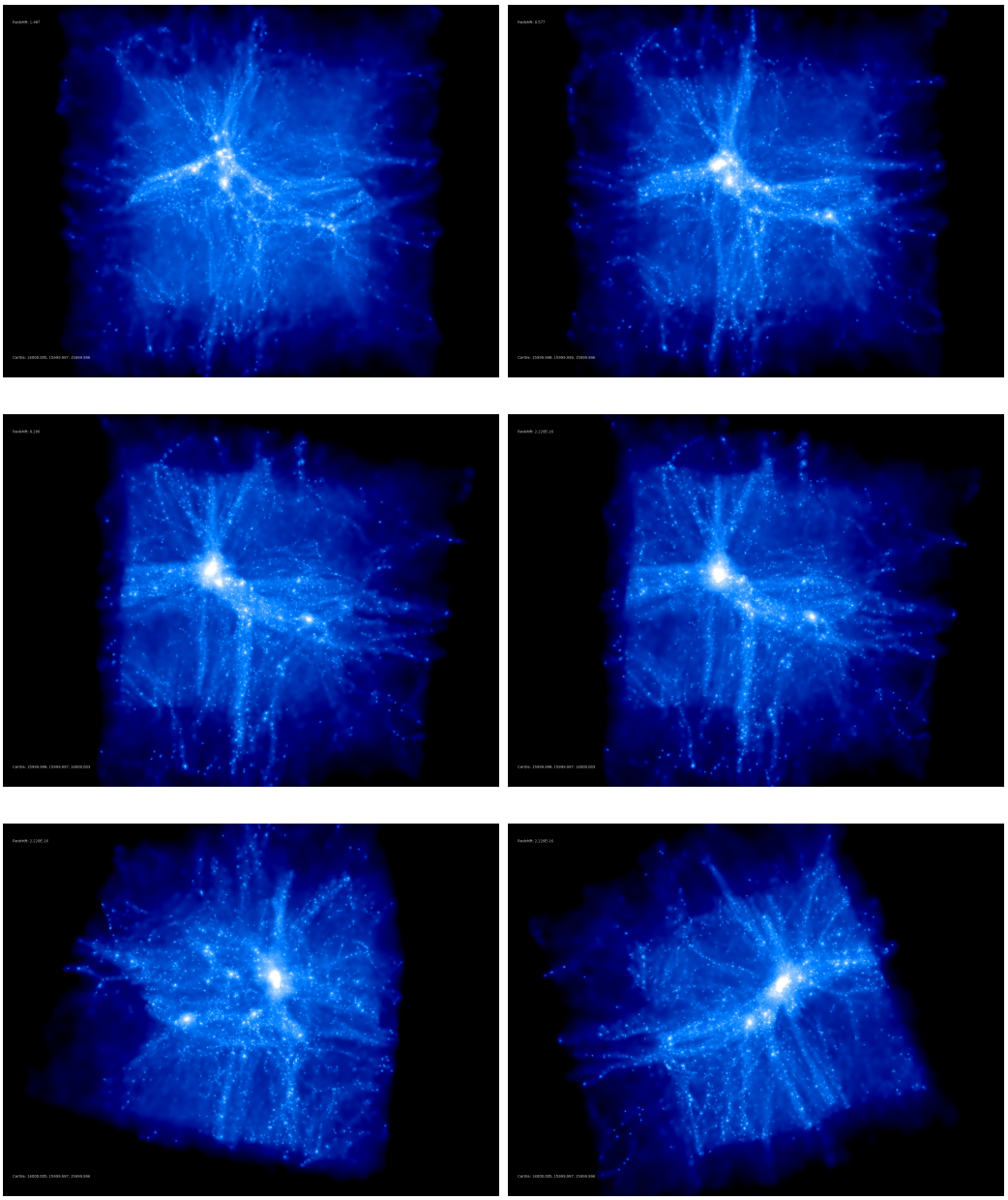

Rvir for stages_20 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius

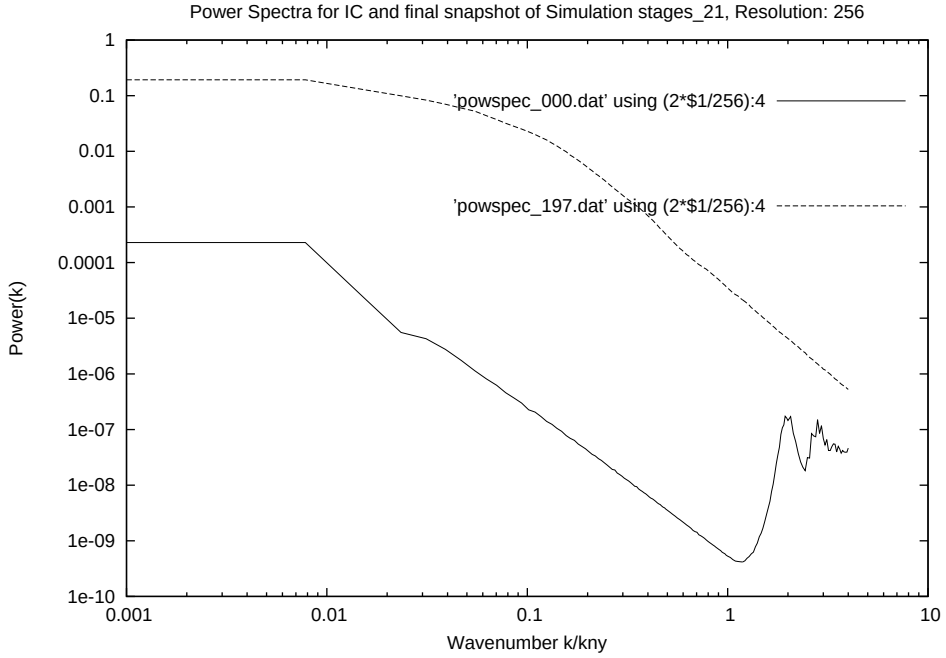

Vrms for r256 with 25592 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

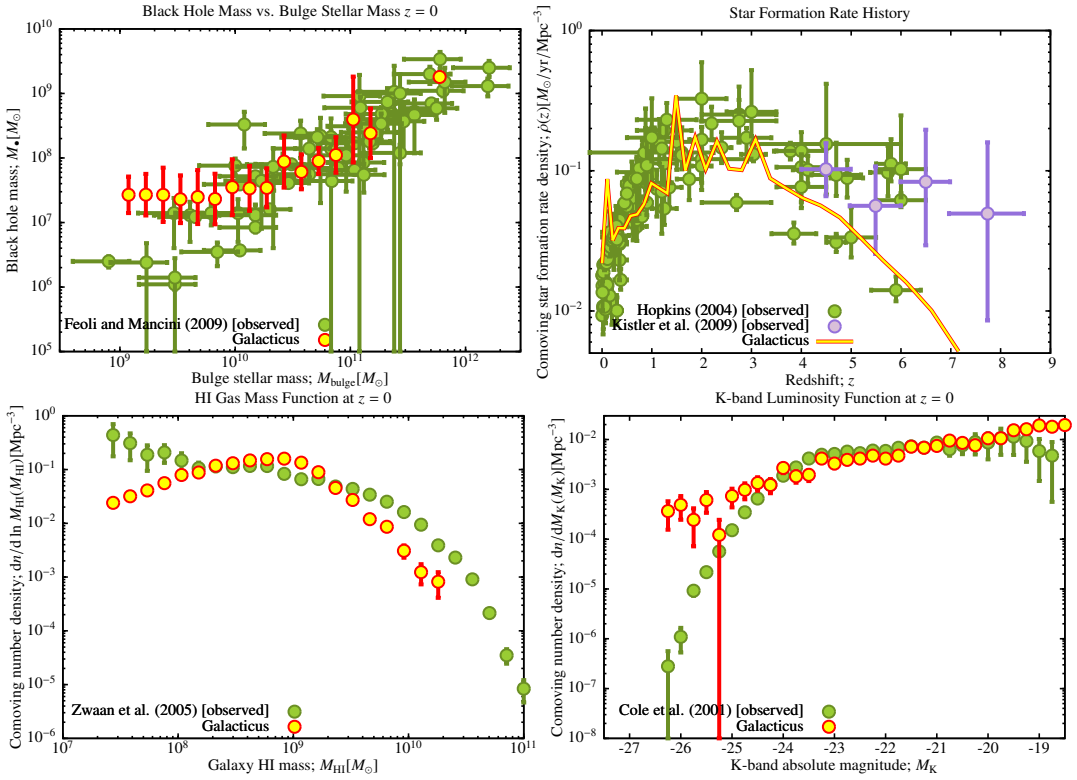

Spin for r256 with 25592 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

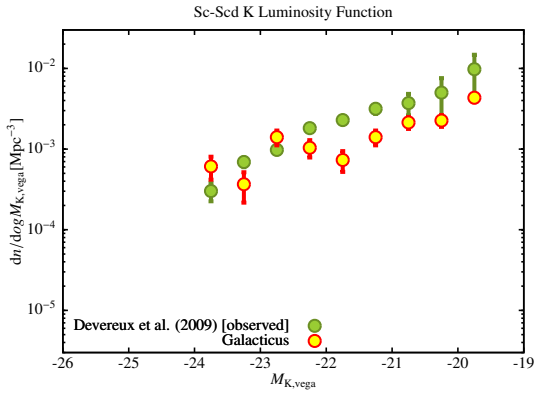
GALACTICUSSED $\surd$
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

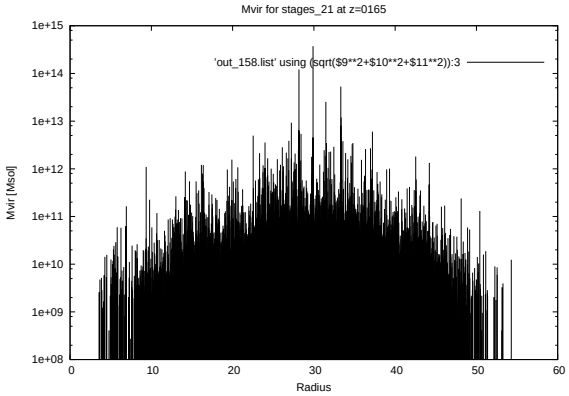
stages_21

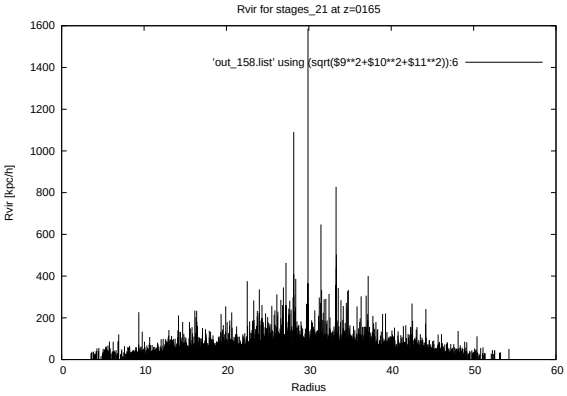


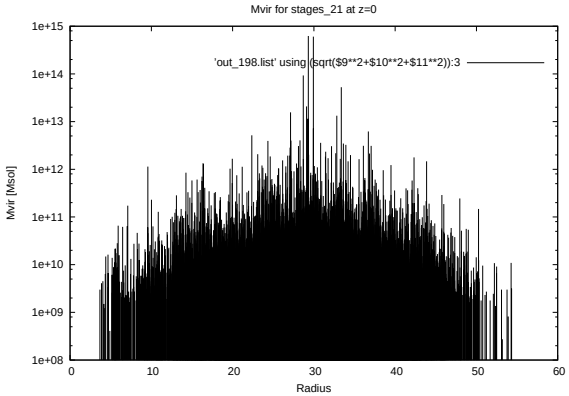

Power Spectra for IC and final snapshot of Simulation stages_21, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny

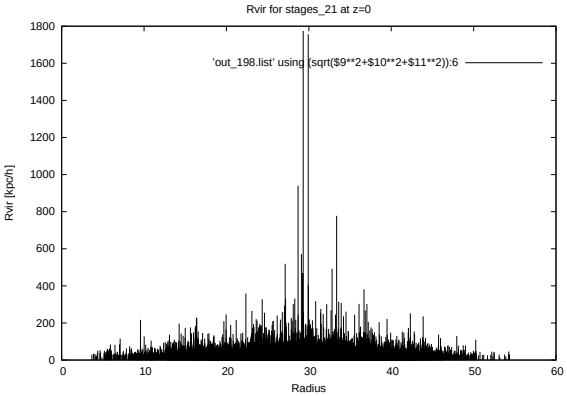

Black Hole Mass vs. Bulge Stellar Mass z = 0
Feoli and Mancini (2009) [observed]
Galacticus
Bulge stellar mass; $M_{bulge}[M_\odot]$
Star Formation Rate History
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus
Redshift; z
HI Gas Mass Function at z = 0
Zwaan et al. (2005) [observed]
Galacticus
Galaxy HI mass; $M_{HI}[M_\odot]$
K-band Luminosity Function at z = 0
Cole et al. (2001) [observed]
Galacticus
K-band absolute magnitude; M_K

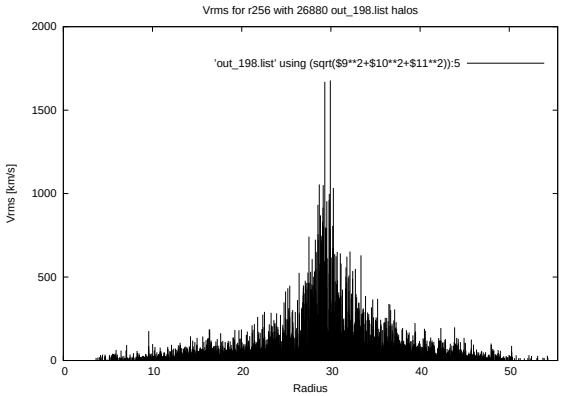

Sc-Scd K Luminosity Function
10^{-2}
10^{-3}
10^{-4}
10^{-5}
$dn/d\log M_{K,vega}$ [Mpc^{-3}]
Devereux et al. (2009) [observed]
Galacticus
-26
-25
-24
-23
-22
-21
-20
-19
$M_{K,vega}$

