

# **Simulations Documentation**

## the AWESOME Project

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# Chapter 1

## Notes

09.03.2012 strange error in 2 galacticus jobs `stages_12` and `stages_13` → Markus' converter outdated with new consistenttrees?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 infini-band now

- 06.03.2012 submitted 4 jobs with same seed but different constraints parameters  
 Memory agglomeration fix also on cluster + email to developer  
 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  
 consistenttree: `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 revision 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

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_s1100	harre	r	02/10/2012	15:23:21	astro31	16
83496	0.54786	d3+3c_s150	harre	r	02/10/2012	15:37:13	astro12	16
83497	0.60500	d3+3c_s150	harre	r	02/10/2012	15:39:16	astro30	32
83498	0.60500	d15+3c_s15	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

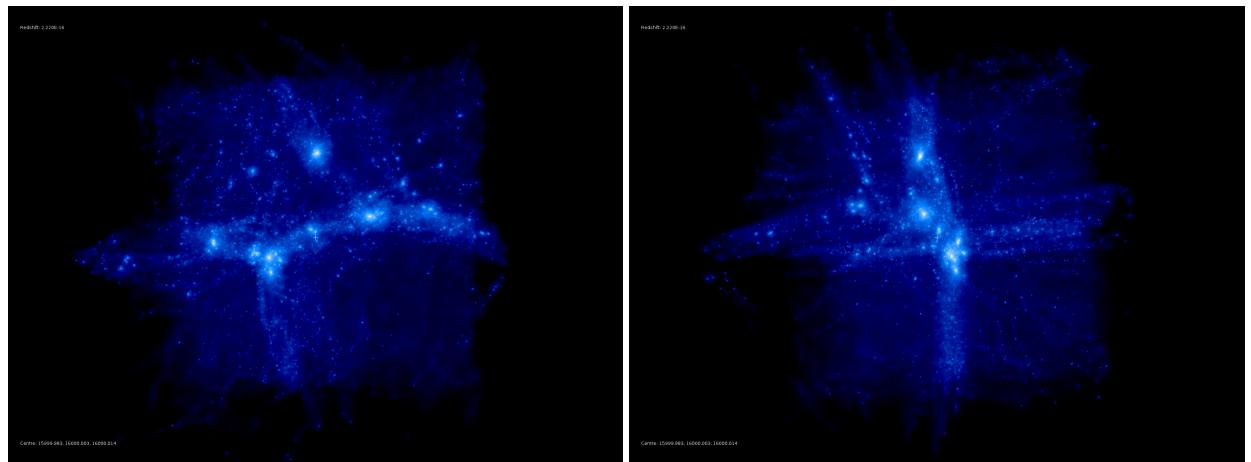
30.01.2012 new consistenttree with vmax=20

# Chapter 2

## Simulations

### 2.1 r128

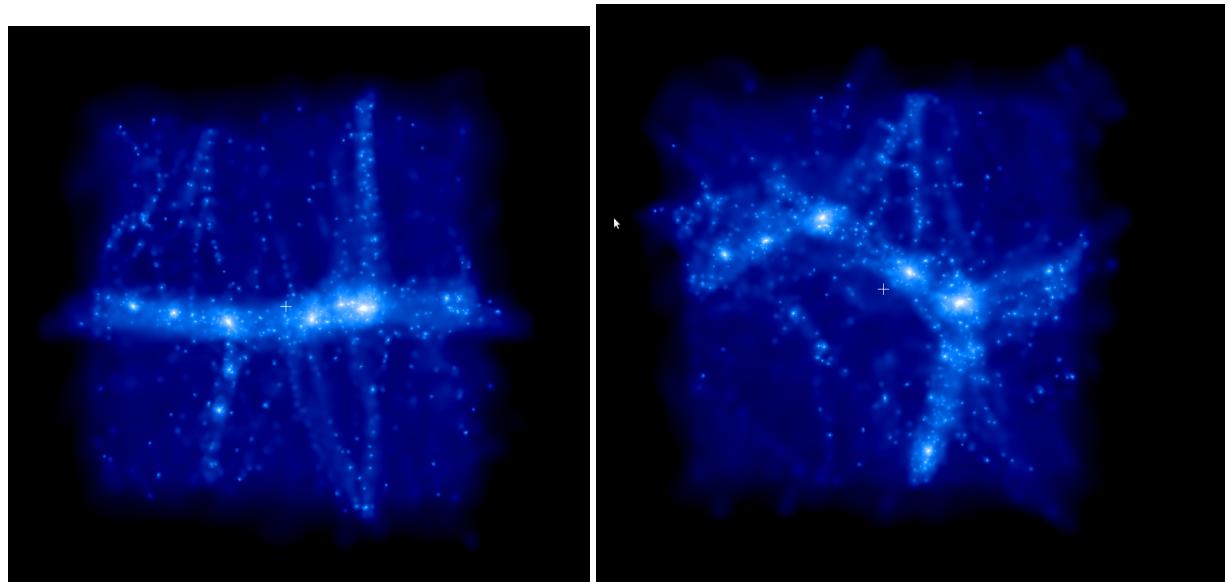
#### 2.1.1 drdx\_3



ROCKSTARRED ✓

pfff → Error: too few halos at scale factor 0.926072 to calculate consistency metric.

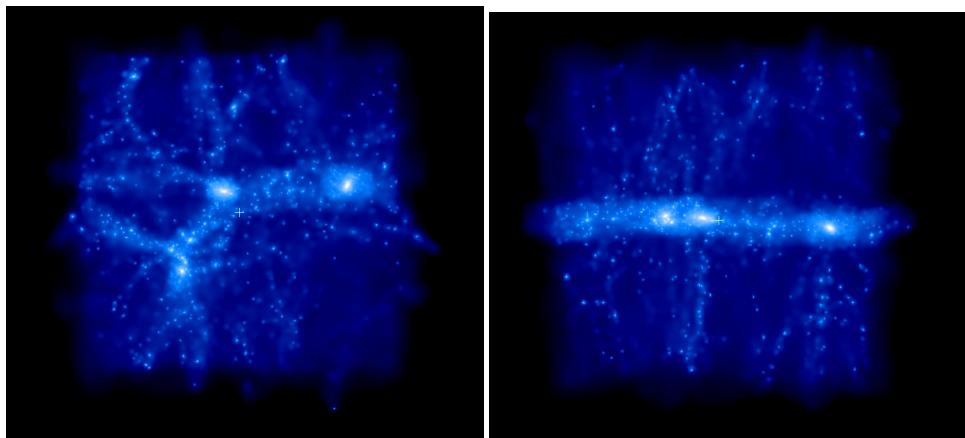
### 2.1.2 drdx\_h100\_r128\_1



ROCKSTARRED ✓

consistenttree: too few halos at scale factor 0.896 ... → wtf?

2.1.3 drdx\_h100\_r128\_2



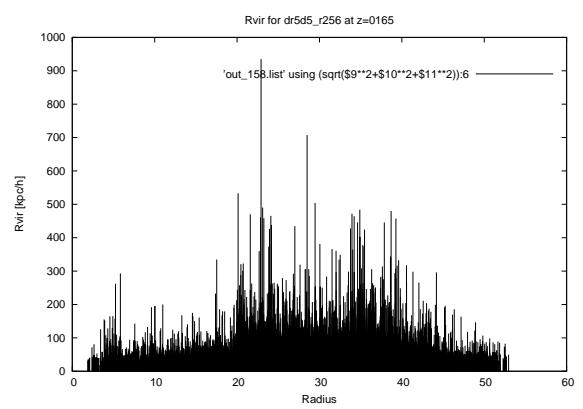
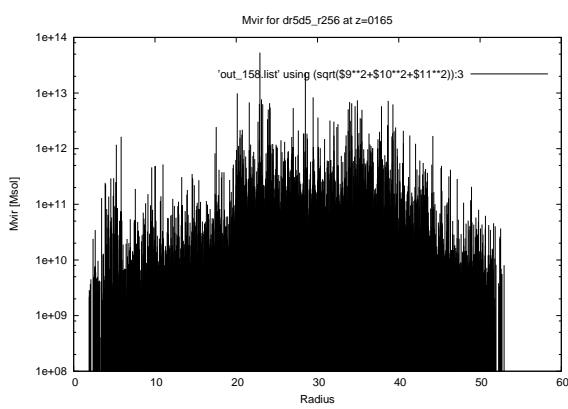
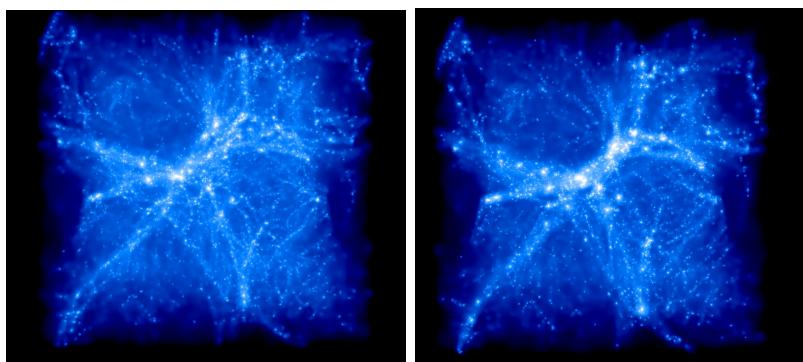
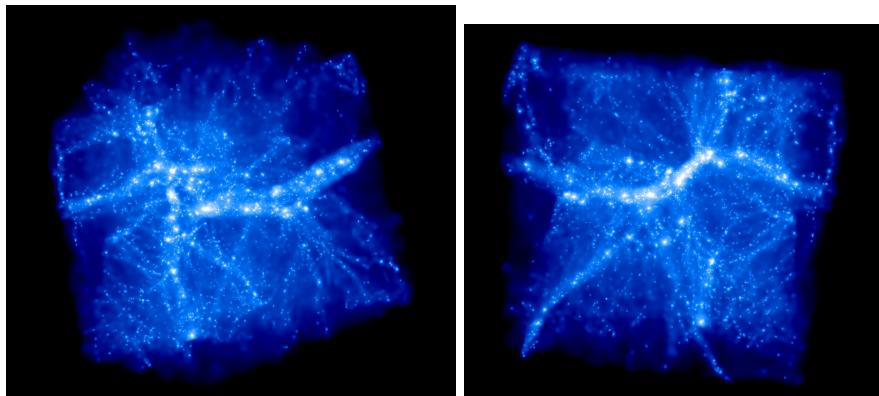
is being rockstarred

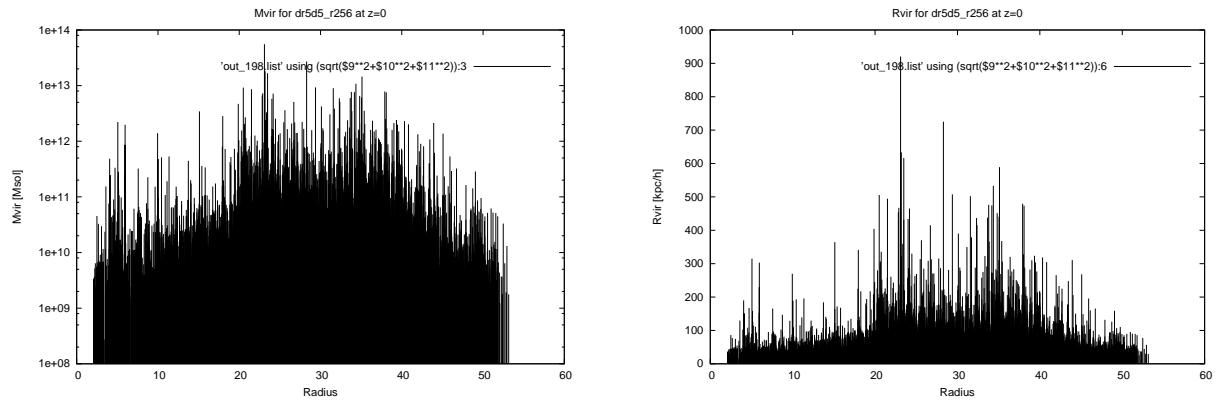
**2.1.4 drkltest+3c+sl50\_1**

```
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)
```