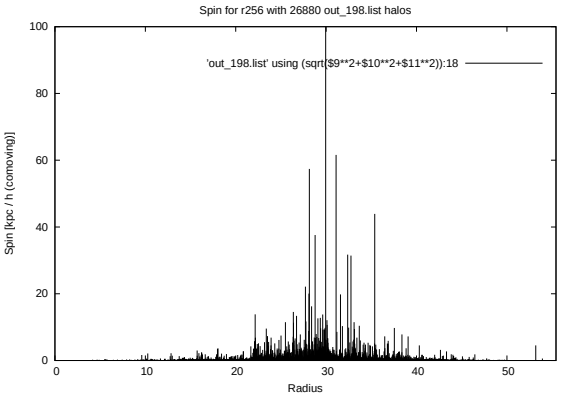

Mvir for stages_21 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
1e+15
1e+14
1e+13
1e+12
1e+11
1e+10
1e+09
1e+08
0
10
20
30
40
50
60
Radius


Rvir for stages_21 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
1600
1400
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
Radius


Mvir for stages_21 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
1e+15
1e+14
1e+13
1e+12
1e+11
1e+10
1e+09
1e+08
0
10
20
30
40
50
60
Radius

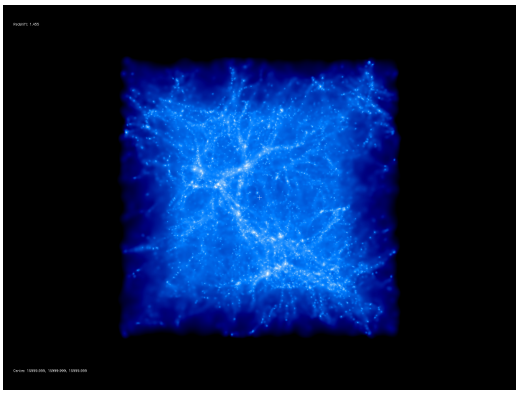
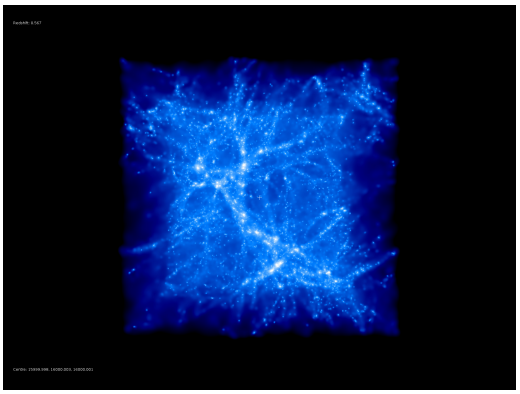
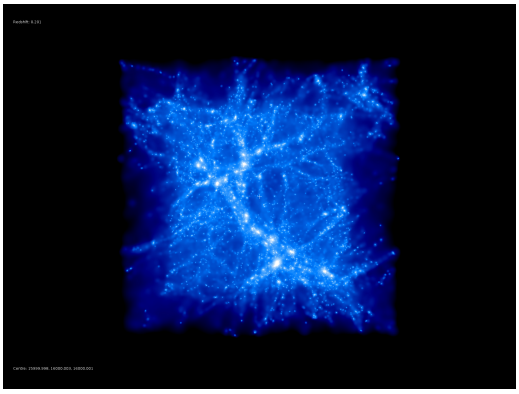
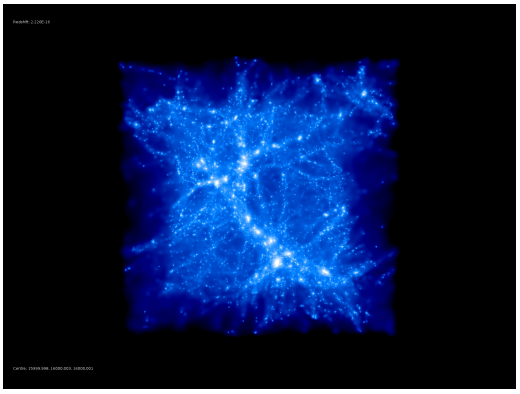
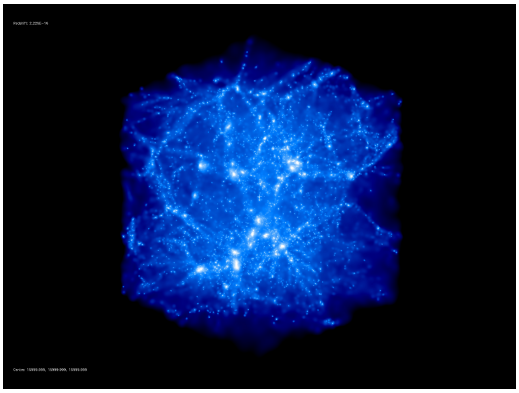
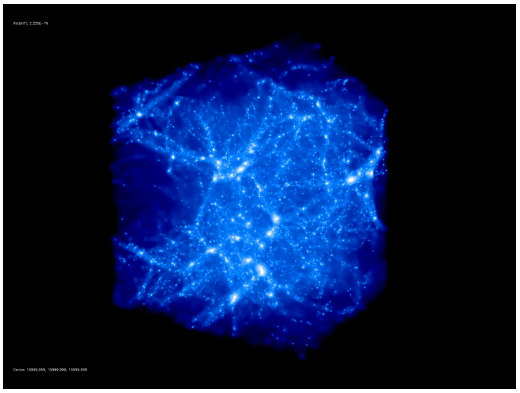

Rvir for stages_21 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
1800
1600
1400
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
Radius

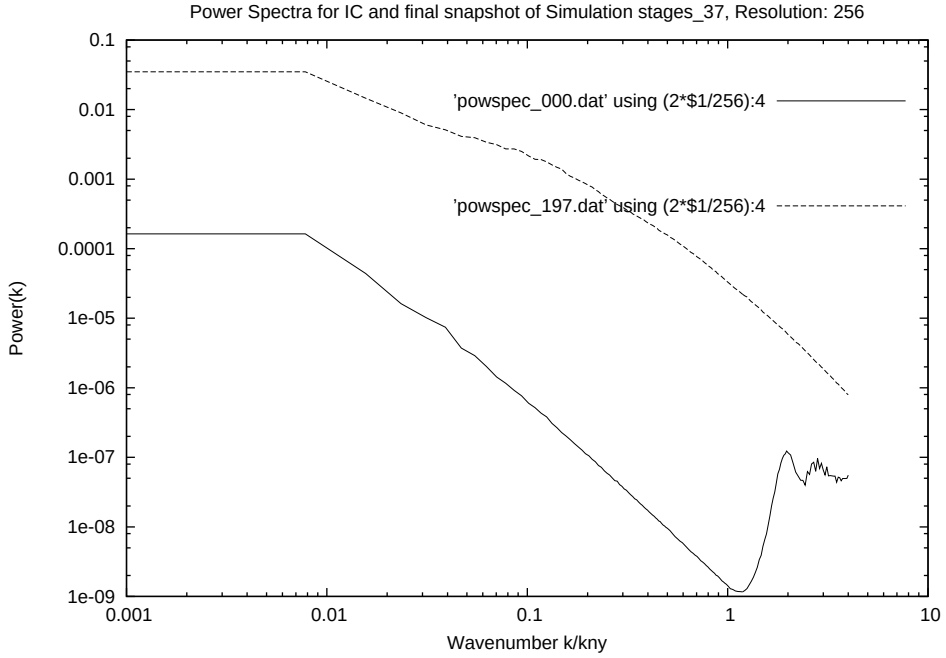

Vrms for r256 with 26880 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
2000
1500
1000
500
0
0
10
20
30
40
50
Radius

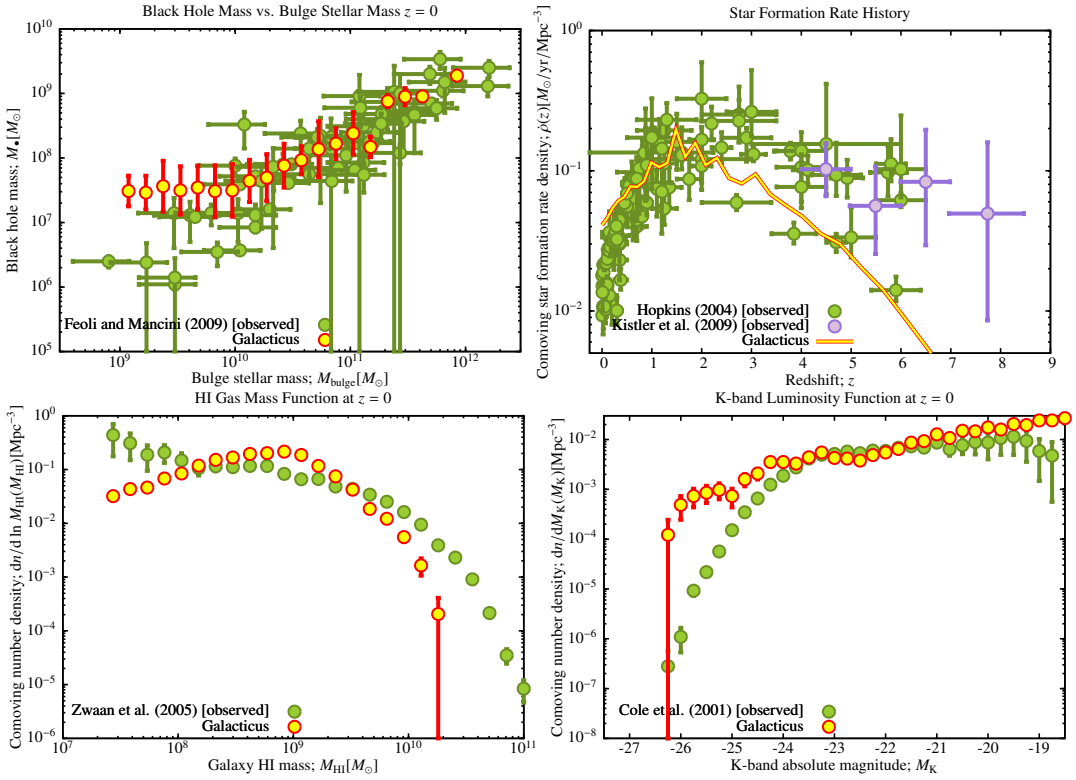

Spin for r256 with 26880 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
100
80
60
40
20
0
0
10
20
30
40
50
Radius

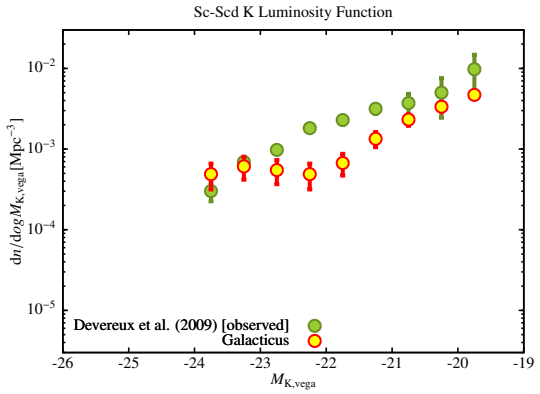
GALACTICUSSED $\surd$
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

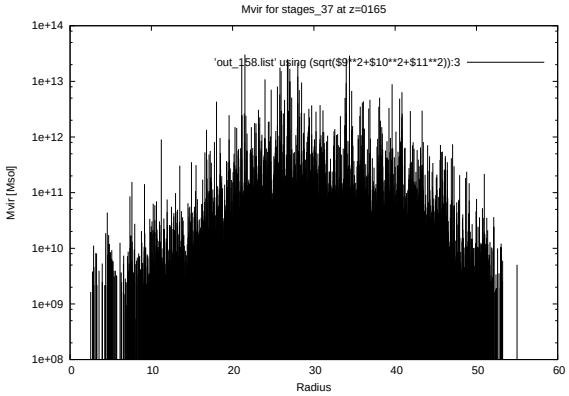
stages_37

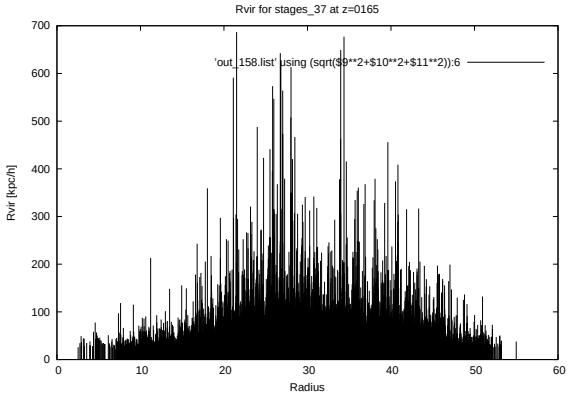







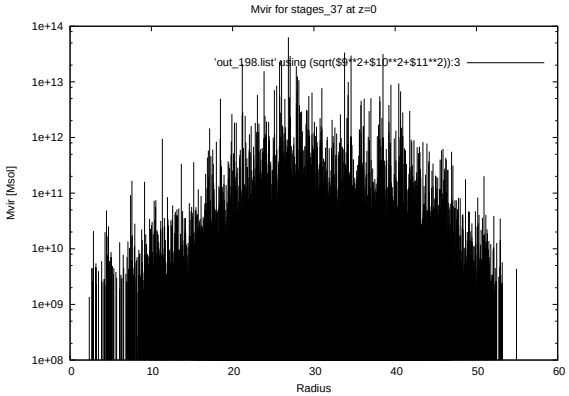

Power Spectra for IC and final snapshot of Simulation stages_37, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
0.001
0.01
0.1
1
10

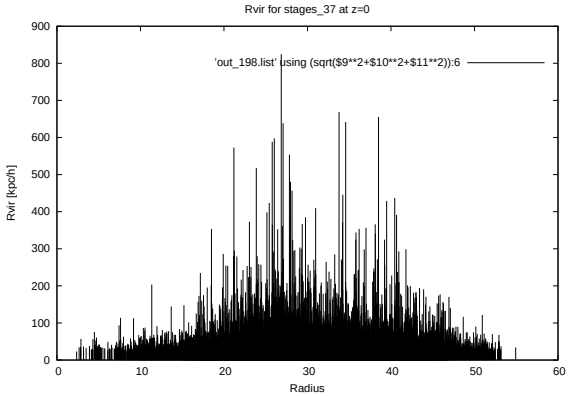

Black Hole Mass vs. Bulge Stellar Mass z = 0
Black hole mass; $M_\bullet[M_\odot]$
Bulge stellar mass; $M_{\rm bulge}[M_\odot]$
Feoli and Mancini (2009) [observed]
Galacticus
Star Formation Rate History
Comoving star formation rate density; $\dot{\rho}(z)[M_\odot/{\rm yr}/{\rm Mpc}^3]$
Redshift; z
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus
HI Gas Mass Function at z = 0
Comoving number density; $dn/d\ln M_{\rm HI}(M_{\rm HI})[{\rm Mpc}^{-3}]$
Galaxy HI mass; $M_{\rm HI}[M_\odot]$
Zwaan et al. (2005) [observed]
Galacticus
K-band Luminosity Function at z = 0
Comoving number density; $dn/(dM_{\rm K}(M_{\rm K})[{\rm Mpc}^{-3}]$
K-band absolute magnitude; $M_{\rm K}$
Cole et al. (2001) [observed]
Galacticus

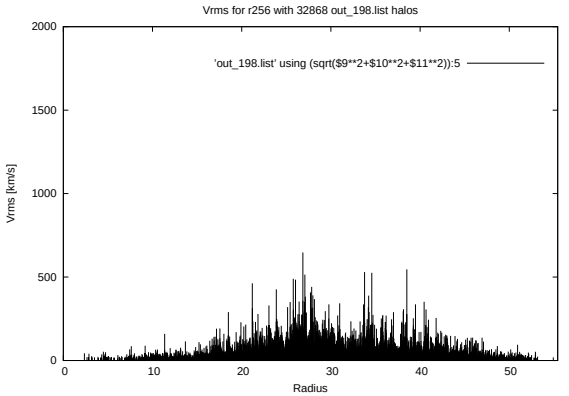

Sc-Scd K Luminosity Function
Devereux et al. (2009) [observed]
Galacticus
$M_{K,vega}$
$dn/d\sigma g M_{K,vega}$ [Mpc^{-3}]

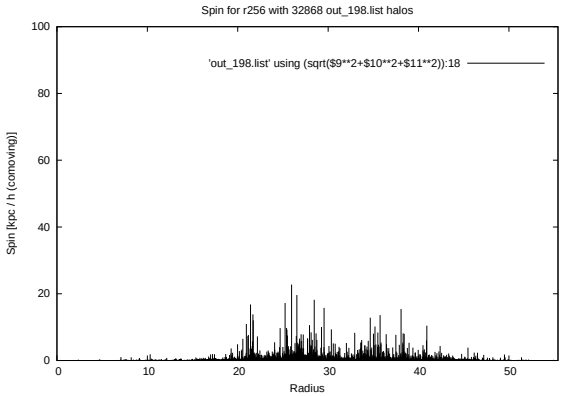

Mvir for stages_37 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for stages_37 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for stages_37 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius

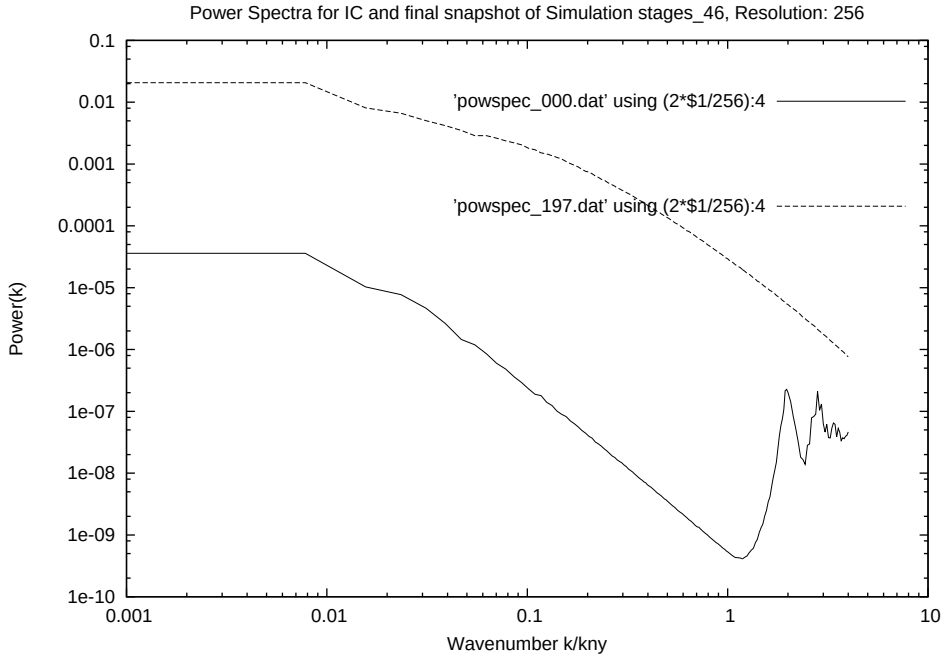

Rvir for stages_37 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Vrms for r256 with 32868 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

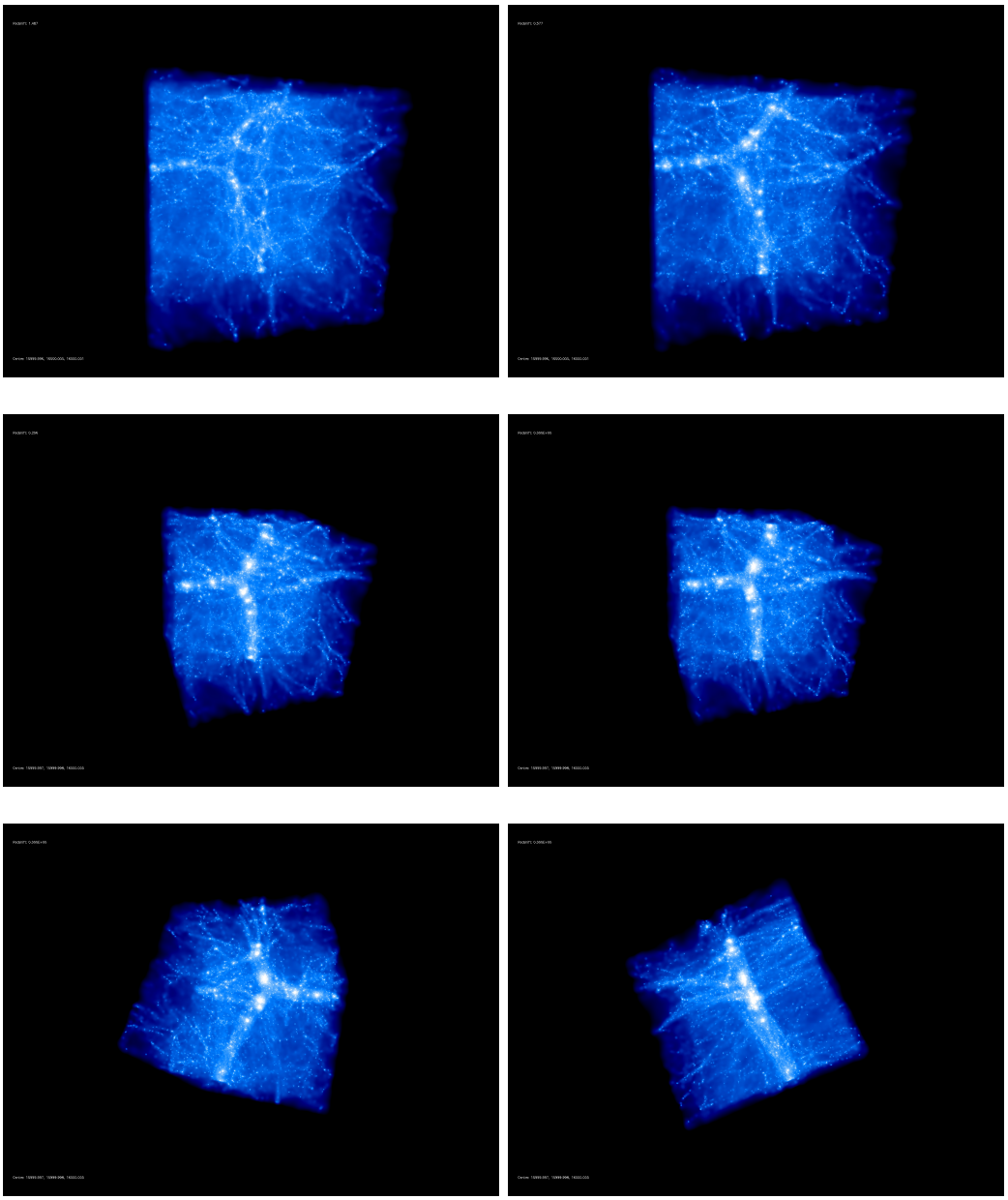

Spin for r256 with 32868 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

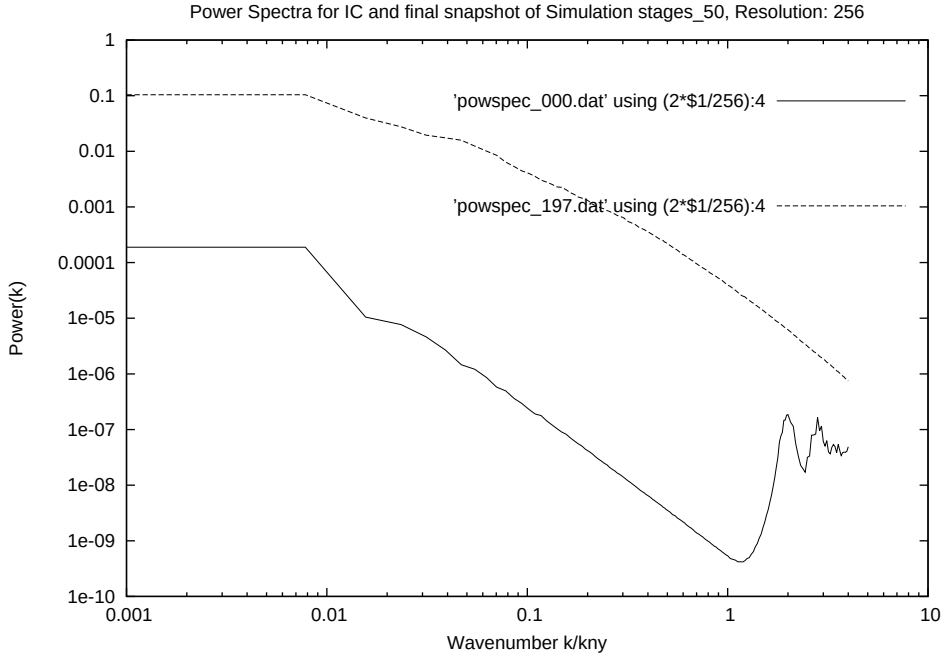
GALACTICUSSED $\surd$
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

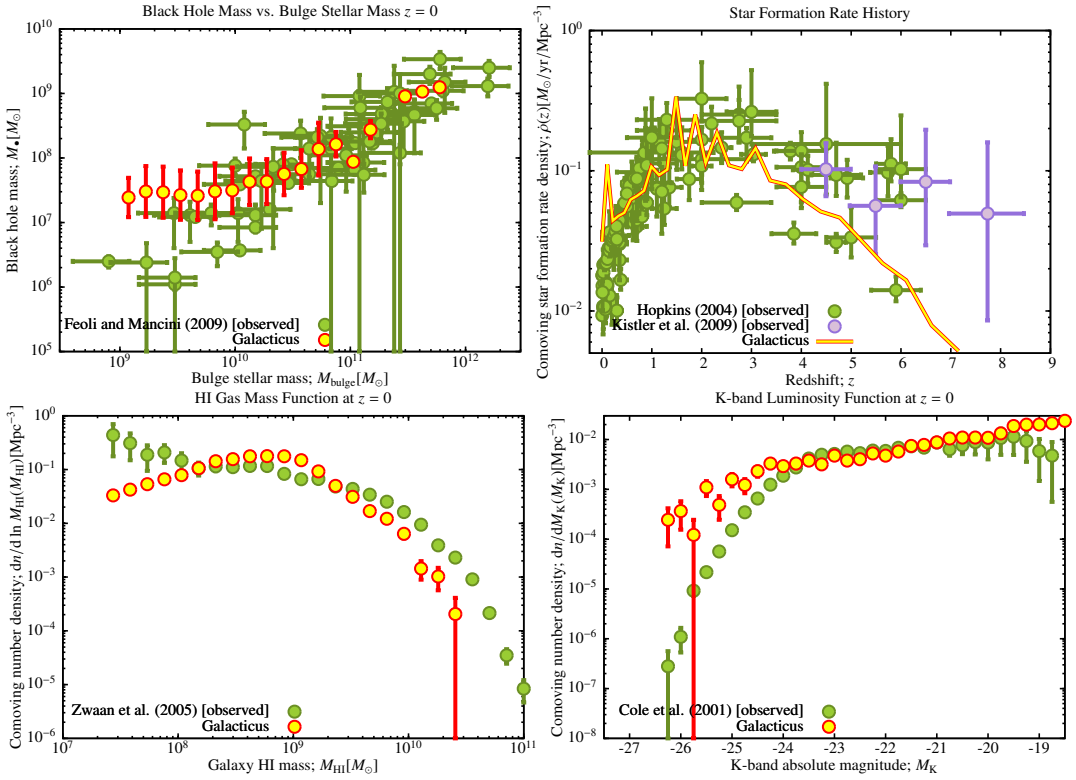
stages_46

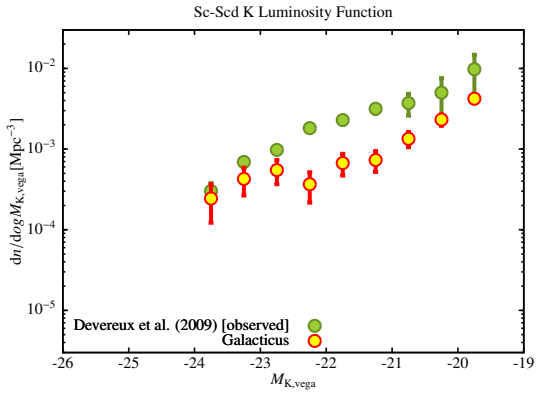

Power Spectra for IC and final snapshot of Simulation stages_46, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
0.001
0.01
0.1
1
10