## 2.2 r256

### 2.2.1 dr5d5\_r256





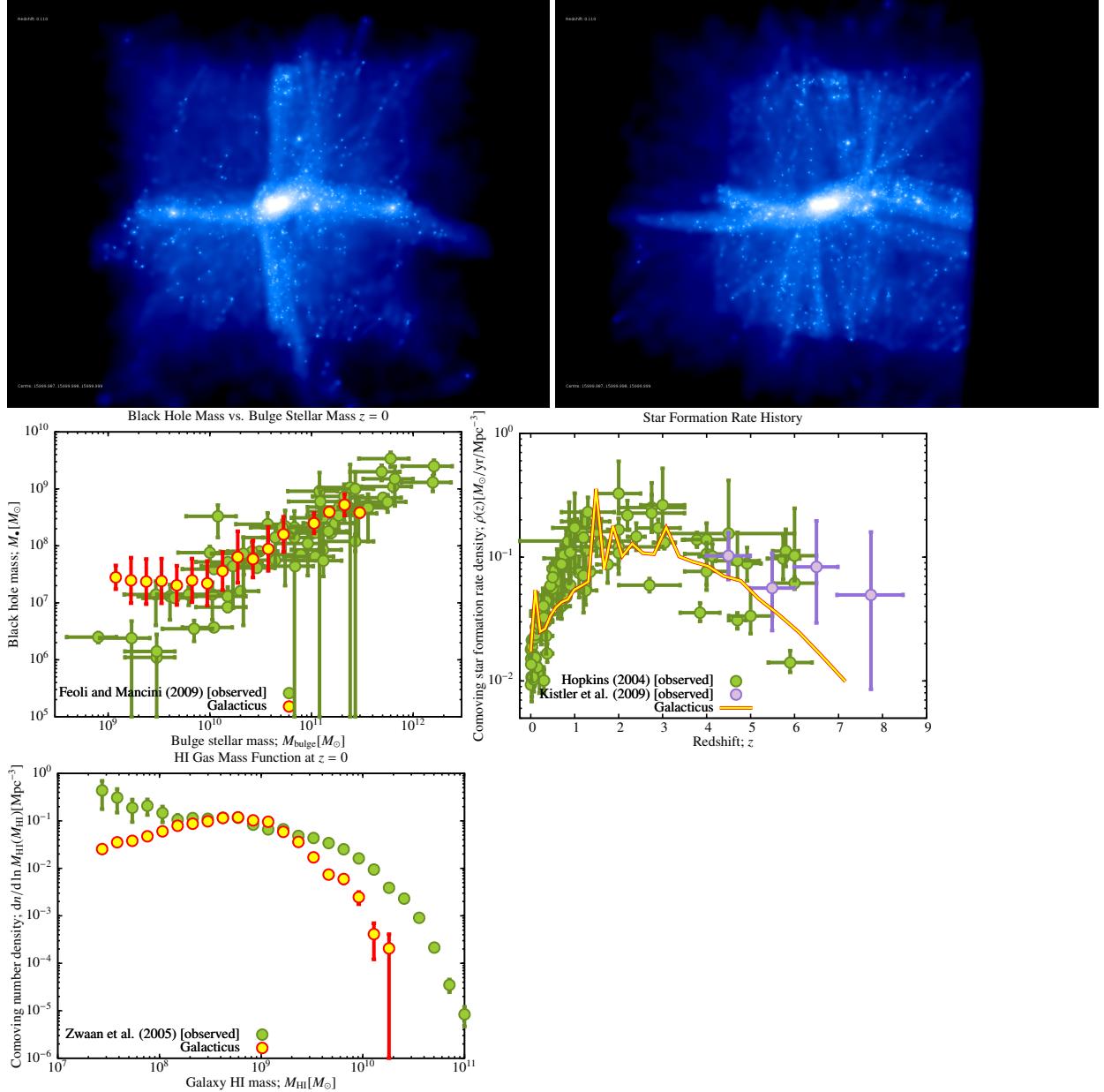
is being galacticussed  
 CONSISTENTTREEED ✓  
 ROCKSTARRED ✓  
 → re-rockstar on AMD ...-03

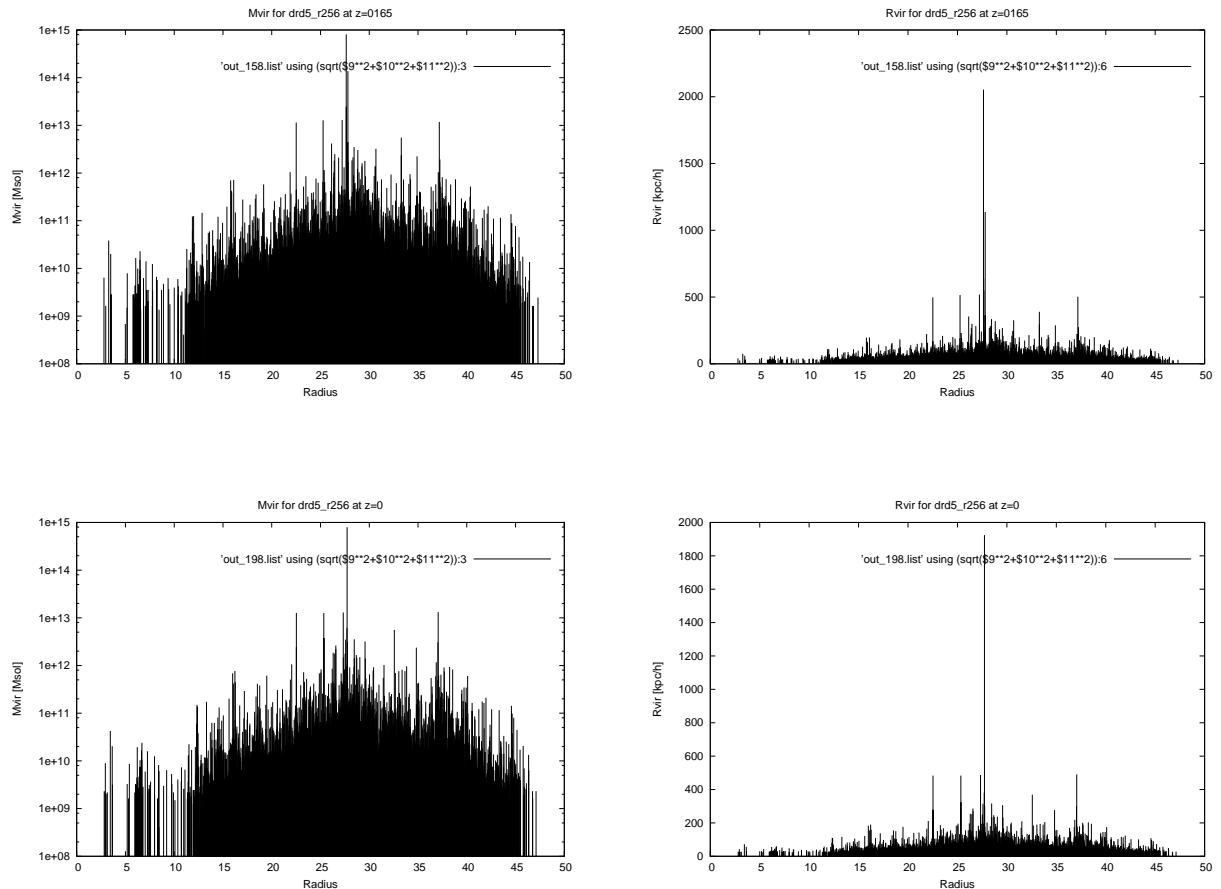
```
find_parents_and_cleanup.c:130:  

lookup_new_id: Assertion `new_id' failed.
```

is being consistenttreeed

### 2.2.2 drd5\_r256 ( $\sim$ )



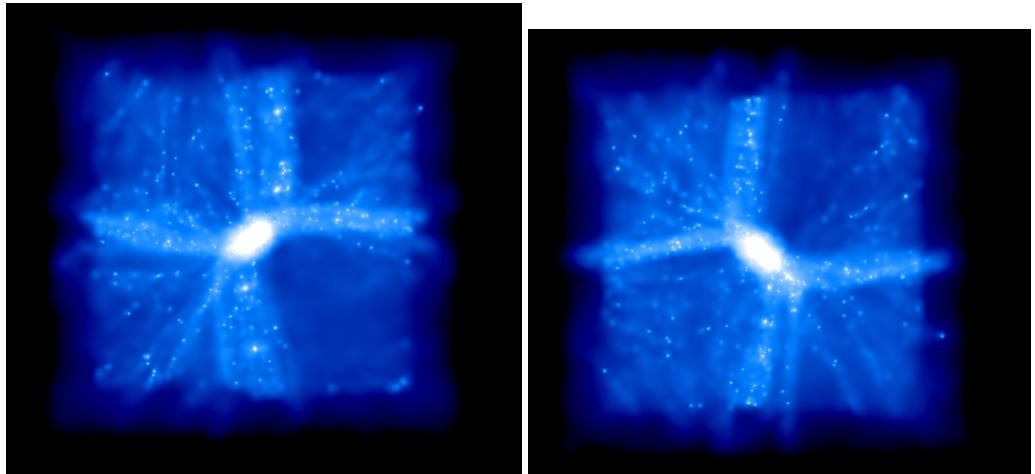


GALACTICUSSED ✓  
galacticus running on SGE  
→ re-converted with bugfixed converter  
tree copied to markus transfer  
GALACTICUS:

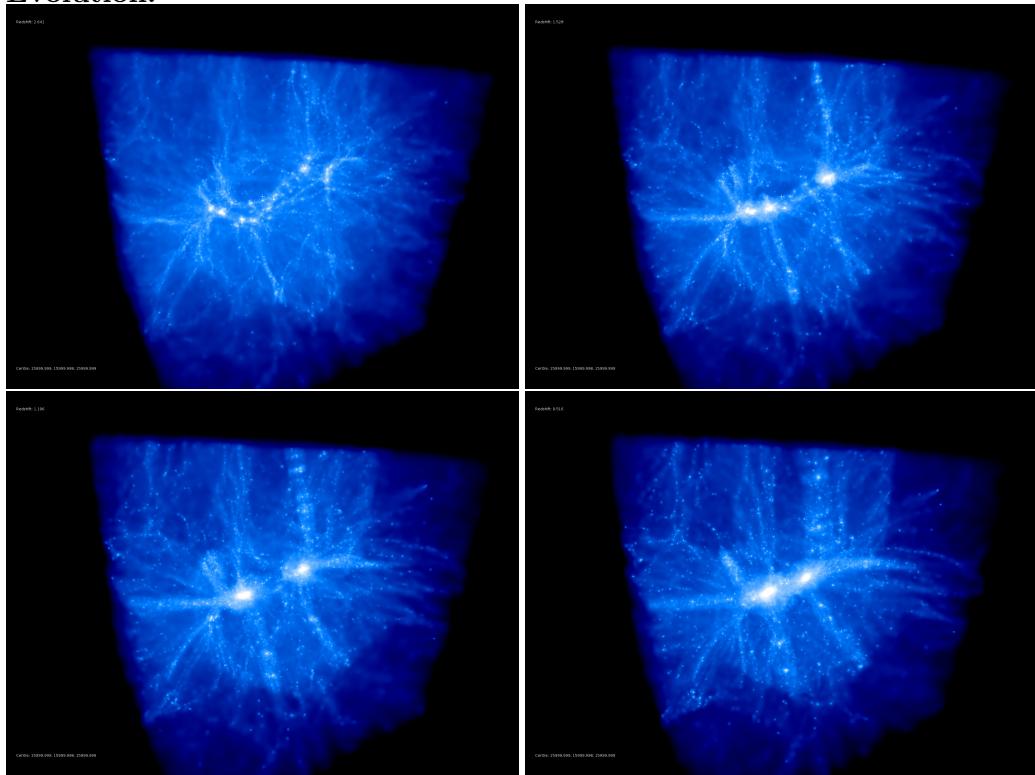
```
Fatal error in Build_Descendent\_Pointers():
failed to find descendent node: 5546454 of 5522259
galacticus.sh: line 67: 25689 Aborted
```