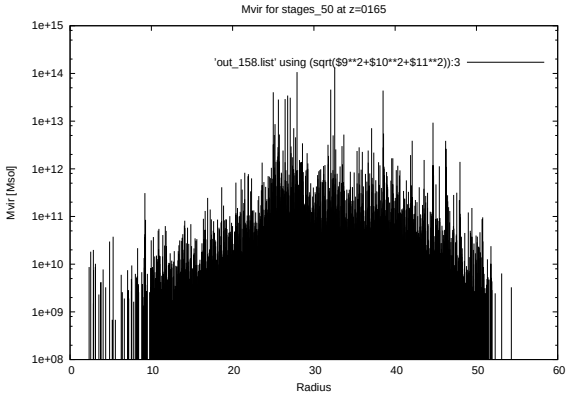
stages_50

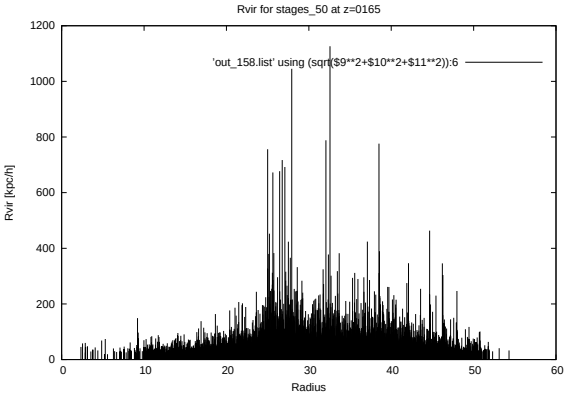


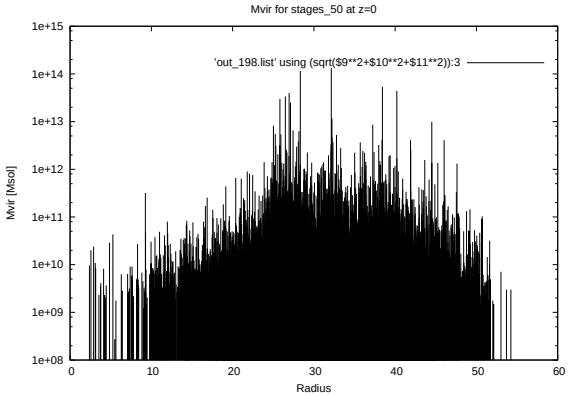

Power Spectra for IC and final snapshot of Simulation stages_50, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny

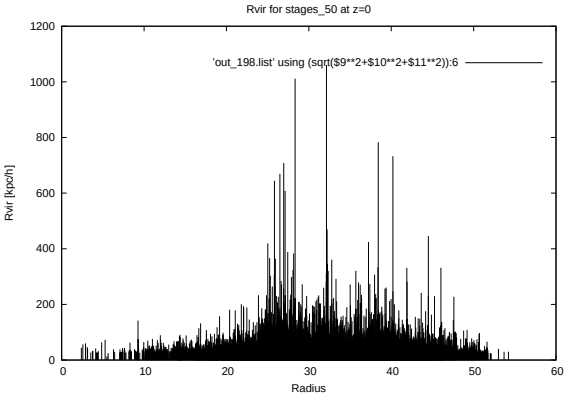

Black Hole Mass vs. Bulge Stellar Mass z = 0
Feoli and Mancini (2009) [observed]
Galacticus
Bulge stellar mass; $M_{bulge}[M_\odot]$
Star Formation Rate History
Hopkins (2004) [observed]
Kistler et al. (2009) [observed]
Galacticus
Redshift; z
HI Gas Mass Function at z = 0
Zwaan et al. (2005) [observed]
Galacticus
Galaxy HI mass; $M_{HI}[M_\odot]$
K-band Luminosity Function at z = 0
Cole et al. (2001) [observed]
Galacticus
K-band absolute magnitude; M_K

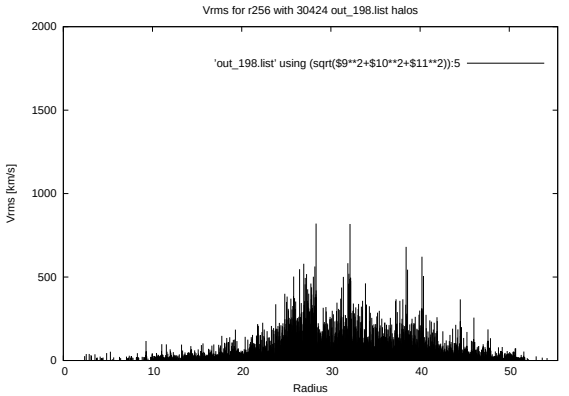

Sc-Scd K Luminosity Function
Devereux et al. (2009) [observed]
Galacticus
$M_{K,vega}$
$dn/d\log M_{K,vega}$ [Mpc^{-3}]

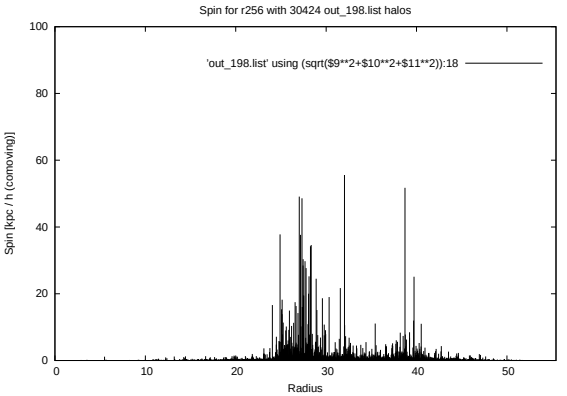

Mvir for stages_50 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for stages_50 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for stages_50 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius

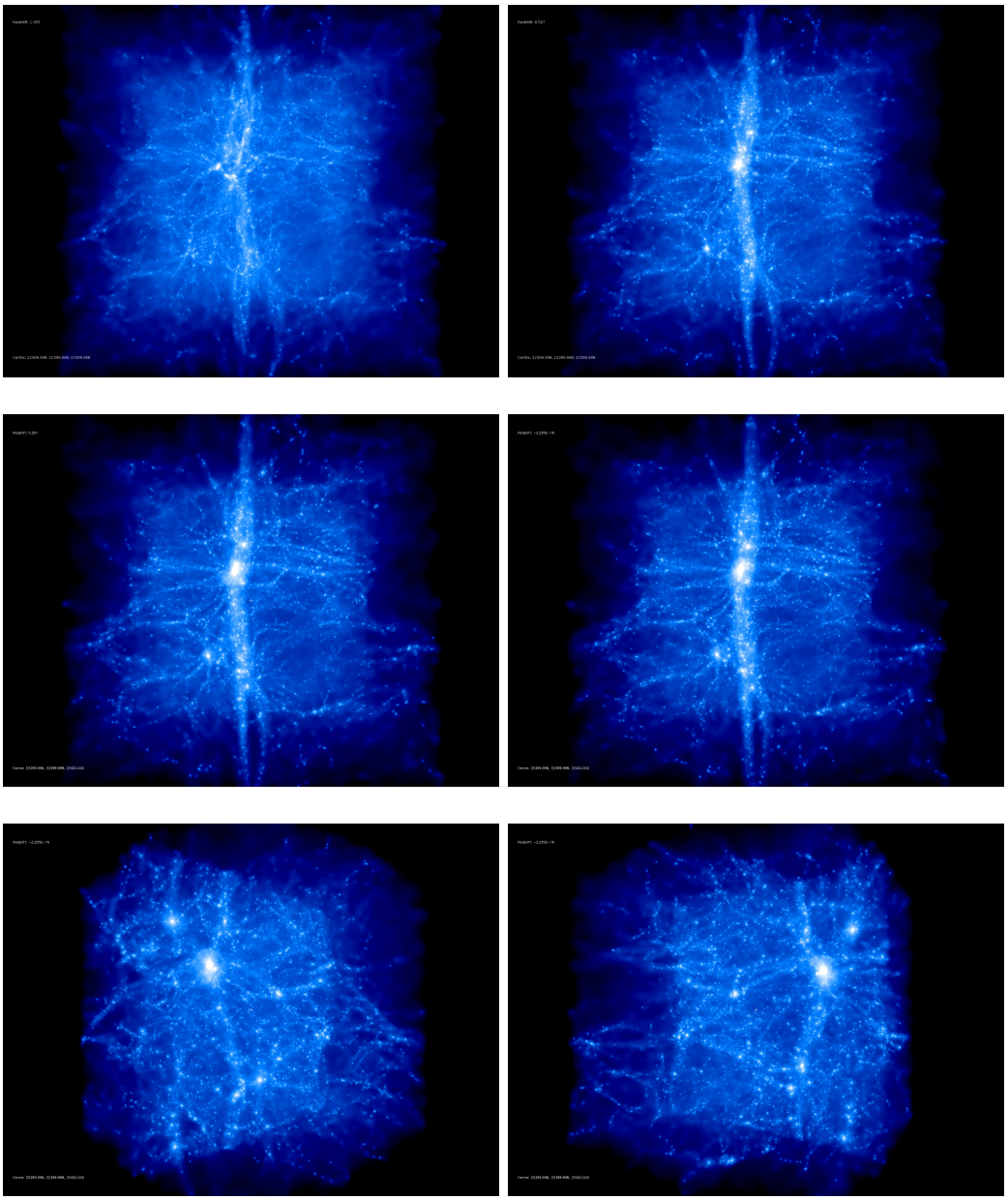

Rvir for stages_50 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius

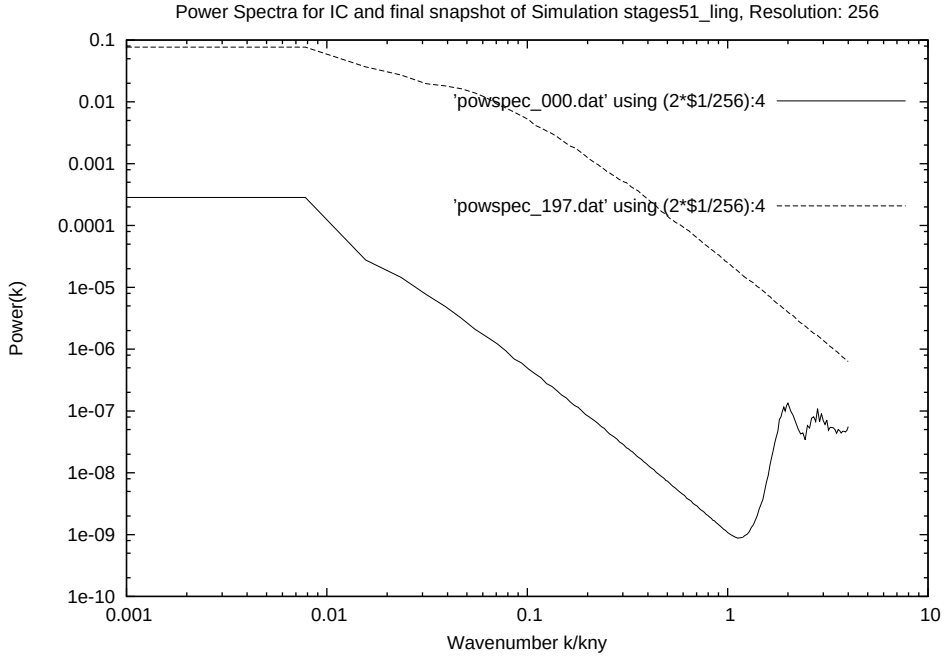

Vrms for r256 with 30424 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius