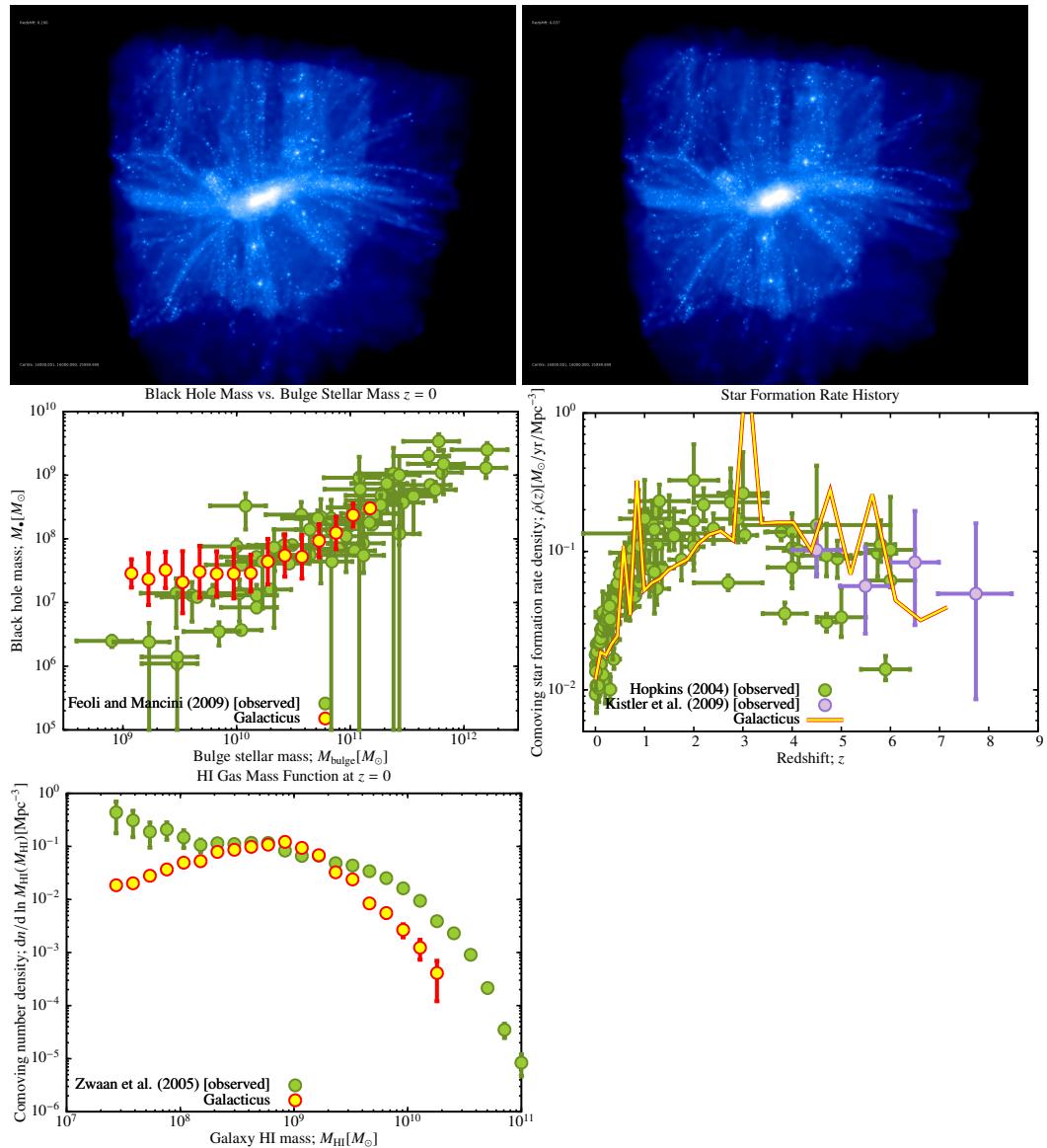
CONSISTENTTREEED ✓  
ROCKSTARRED ✓

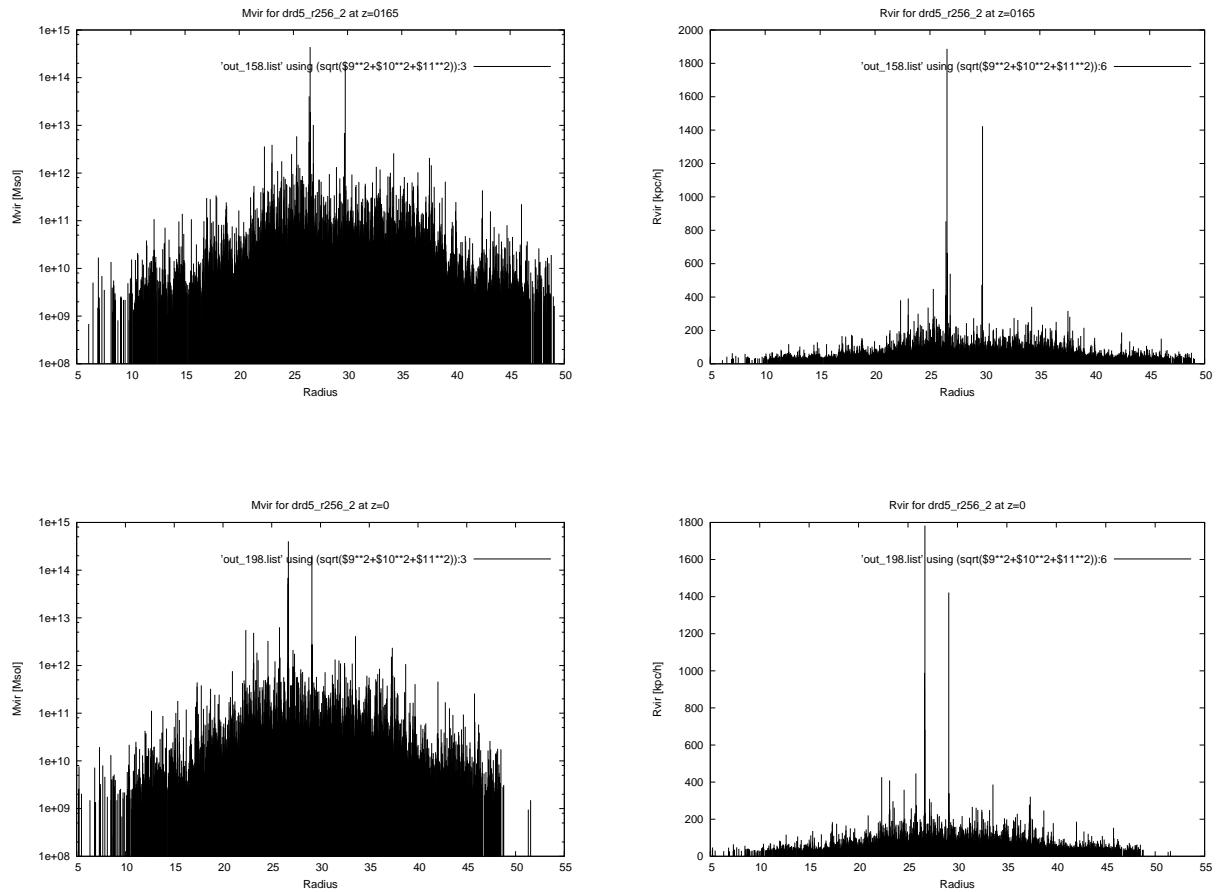
### 2.2.3 drd5\_r256\_2 (+ major merger in progress)



**Evolution:**







GALACTICUSSED ✓  
→ 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  

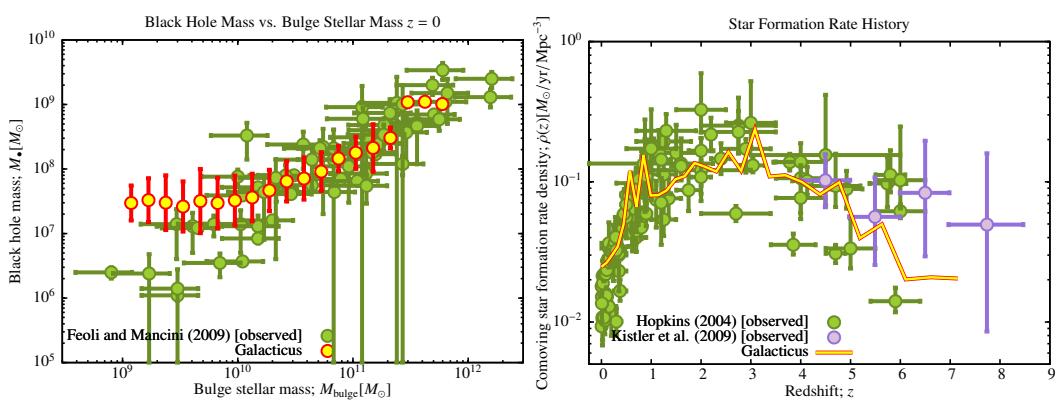
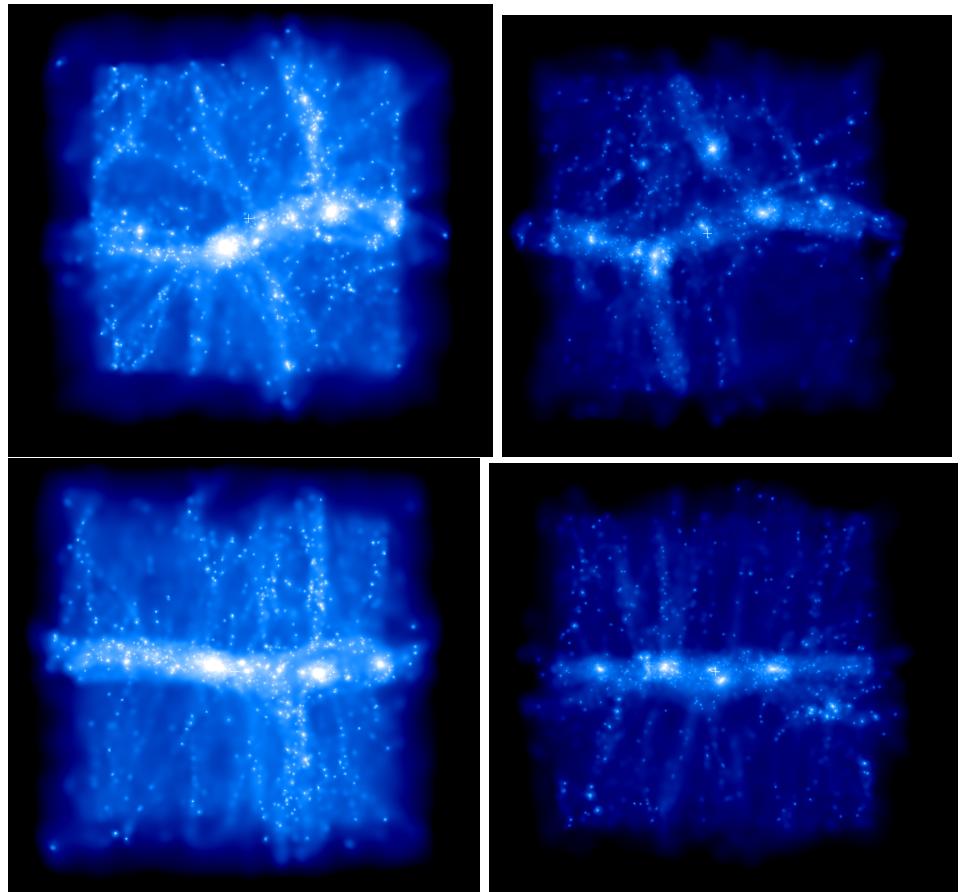
#4 0x48ADC3 in __merger_tree_read_MOD_merger_tree_read_do  