Spin for r256 with 30424 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

GALACTICUSSED $\surd$
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

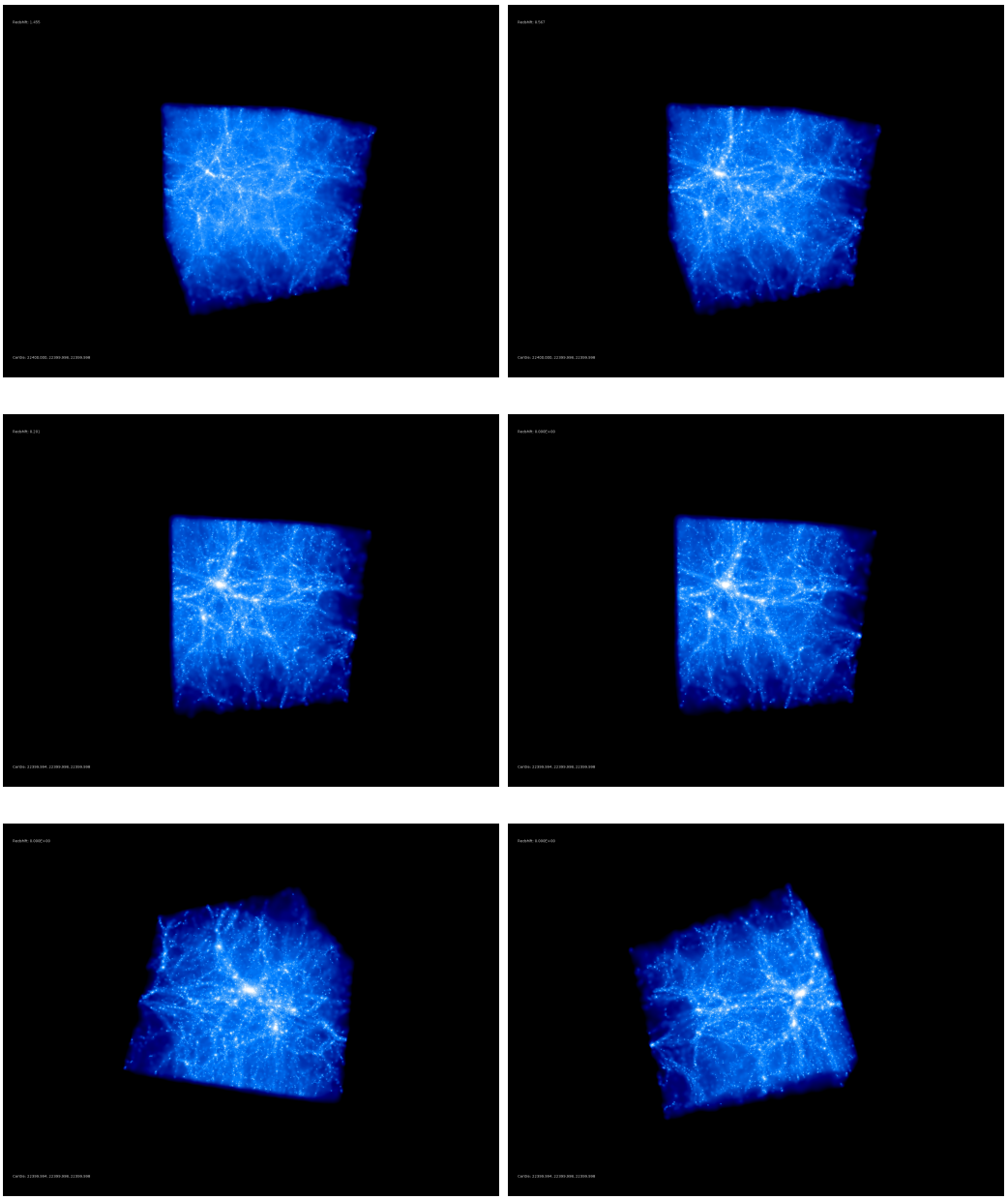
stages51_ling

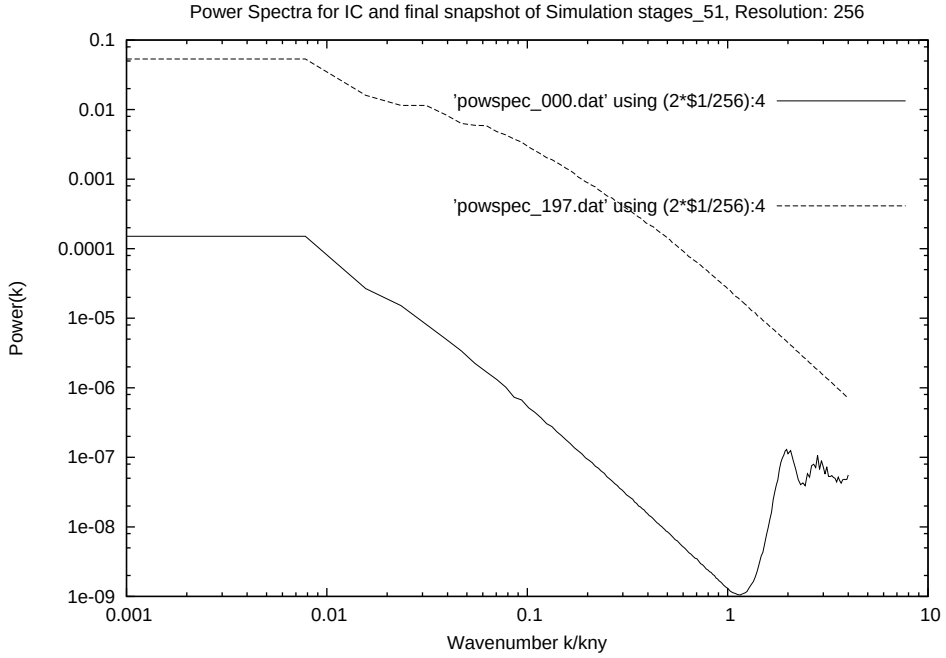


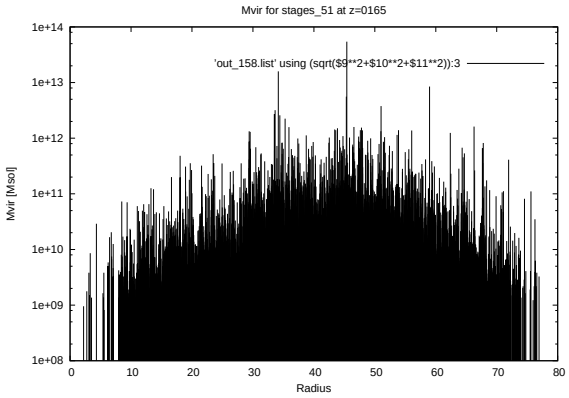


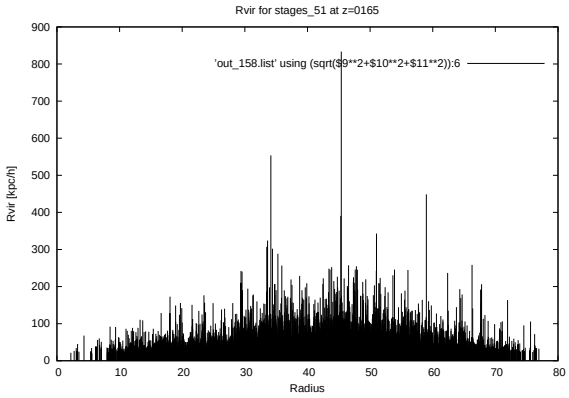
GALACTICUSSED $\surd$
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

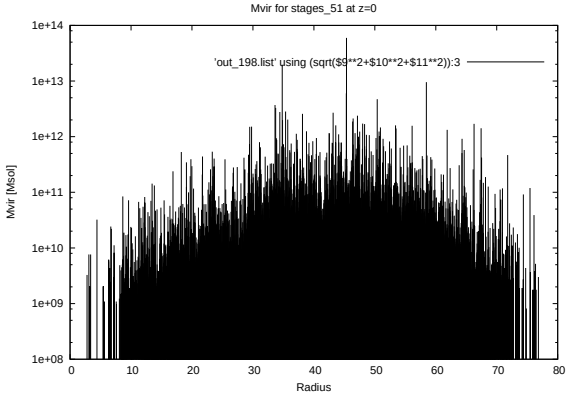
stages_51

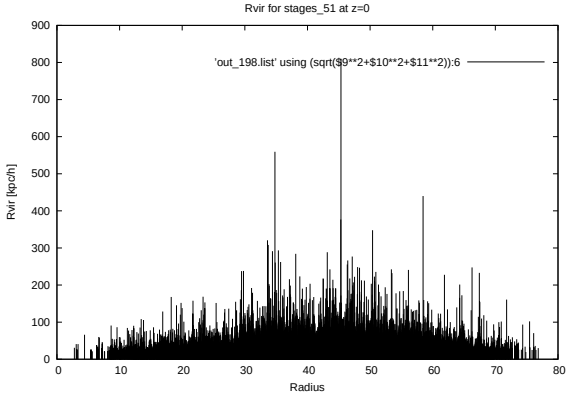


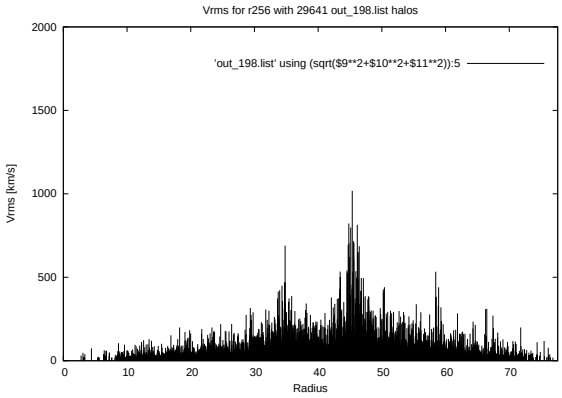

Power Spectra for IC and final snapshot of Simulation stages_51, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
0.001
0.01
0.1
1
10

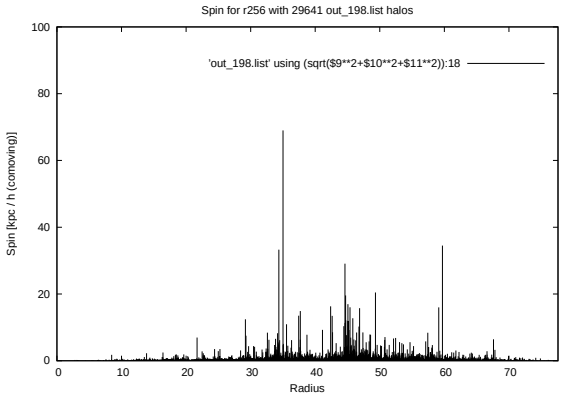

Mvir for stages_51 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Rvir for stages_51 at z=0165
'out_158.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius


Mvir for stages_51 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius

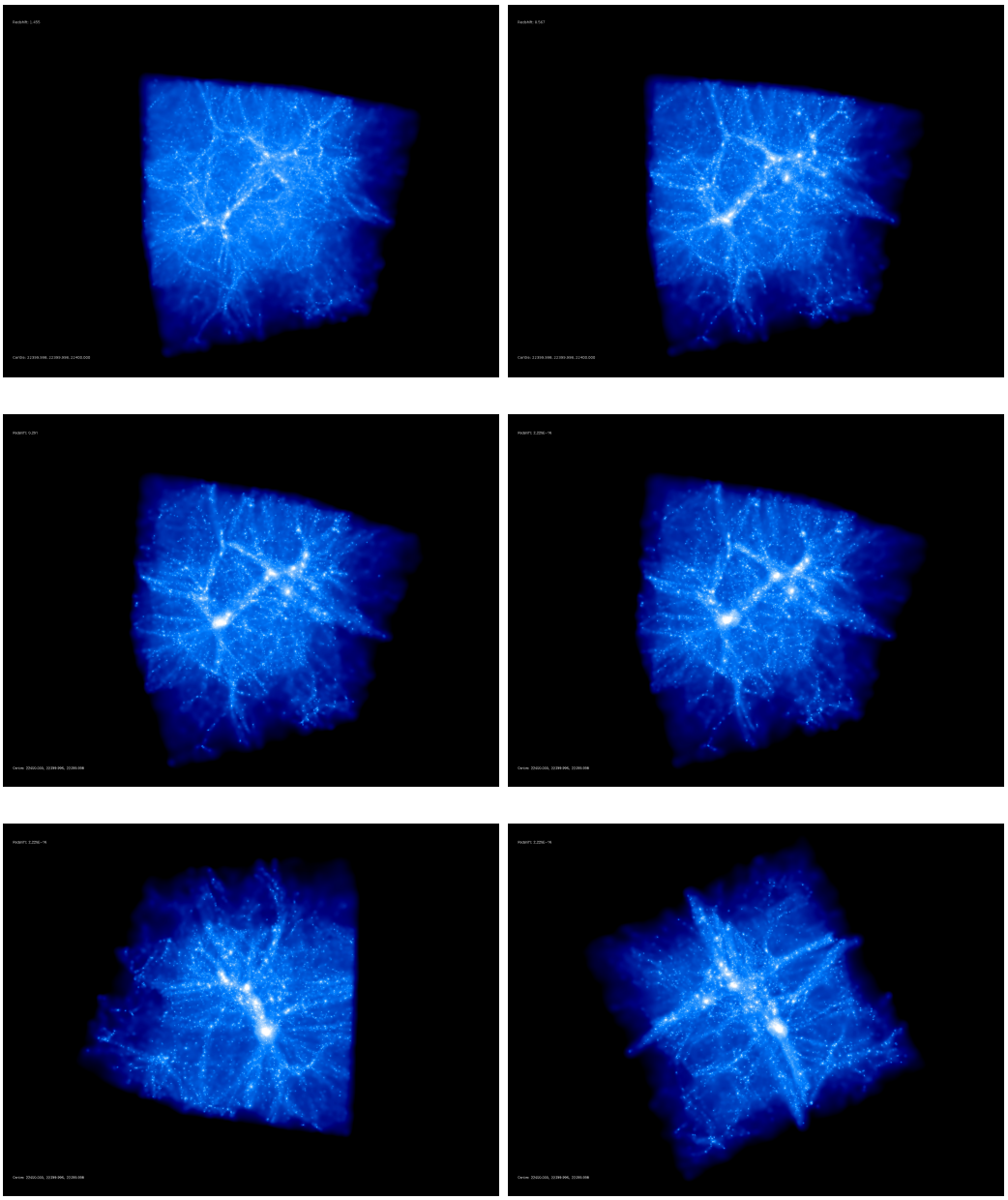

Rvir for stages_51 at z=0
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):6
Rvir [kpc/h]
Radius