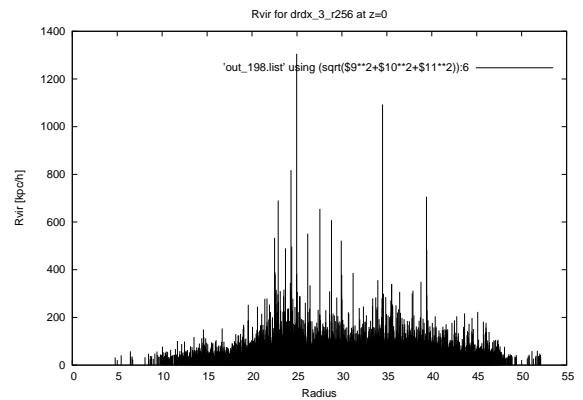
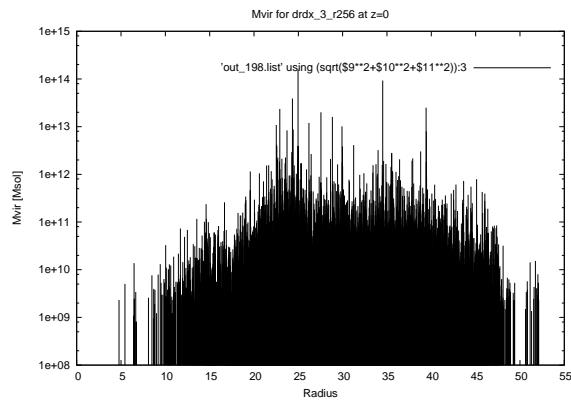
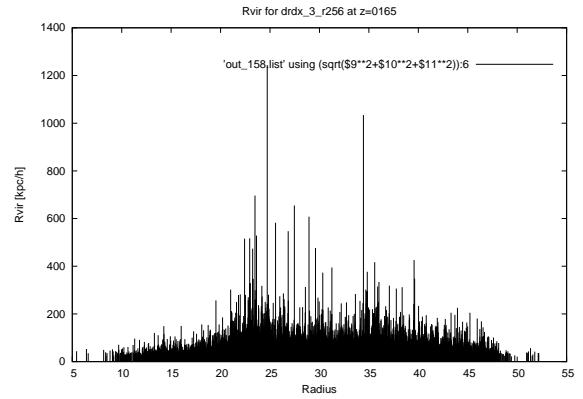
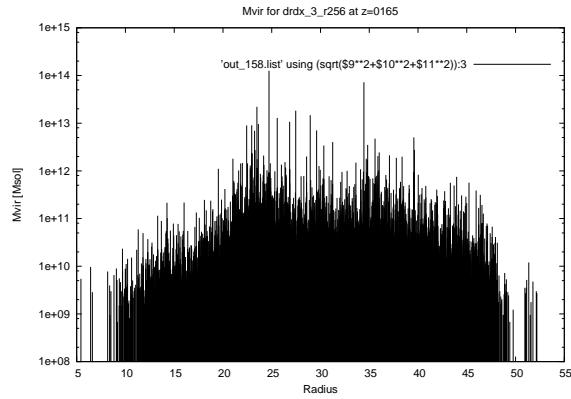
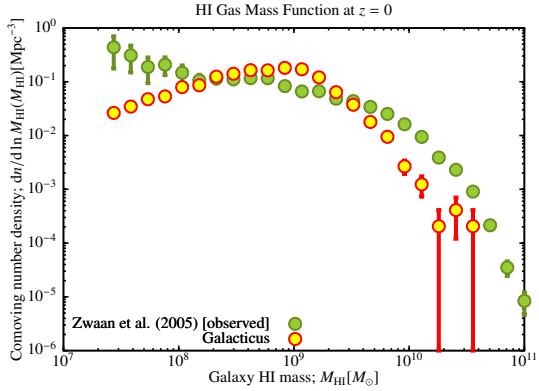
#5 0x48205E in __merger_tree_construction_MOD_merger_tree_create
```

```
#6 0x46F469 in __galacticus_tasks_evolve_tree_MOD_galacticus_task_evolve_tree._omp_
.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

CONSISTENTTREEED √
ROCKSTARRED √ (lasted about 9000minutes)
```

### 2.2.4 drdx\_3\_r256





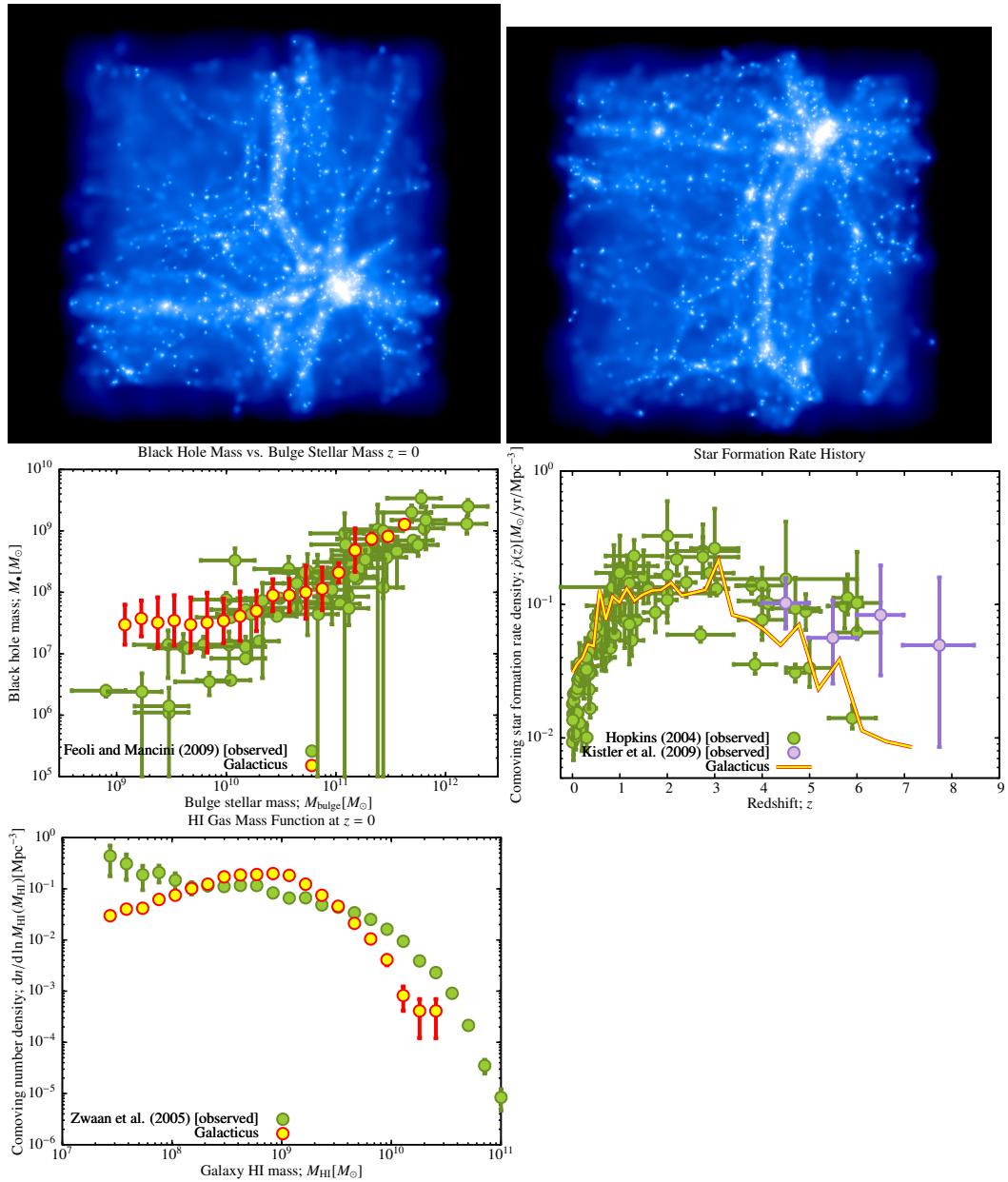
GALACTICUSSED ✓  
→ fixed in revision 709

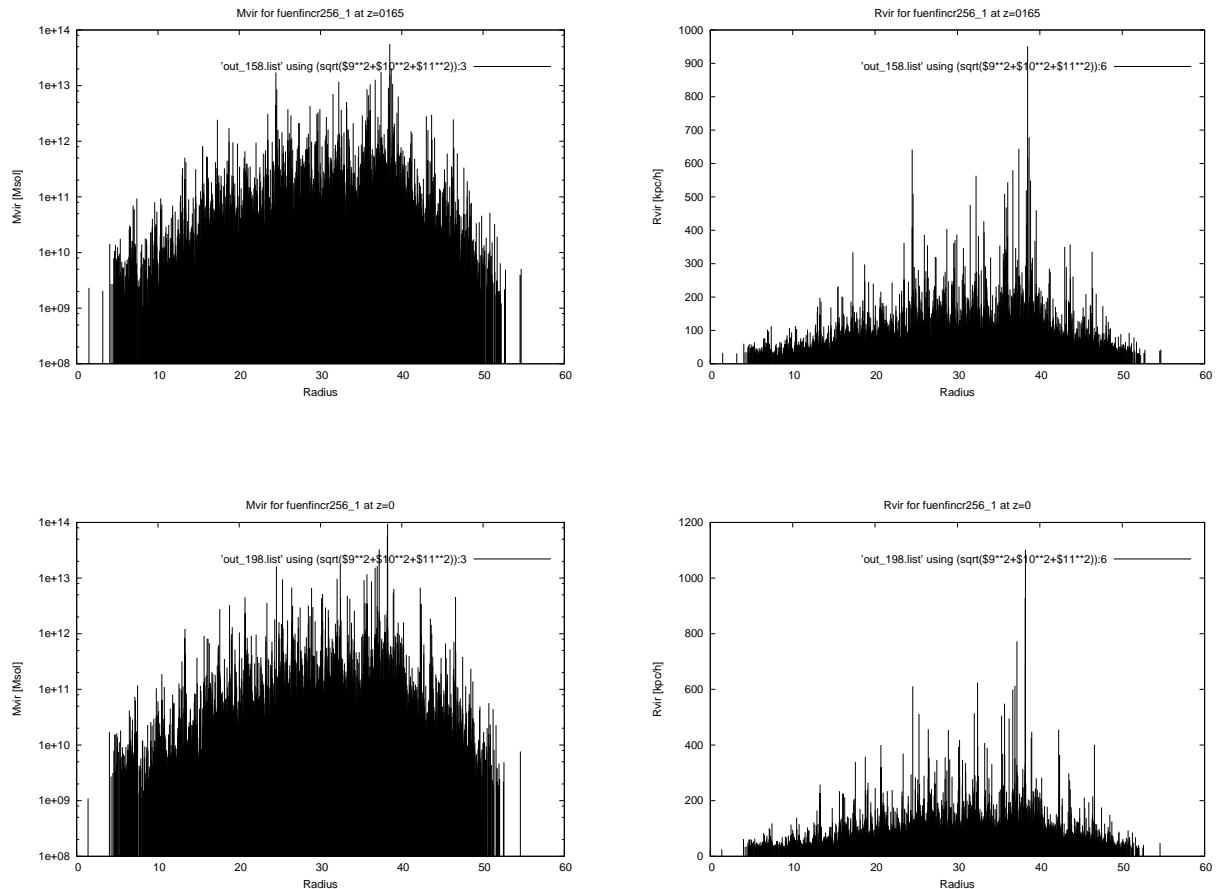
GALACTICUS REV708:

```
#4 0x301763648F
#5 0x49B1B8 in __merger_tree_read_MOD_build_descendent_pointers at merger_trees.co
#6 0x49FF70 in __merger_tree_read_MOD_merger_tree_read_do at merger_trees.construct
#7 0x4923BE in __merger_tree_construction_MOD_merger_tree_create at merger_trees.co
#8 0x4800C6 in __galacticus_tasks_evolve_tree_MOD_galacticus_task_evolve_tree._omp_
#9 0x2AC099B4F829
#10 0x3017A07CDO
#11 0x30176DFD3C
#12 0xFFFFFFFFFFFFFFF
/sge-root/sge/AMD64/spool/astro13/job_scripts/83594: line 22: 13318 Aborted