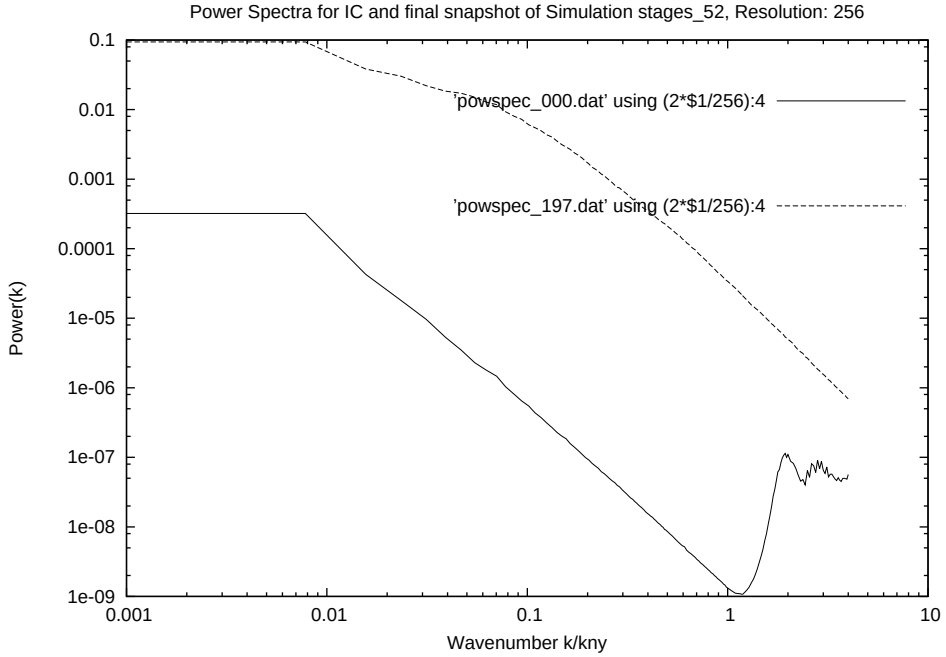


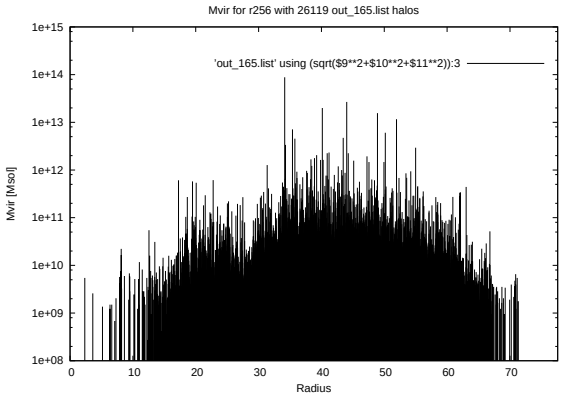


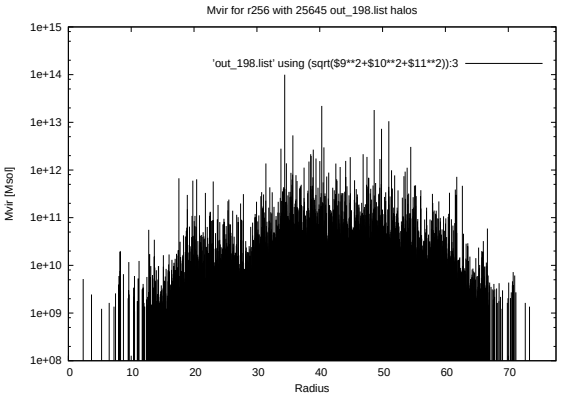
GALACTICUSSED $\surd$
CONSISTENTTREED $\surd$
ROCKSTARRED $\surd$

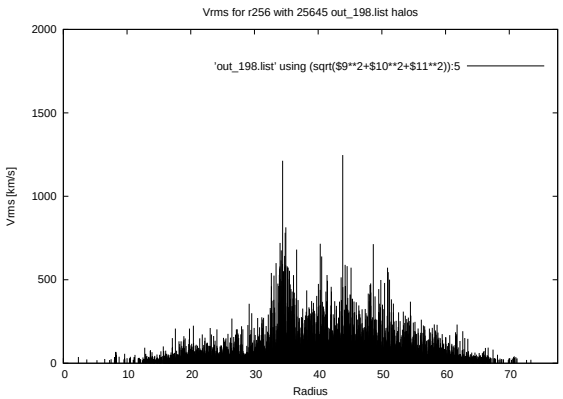
stages_52

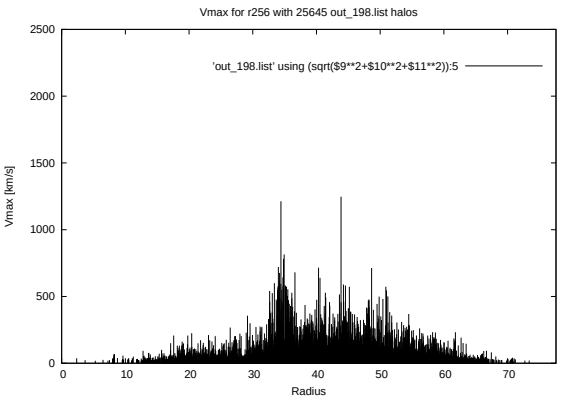


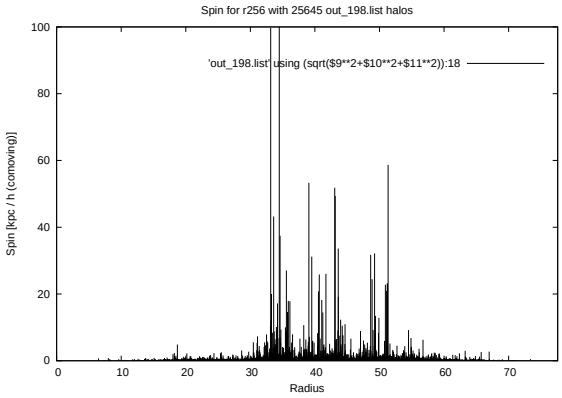

Power Spectra for IC and final snapshot of Simulation stages_52, Resolution: 256
'powspec_000.dat' using (2*$1/256):4
'powspec_197.dat' using (2*$1/256):4
Power(k)
Wavenumber k/kny
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
0.001
0.01
0.1
1
10


Mvir for r256 with 26119 out_165.list halos
'out_165.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Mvir for r256 with 25645 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Vrms for r256 with 25645 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius


Vmax for r256 with 25645 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vmax [km/s]
Radius

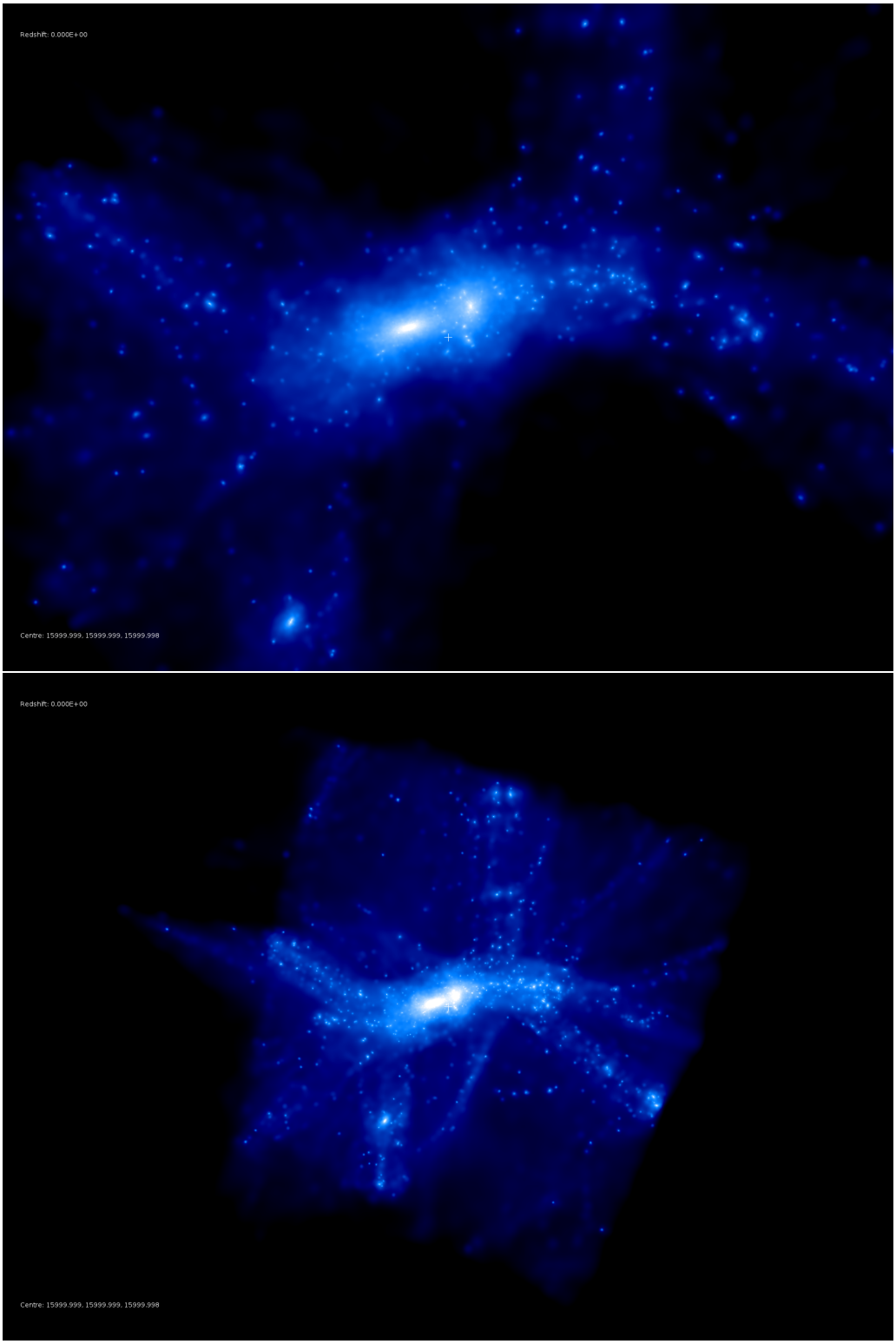

Spin for r256 with 25645 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius
0
20
40
60
80
100
0
10
20
30
40
50
60
70