CONSISTENTTREEED √
ROCKSTARRED √
is being rockstarred on astro-x4600-03
This run is a test if r256 and r128 (drdx_3) are comparable → see pictures.
```

### 2.2.5 fuenfincr256\_1





GALACTICUSSED ✓

→ re-galacticussing with rev708

GALACTICUS: rev707 exited without error but not finished

GALACTICUSSED ✓ 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  $\log_{10}(Z/Z_{\text{Solar}}) = 0.198$

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.
```

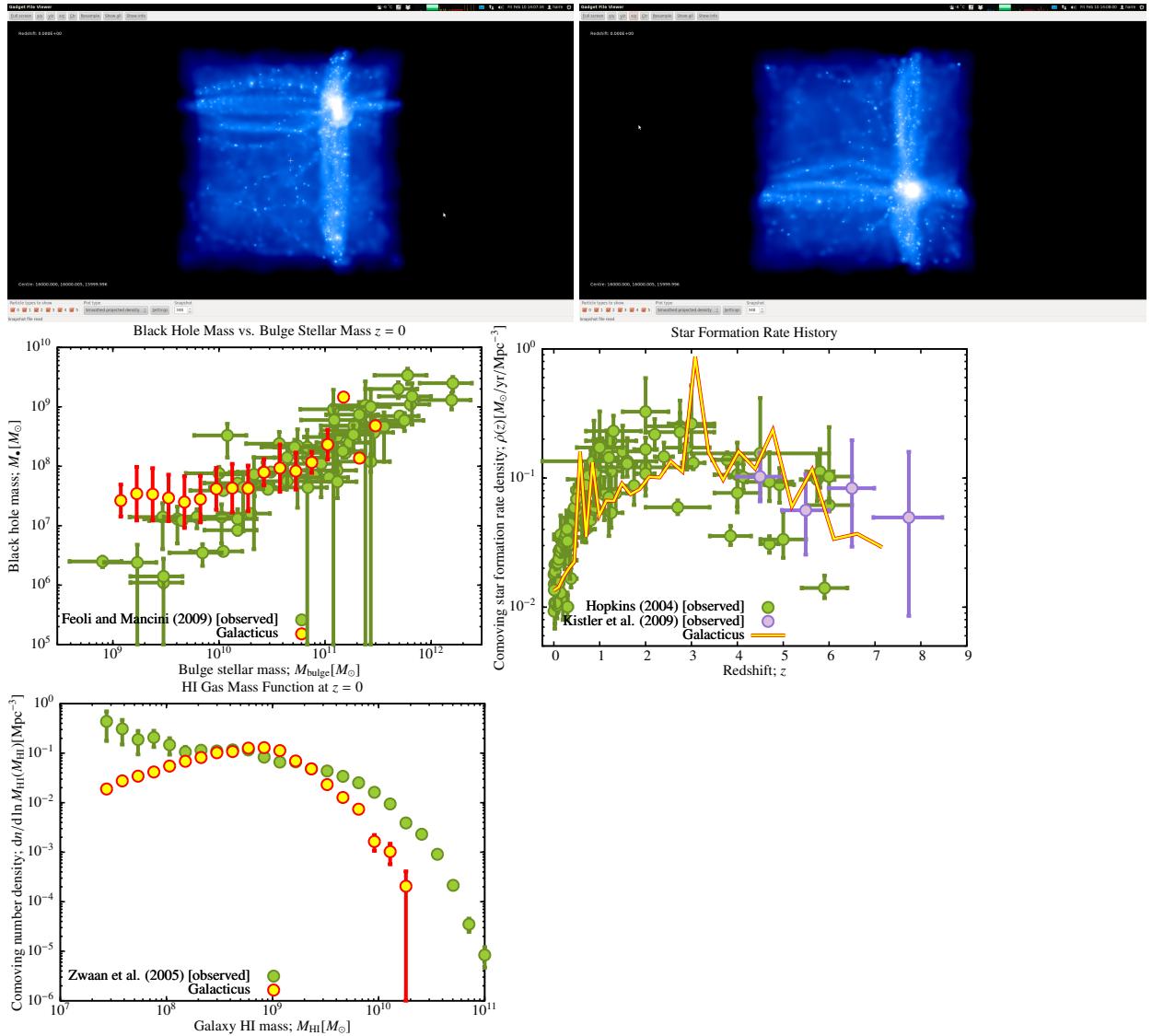
tree copied to markus transfer

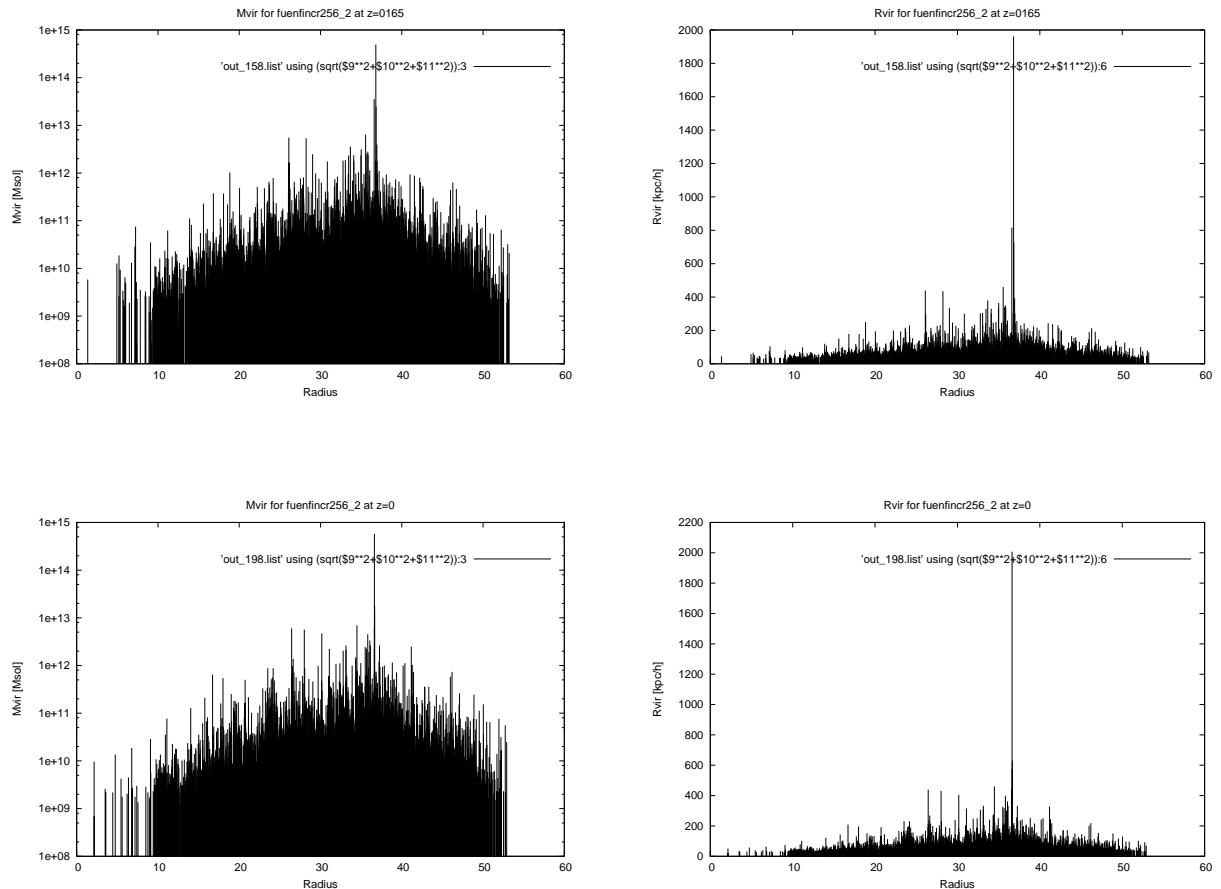
GALACTICUS:

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

ROCKSTARRED ✓  
CONSISTENTTREED ✓

### 2.2.6 fuenfincr256\_2 → dump!





GALACTICUSSED ✓ → 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!

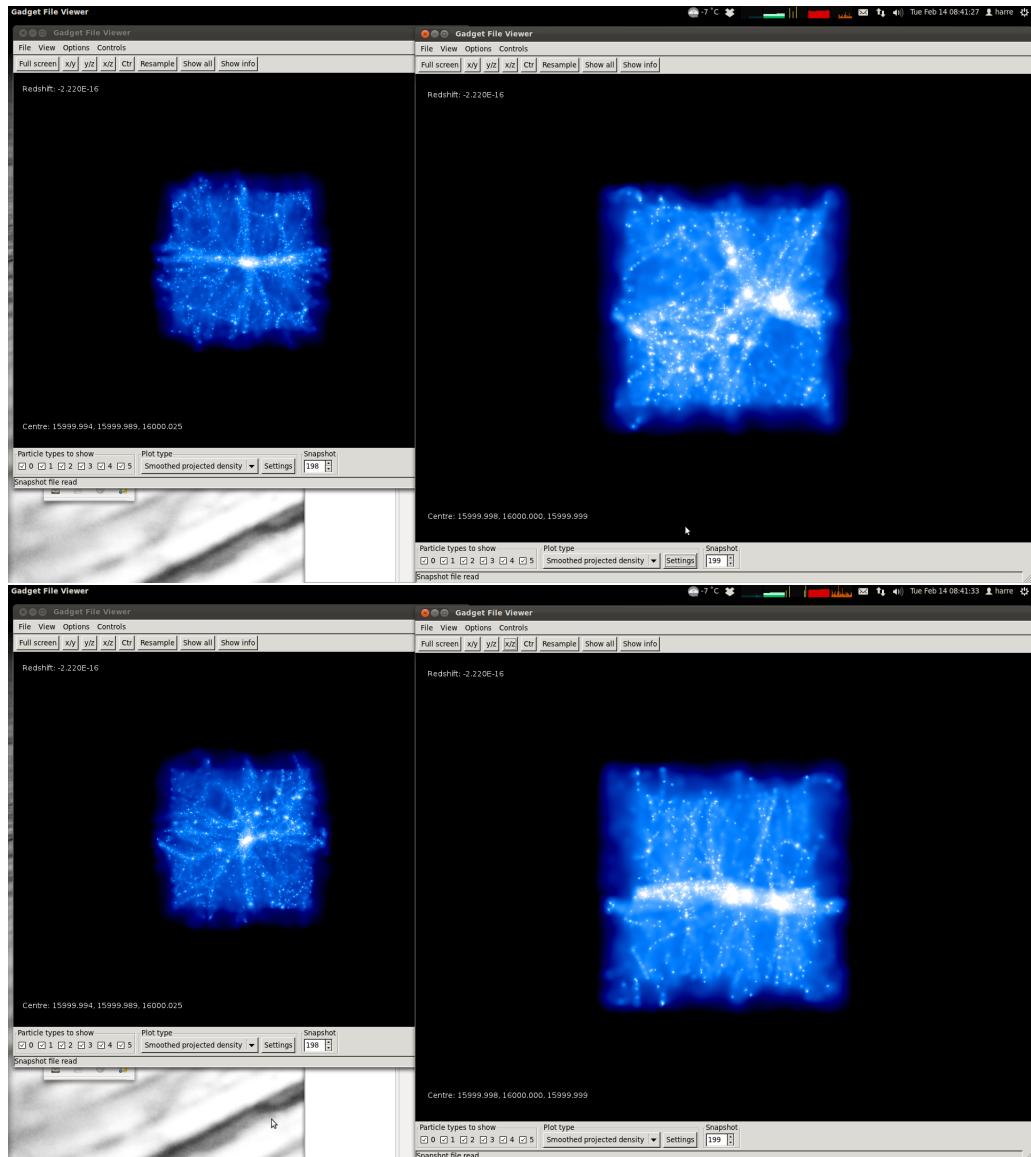
GALACTICUS:

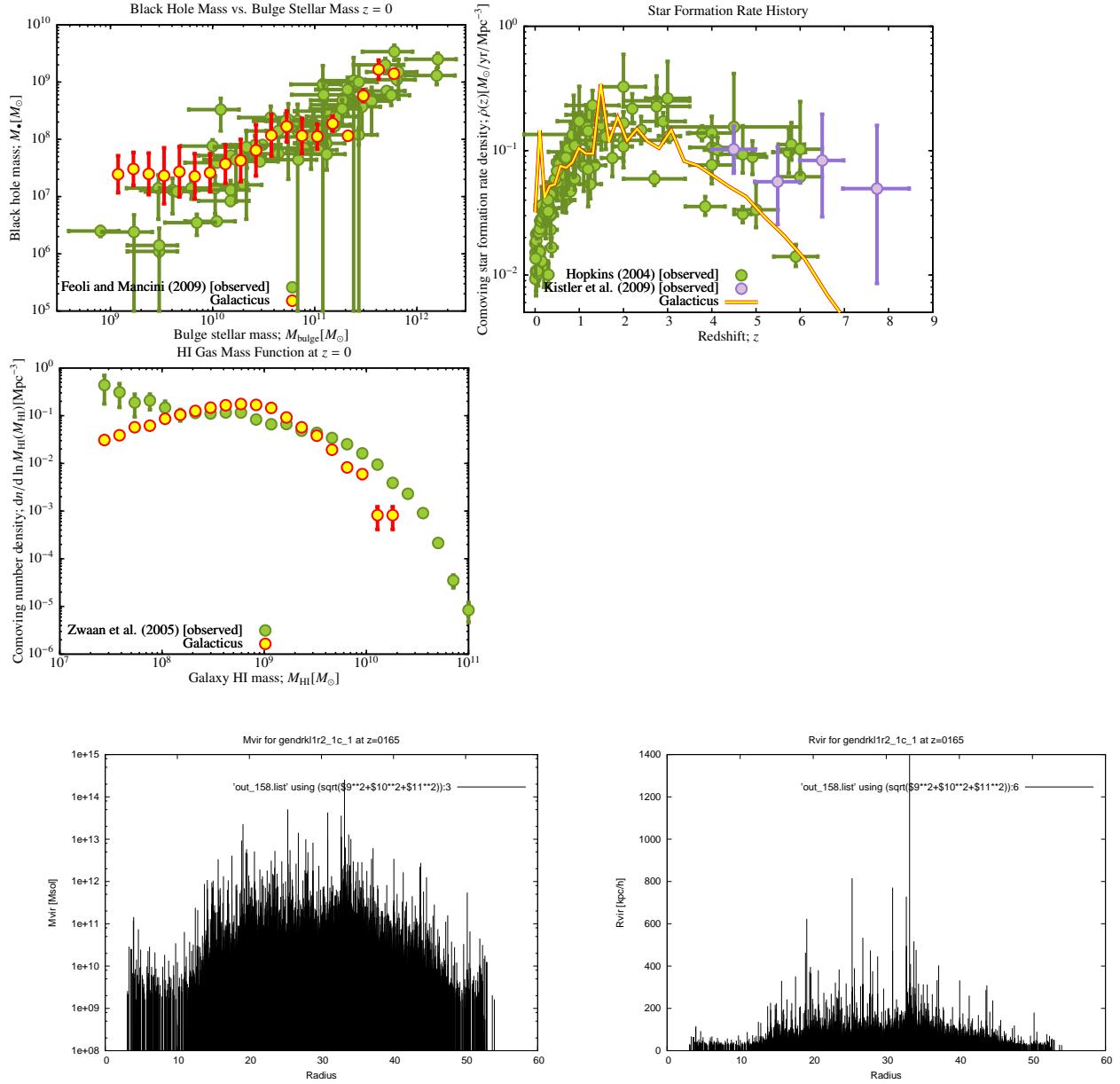
```
Fatal error in Build_Descendent_Pointers():
failed to find descendent node
```

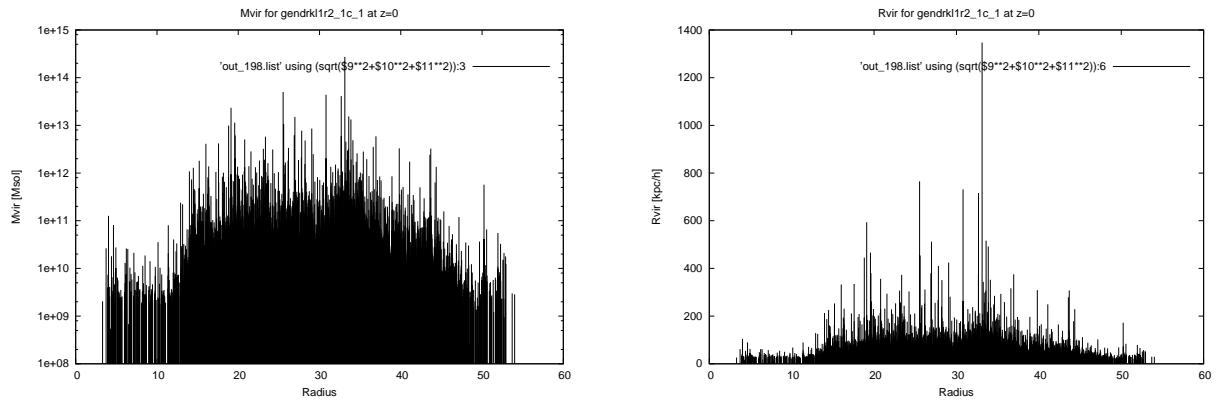
CONSISTENTTREEED ✓

ROCKSTARRED ✓ (lasted about 9000minutes)

### 2.2.7 gendrkl1r2\_1c\_1







GALACTICUSSED WITH REVISION 709 ✓ CONSISTENTTREEDE ✓  
 ROCKSTARRED ✓  
 is being rockstarred on astro-x4600-03

E-Mail sent to Bertschinger

```
$ diff drkt+3c+s15_1+r2/constraints_drkt+3c+s15_1+r2.f
r128/h100/gendrk1l1c_1/constraints_gendrk1l1c_1.f

$ diff gendrk1r2_1c_1/grafic_inc_gendrk1r2_1c_1.f
r128/h100/gendrk1l1c_1/grafic_inc_gendrk1l1c_1.f
5c5
< parameter (np1=256,np2=256,np3=256,ncon=1)
---
> parameter (np1=128,np2=128,np3=128,ncon=1)

diff gendrk1r2_1c_1/graficIO_gendrk1r2_1c_1.out r128/h100/gendrk1l1c_1/graficIO_g
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
```

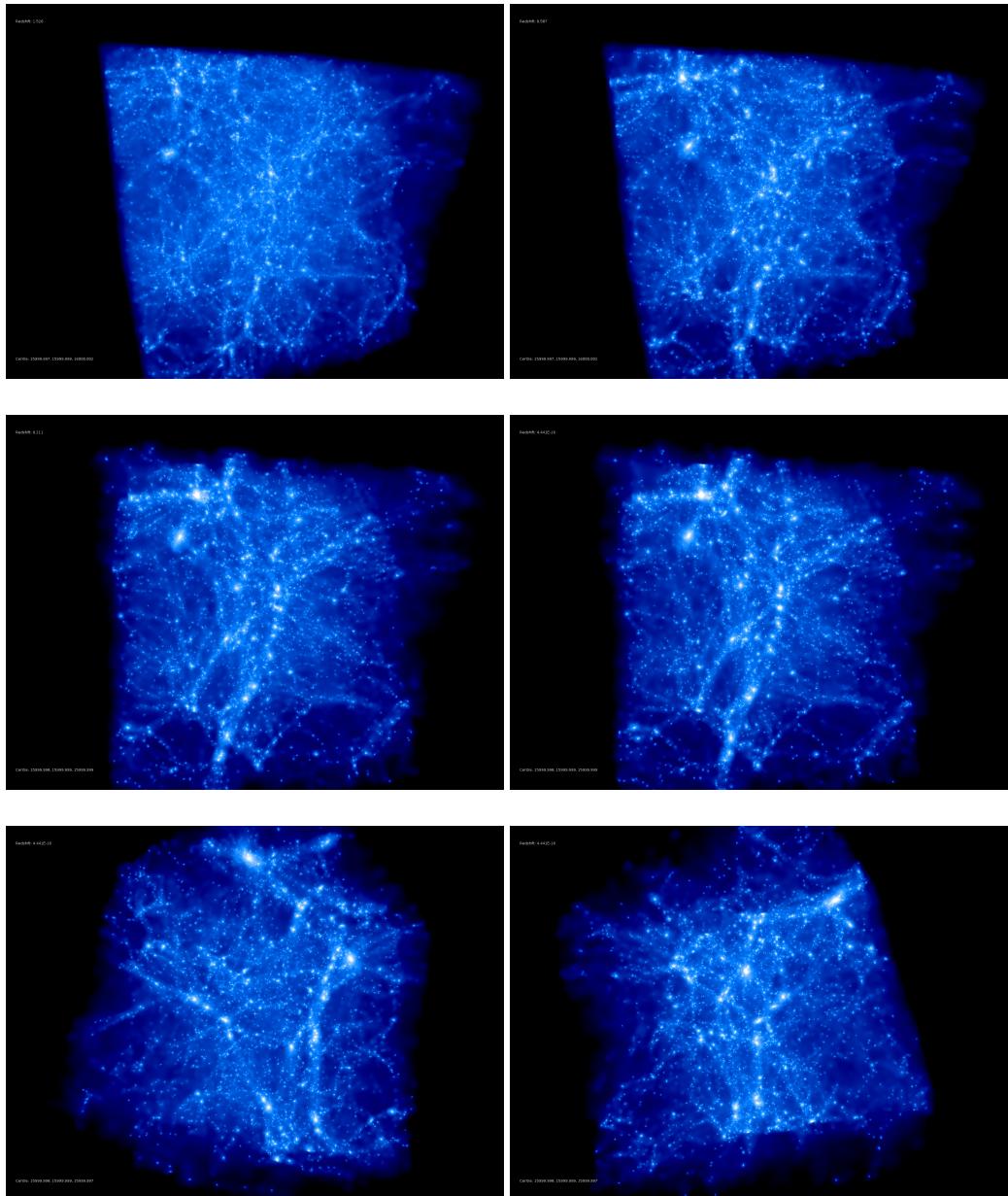
```

<           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

```

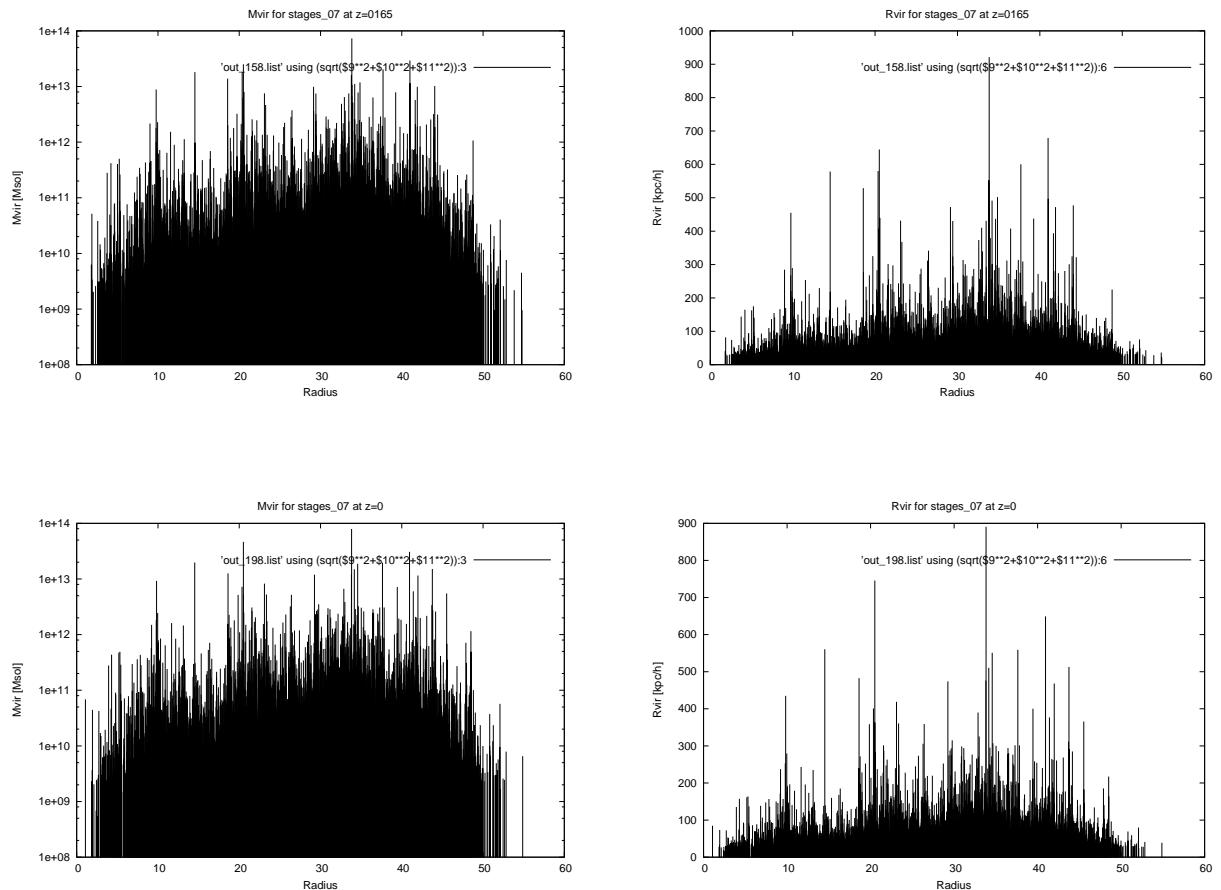
This run is a test if r256 and r128 (`gandrkl_1c_1`) are comparable → see pictures. Sims are not only different in resolution!

### 2.2.8 NGenIC\_26214



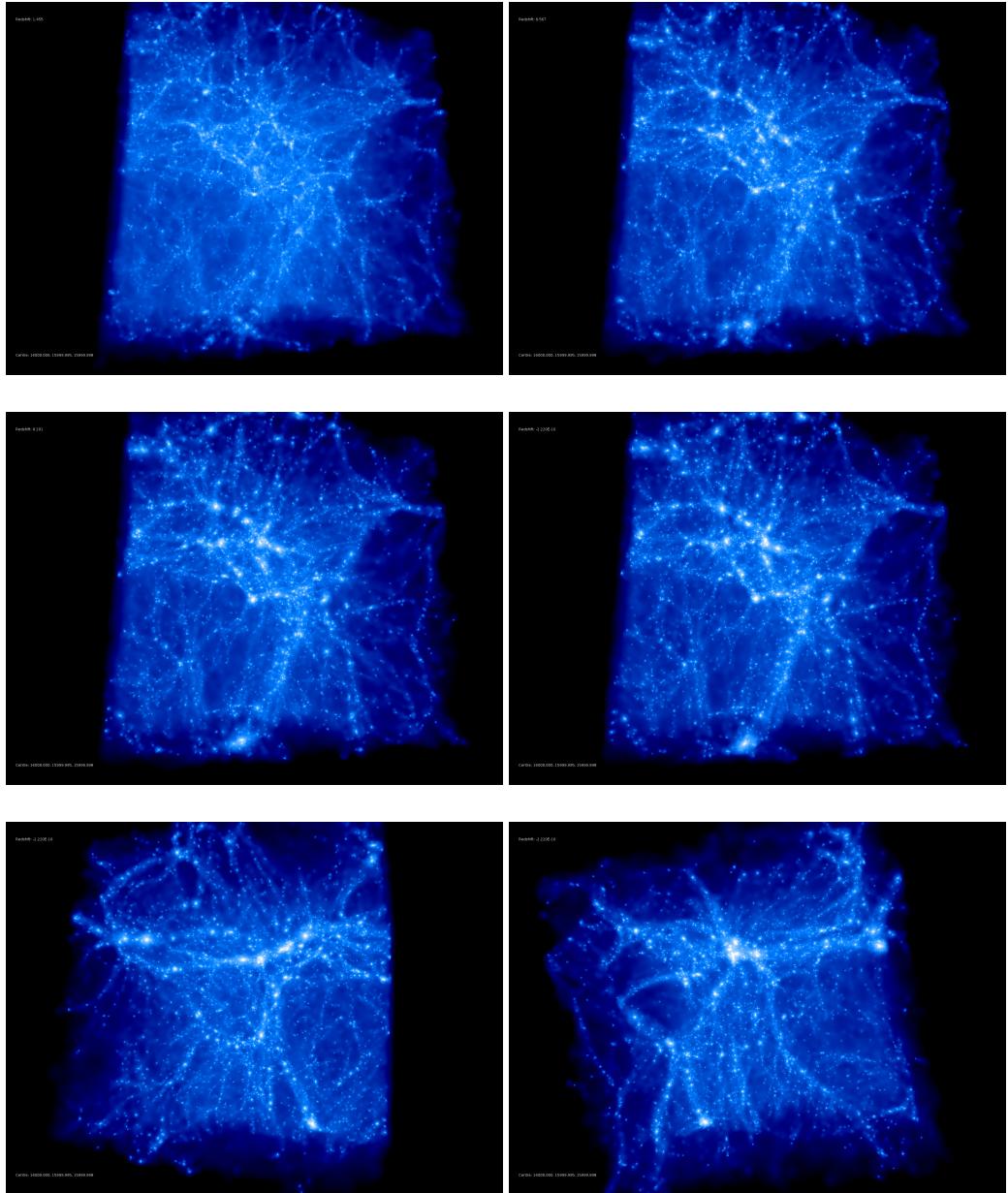
is being rockstarred

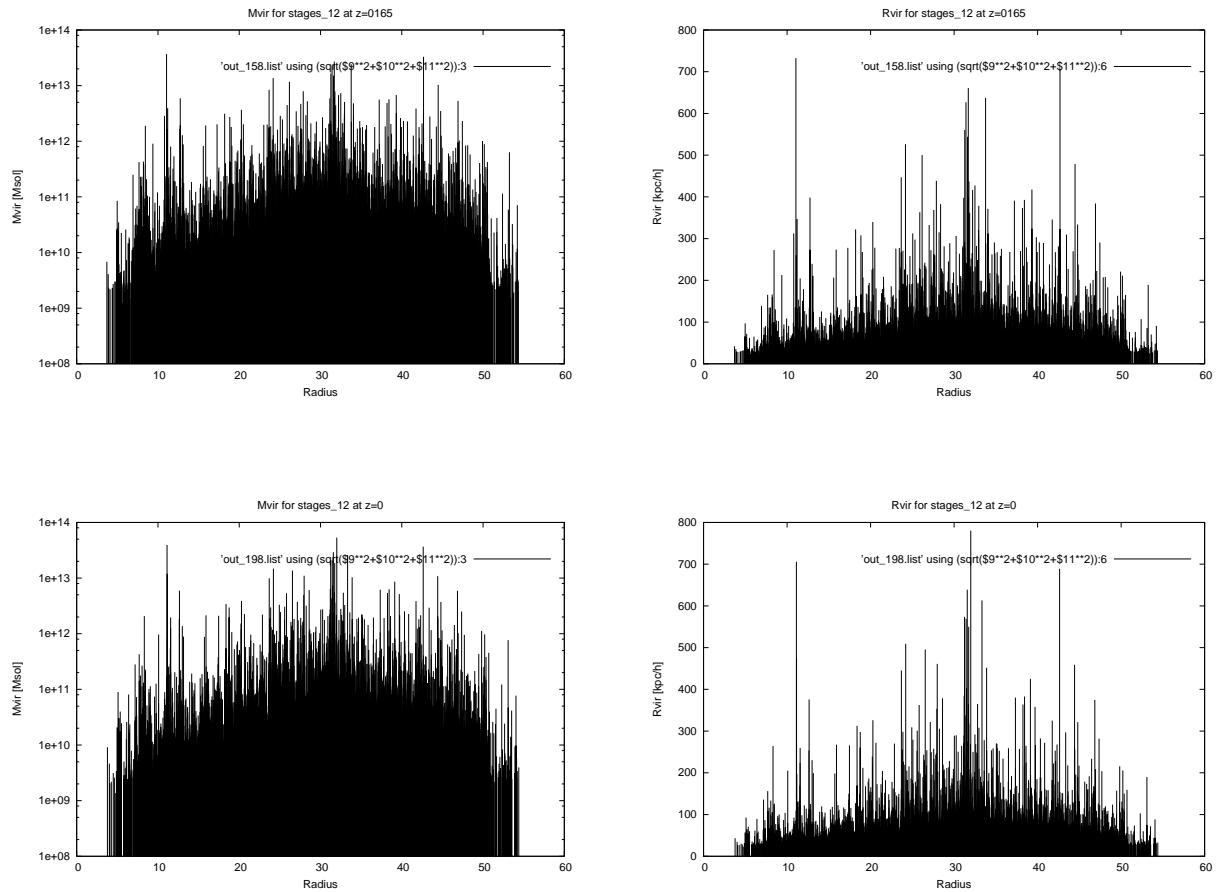
### 2.2.9 stages\_07



is being rockstarred

### 2.2.10 stages\_12



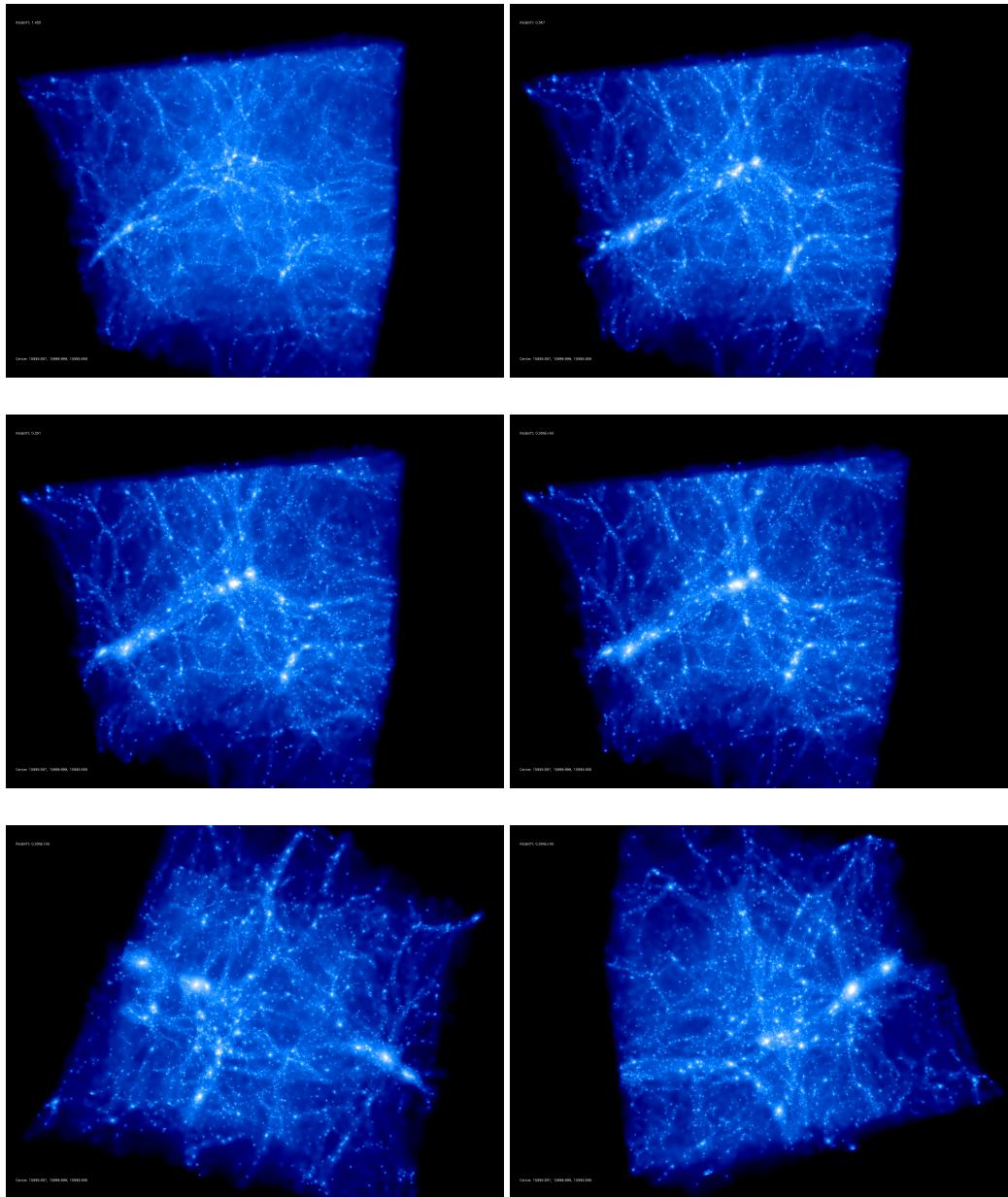


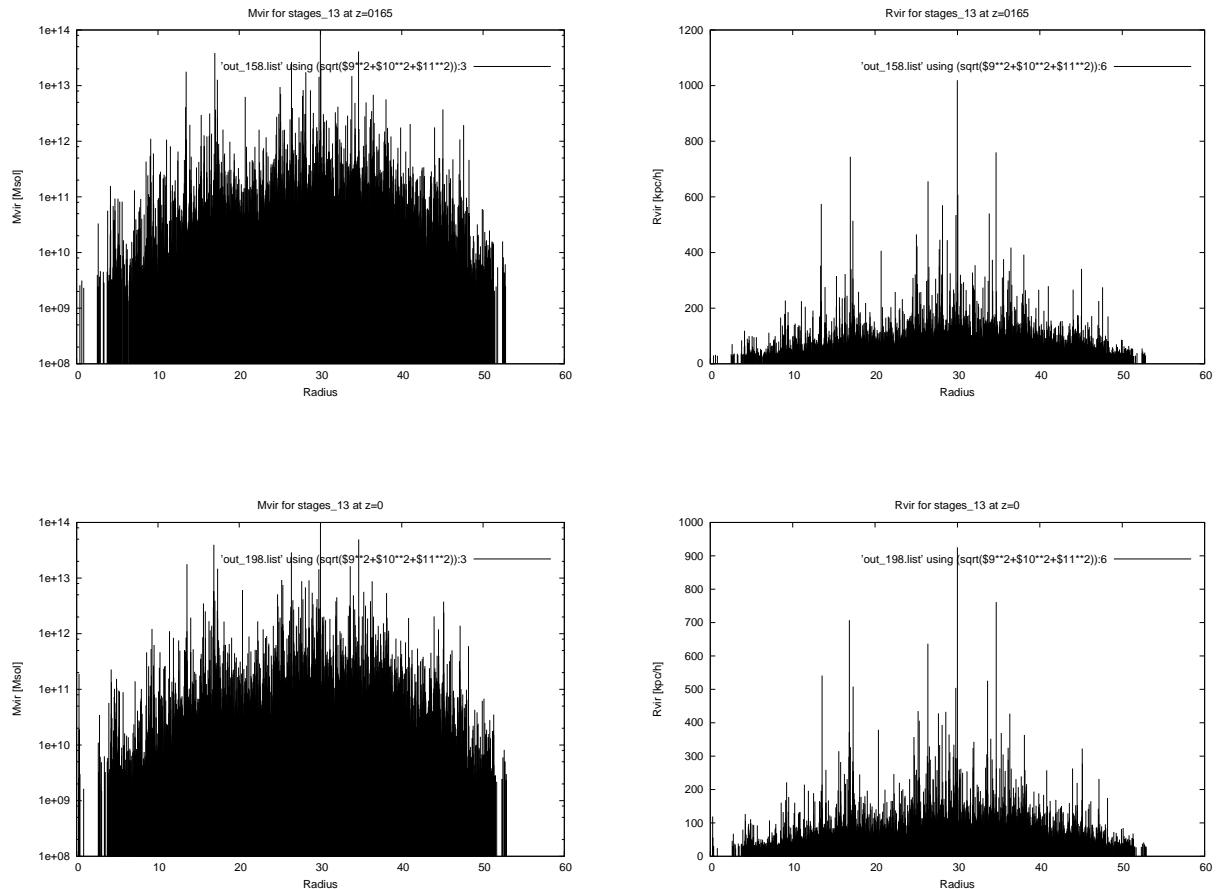
galacticus strange error:

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