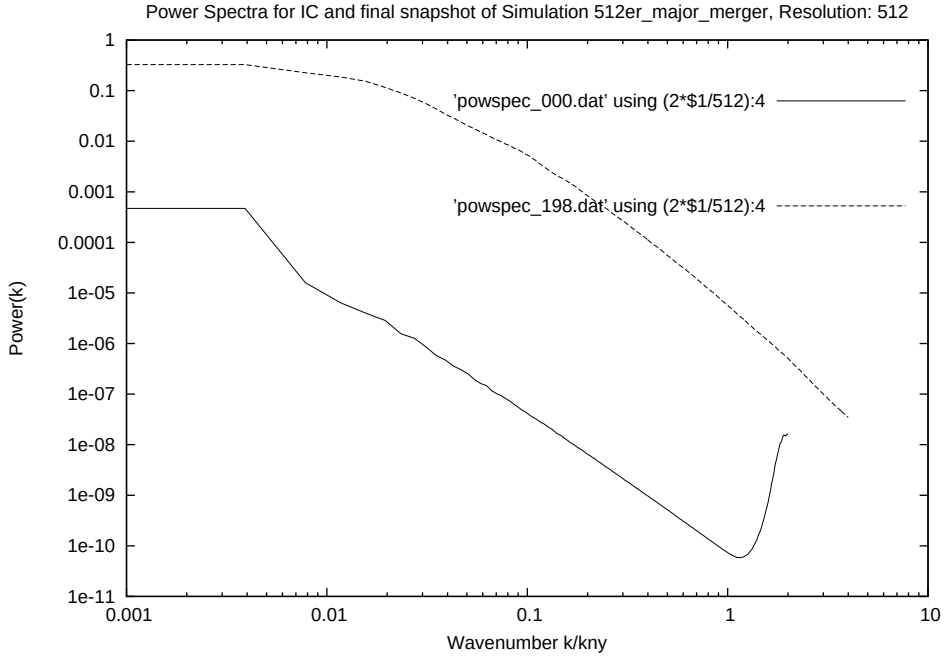
stages_54dr5d5

stages_56

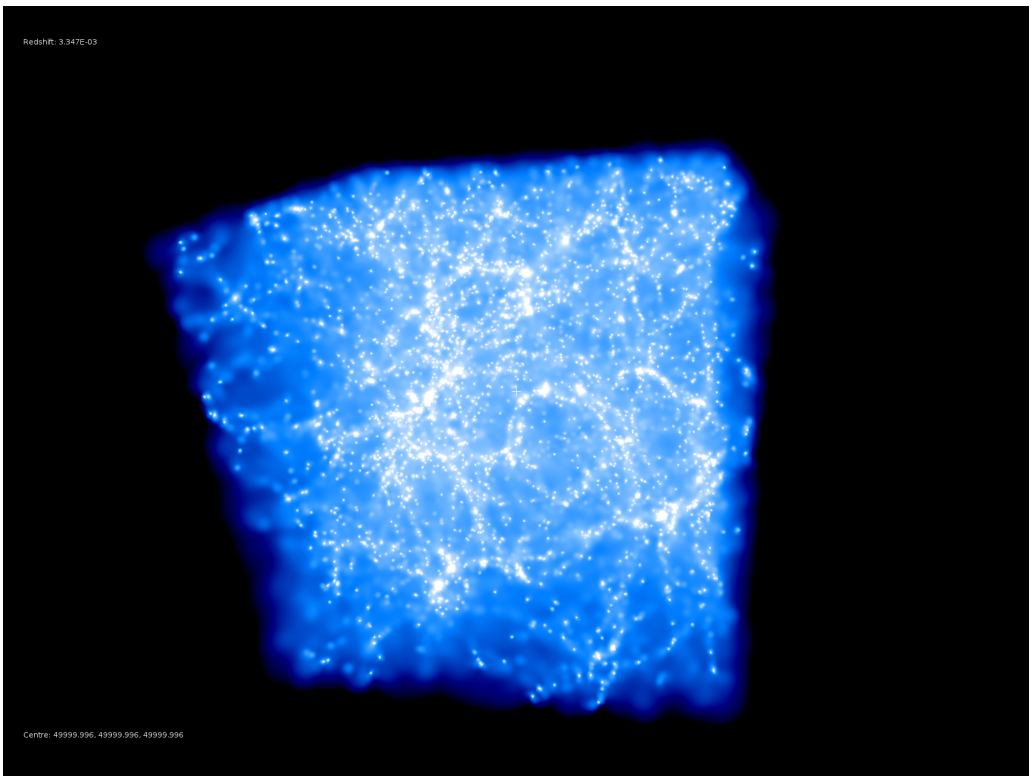
2.3 r512

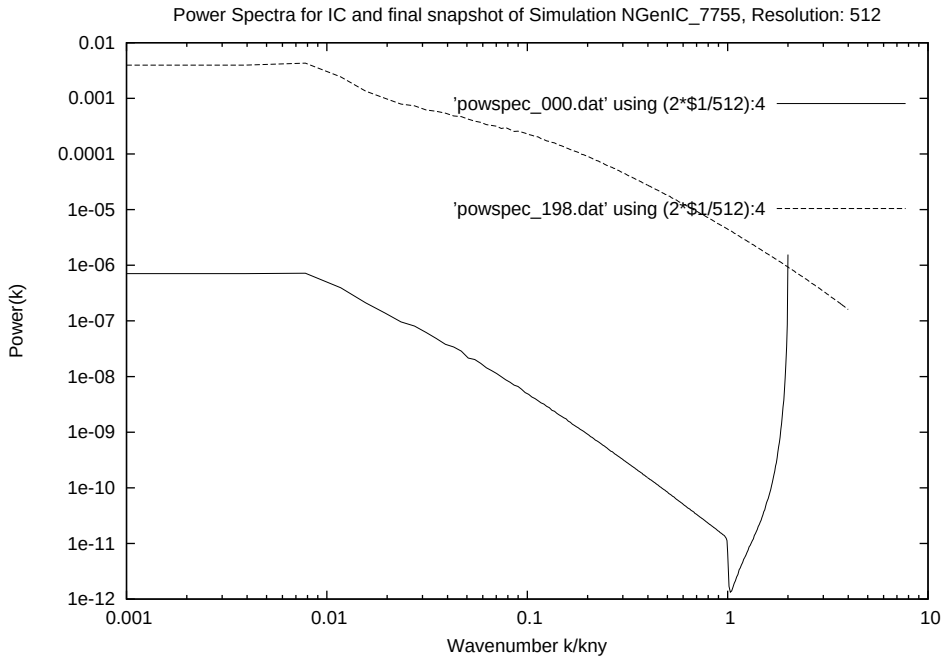
2.3.1 512er_major_merger

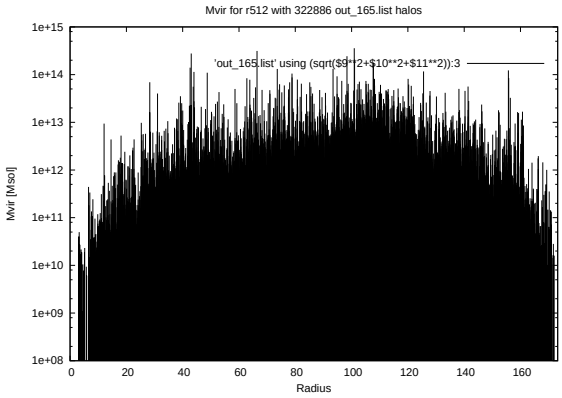


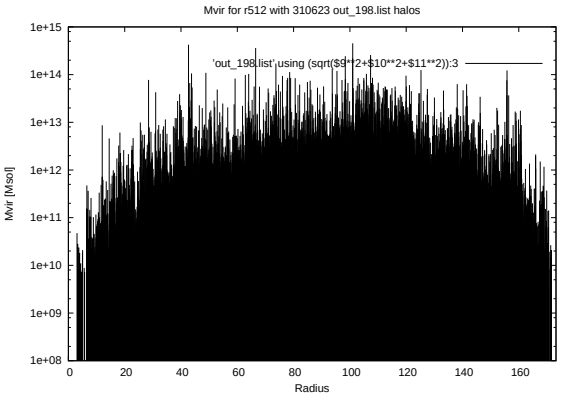

Power Spectra for IC and final snapshot of Simulation 512er_major_merger, Resolution: 512
'powspec_000.dat' using (2*$1/512):4
'powspec_198.dat' using (2*$1/512):4
Power(k)
Wavenumber k/kny
1
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
1e-11
0.001
0.01
0.1
1
10

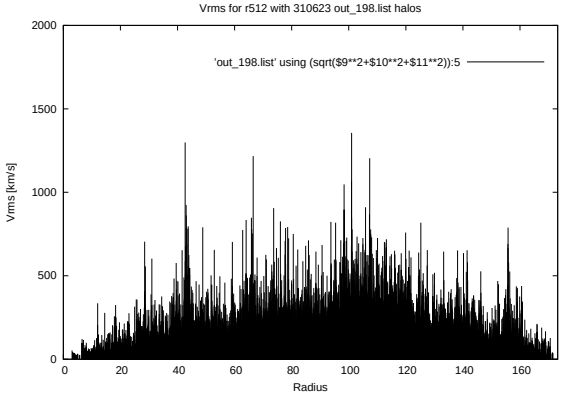
2.3.2 NGenIC_7755

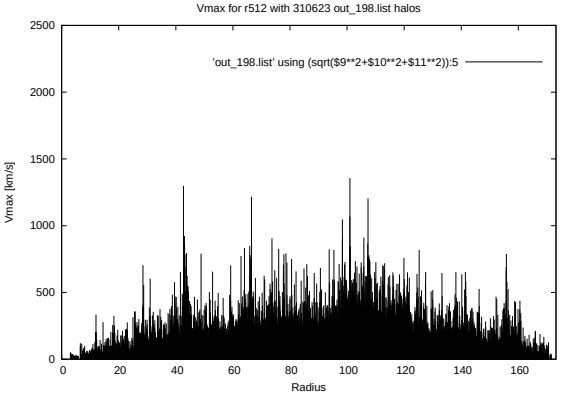


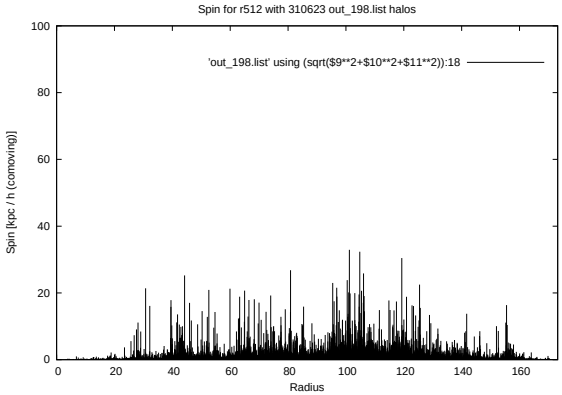



Mvir for r512 with 322886 out_165.list halos
'out_165.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius

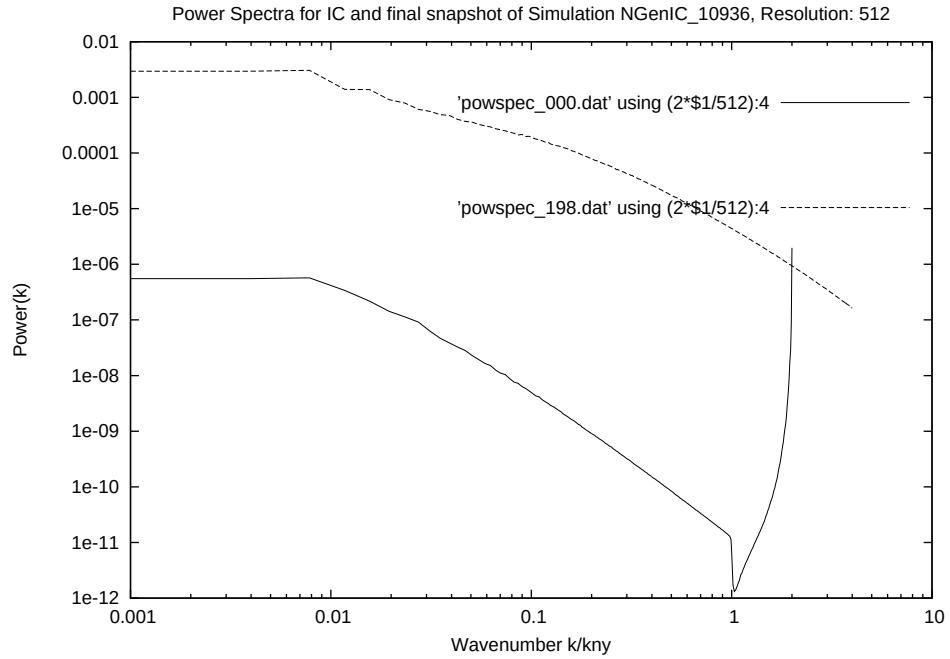

Mvir for r512 with 310623 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius

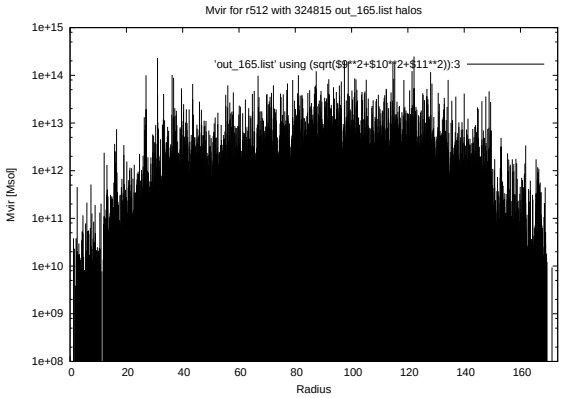

Vrms for r512 with 310623 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius

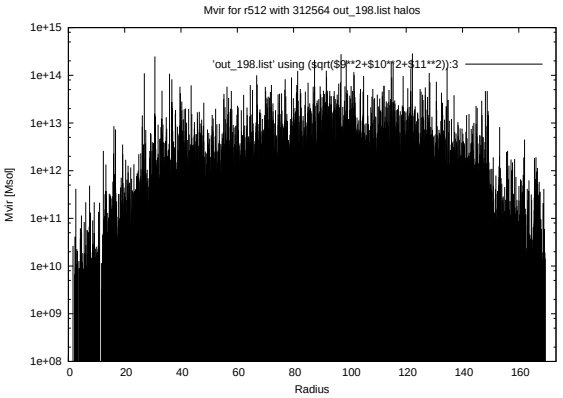

Vmax for r512 with 310623 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vmax [km/s]
Radius

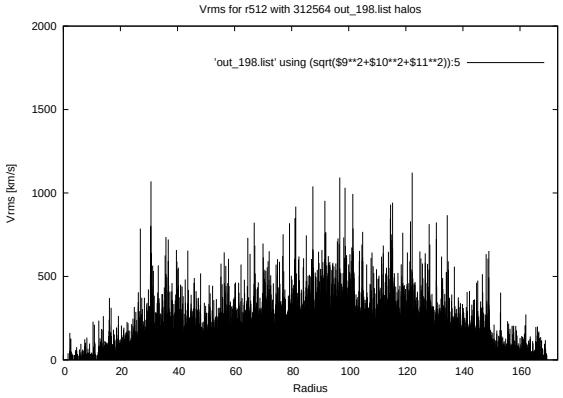

Spin for r512 with 310623 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius

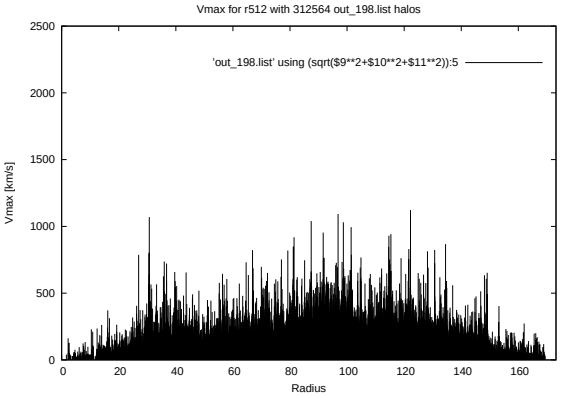
2.3.3 NGenIC_10939

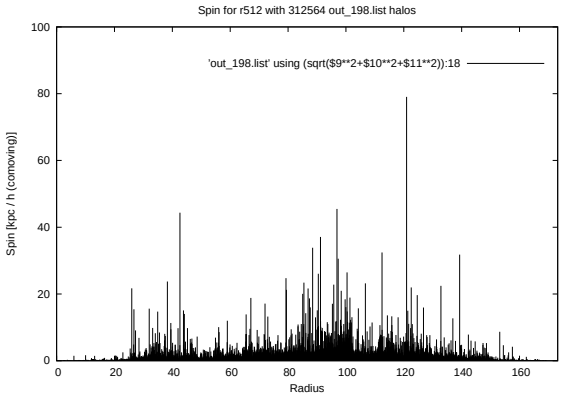




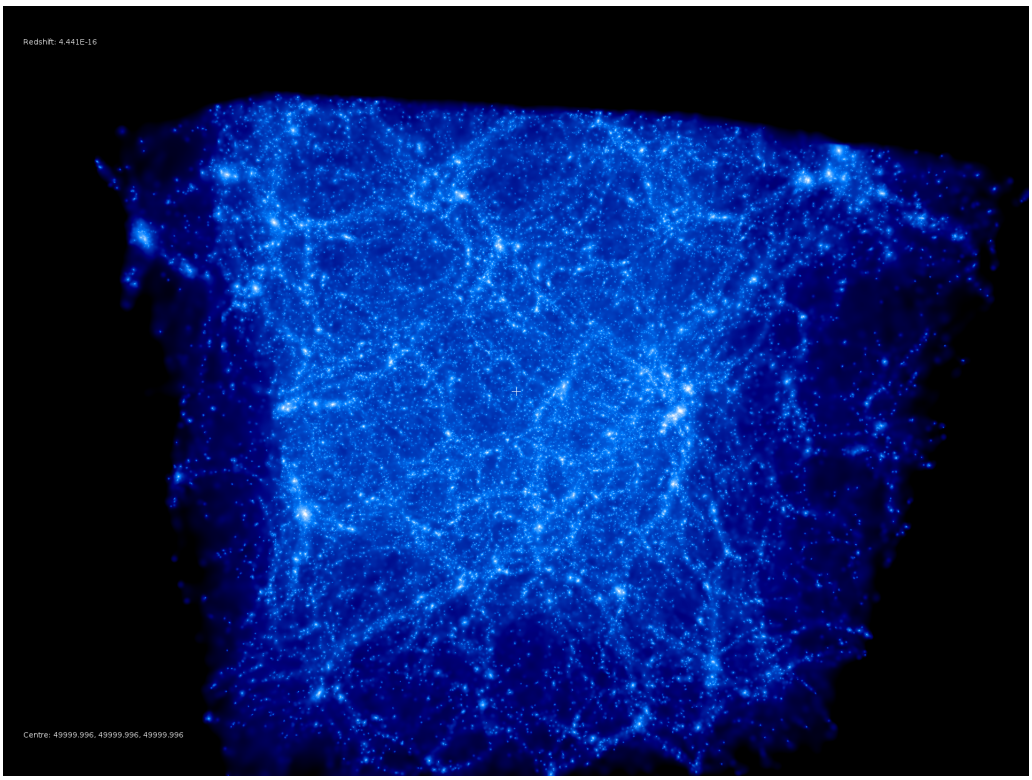


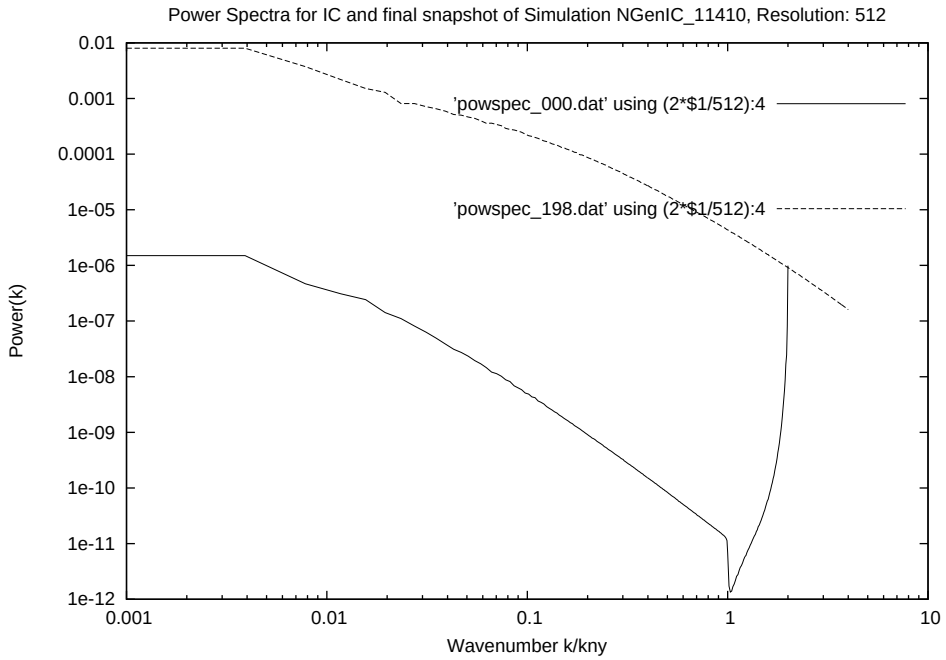




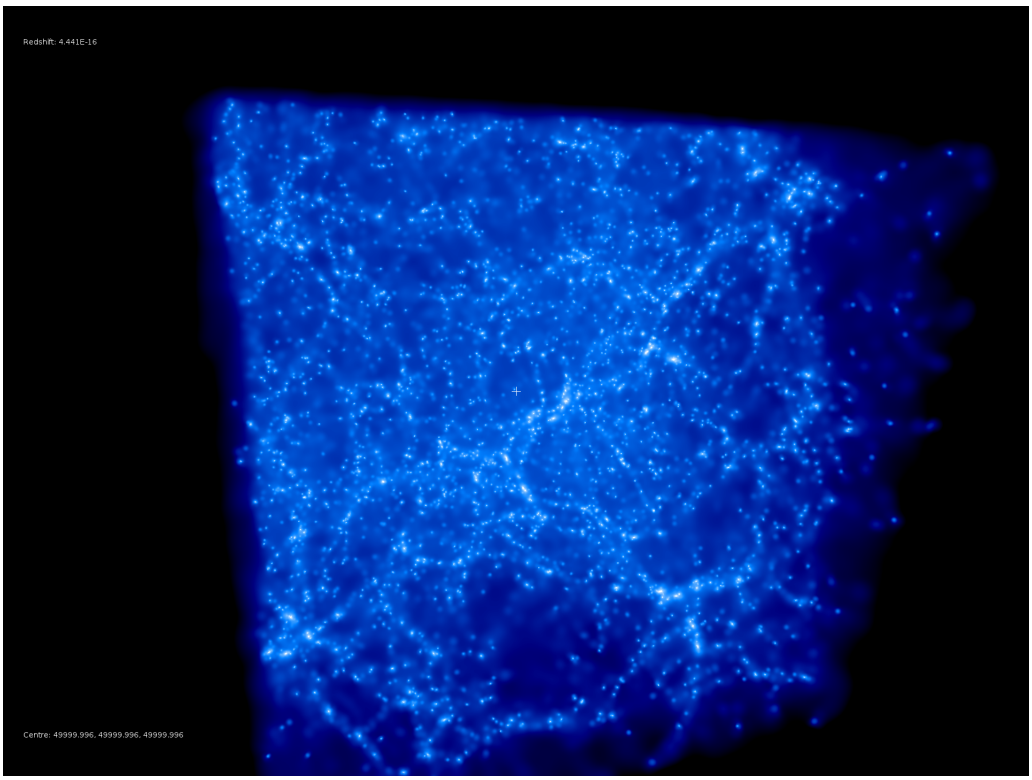

Spin for r512 with 312564 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius
0
20
40
60
80
100
120
140
160

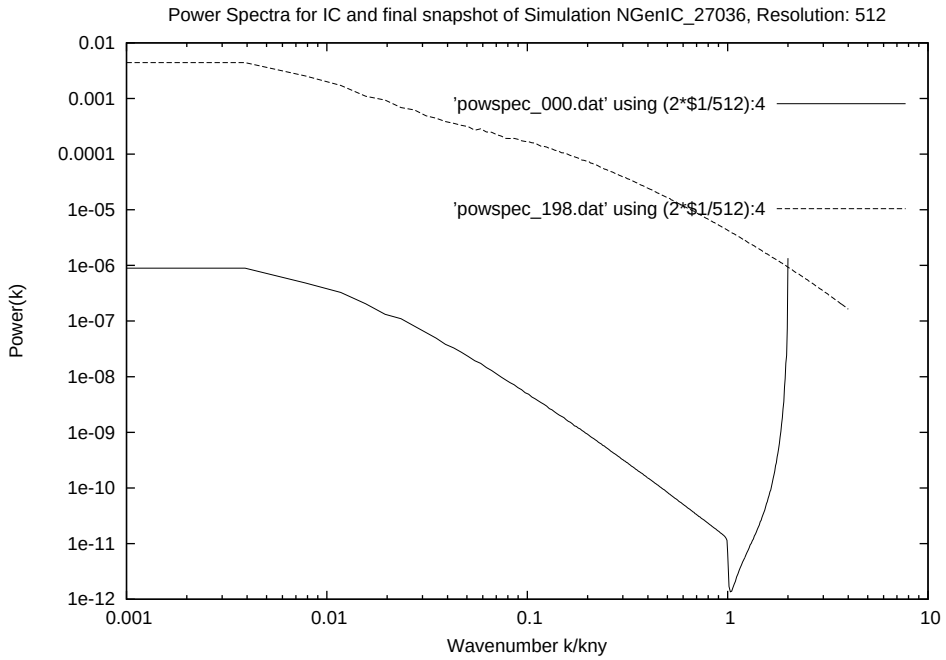
2.3.4 NGenIC_11410

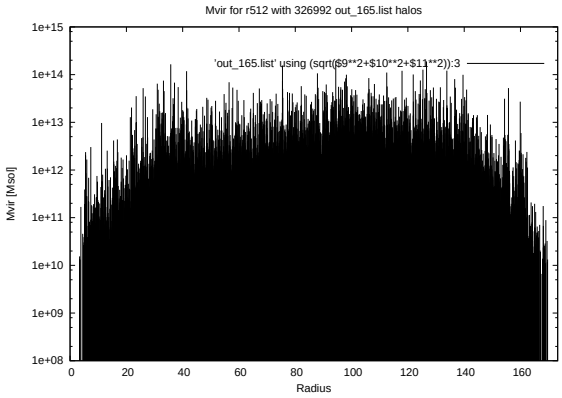


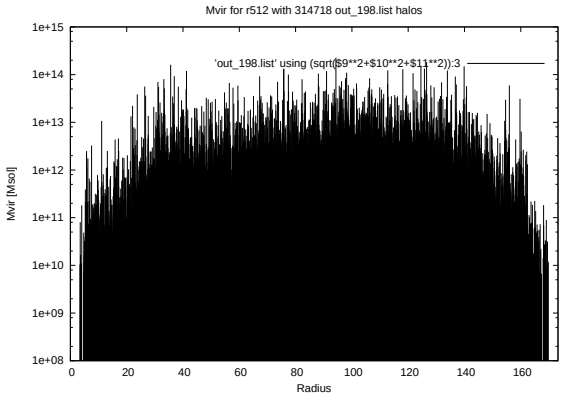


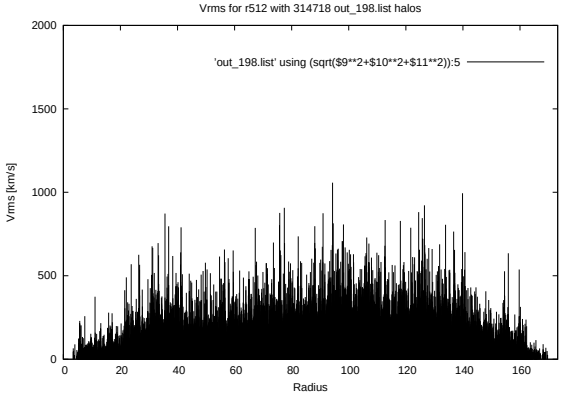
2.3.5 NGenIC_27036

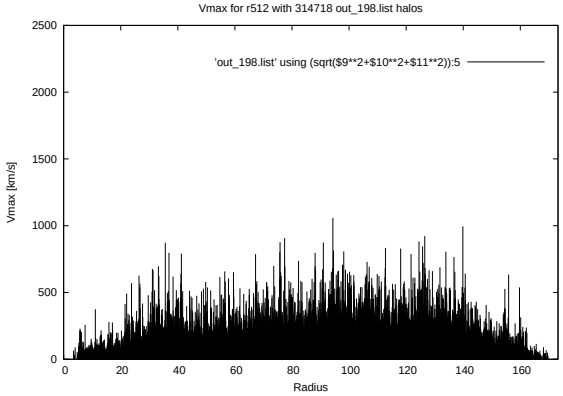


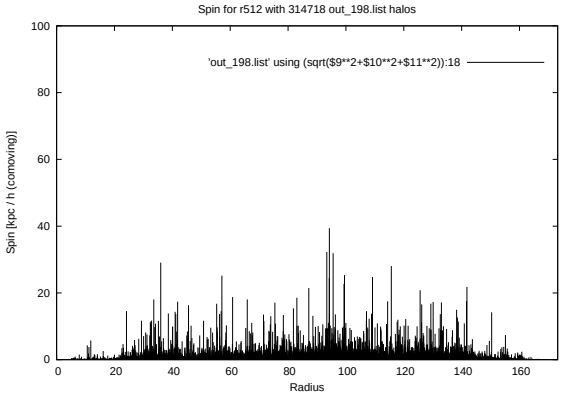



Mvir for r512 with 326992 out_165.list halos
'out_165.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Mvir for r512 with 314718 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):3
Mvir [Msol]
Radius


Vrms for r512 with 314718 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vrms [km/s]
Radius


Vmax for r512 with 314718 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):5
Vmax [km/s]
Radius


Spin for r512 with 314718 out_198.list halos
'out_198.list' using (sqrt($9**2+$10**2+$11**2)):18
Spin [kpc / h (comoving)]
Radius