is being galacticussed  
 CONSISTENTTREEED ✓  
 ROCKSTARRED ✓

### 2.2.11 stages\_13



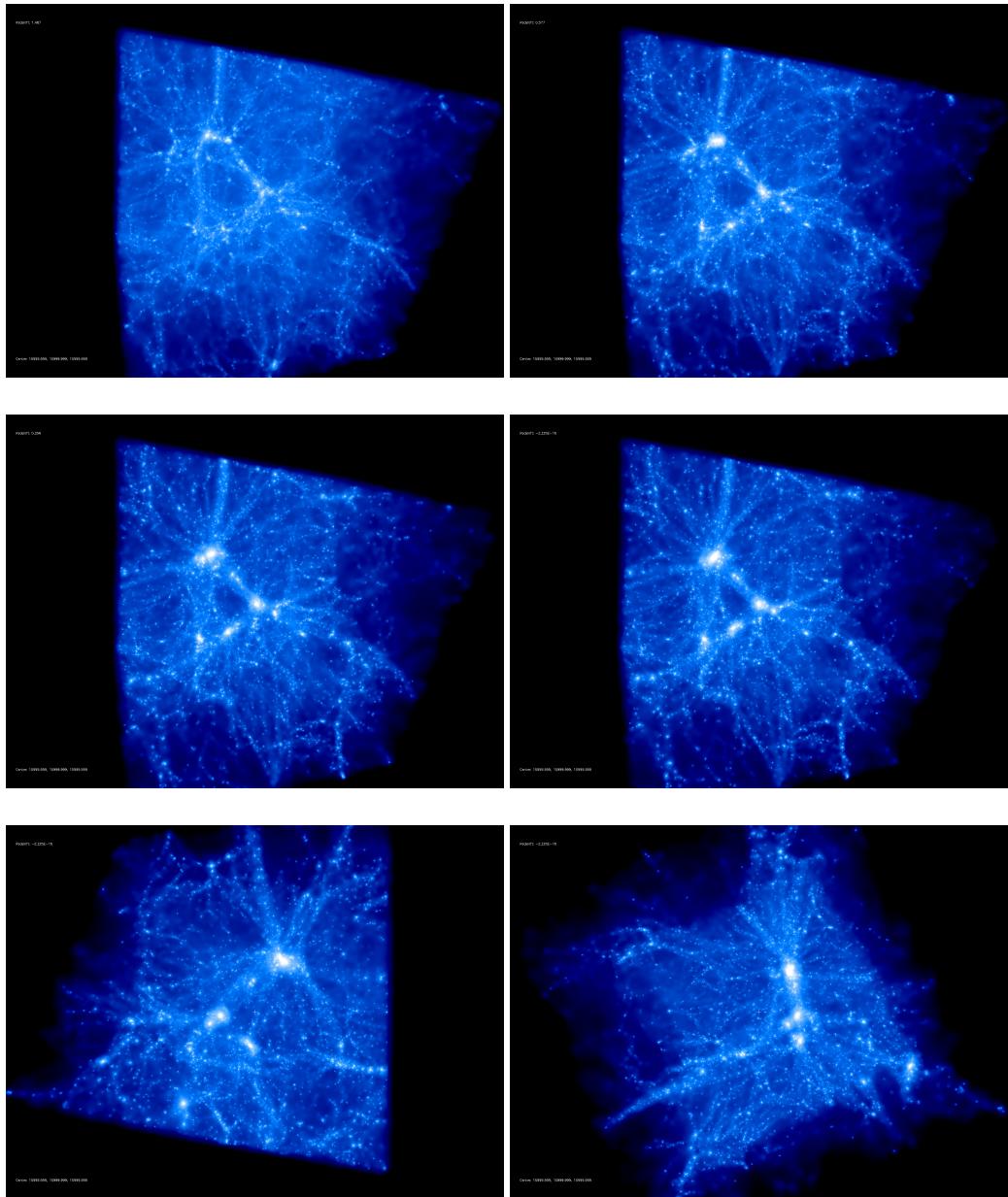


galacticus strange error:

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

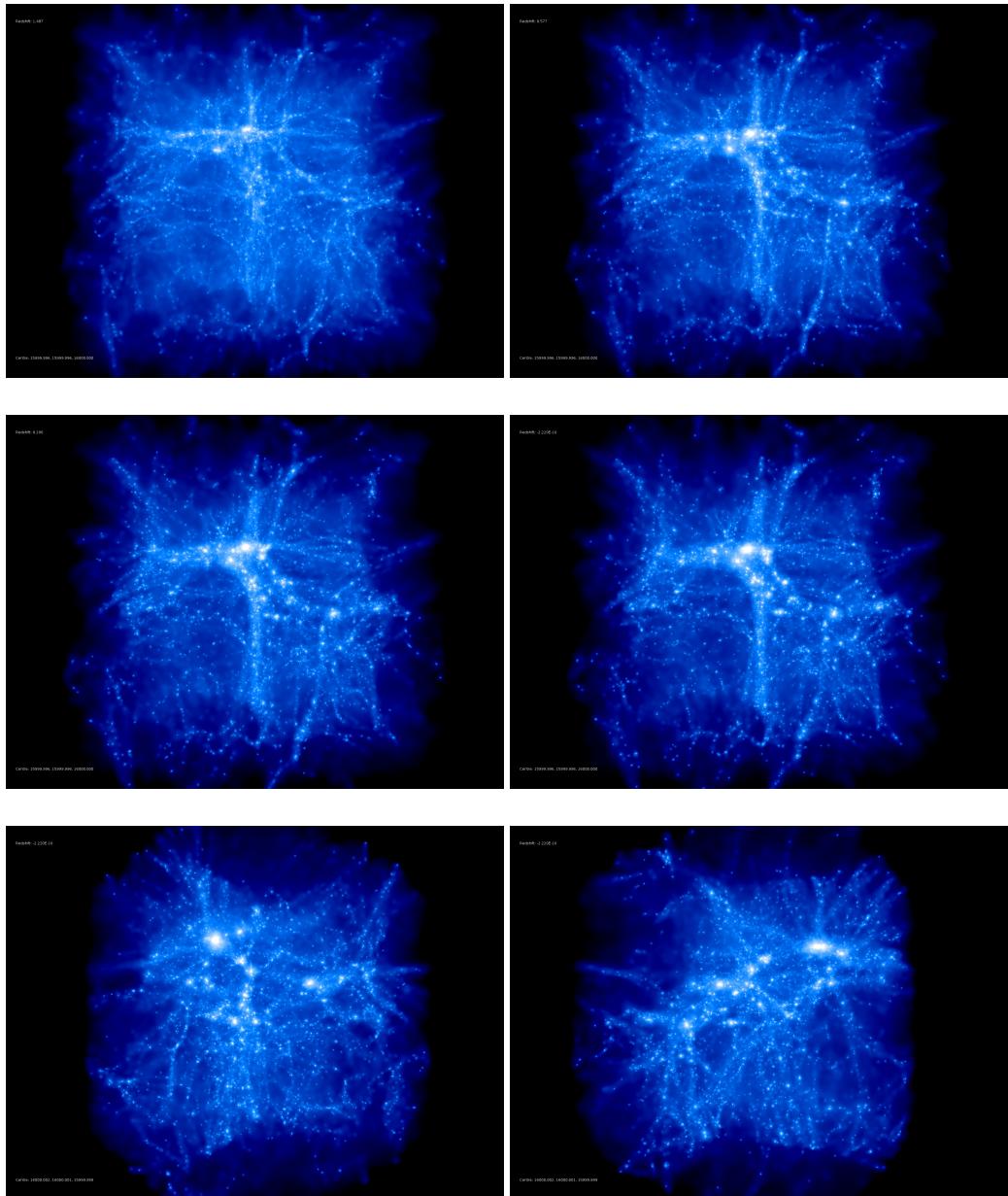
is being galacticussed  
 CONSISTENTTREED ✓  
 ROCKSTARRED ✓

### 2.2.12 stages\_14



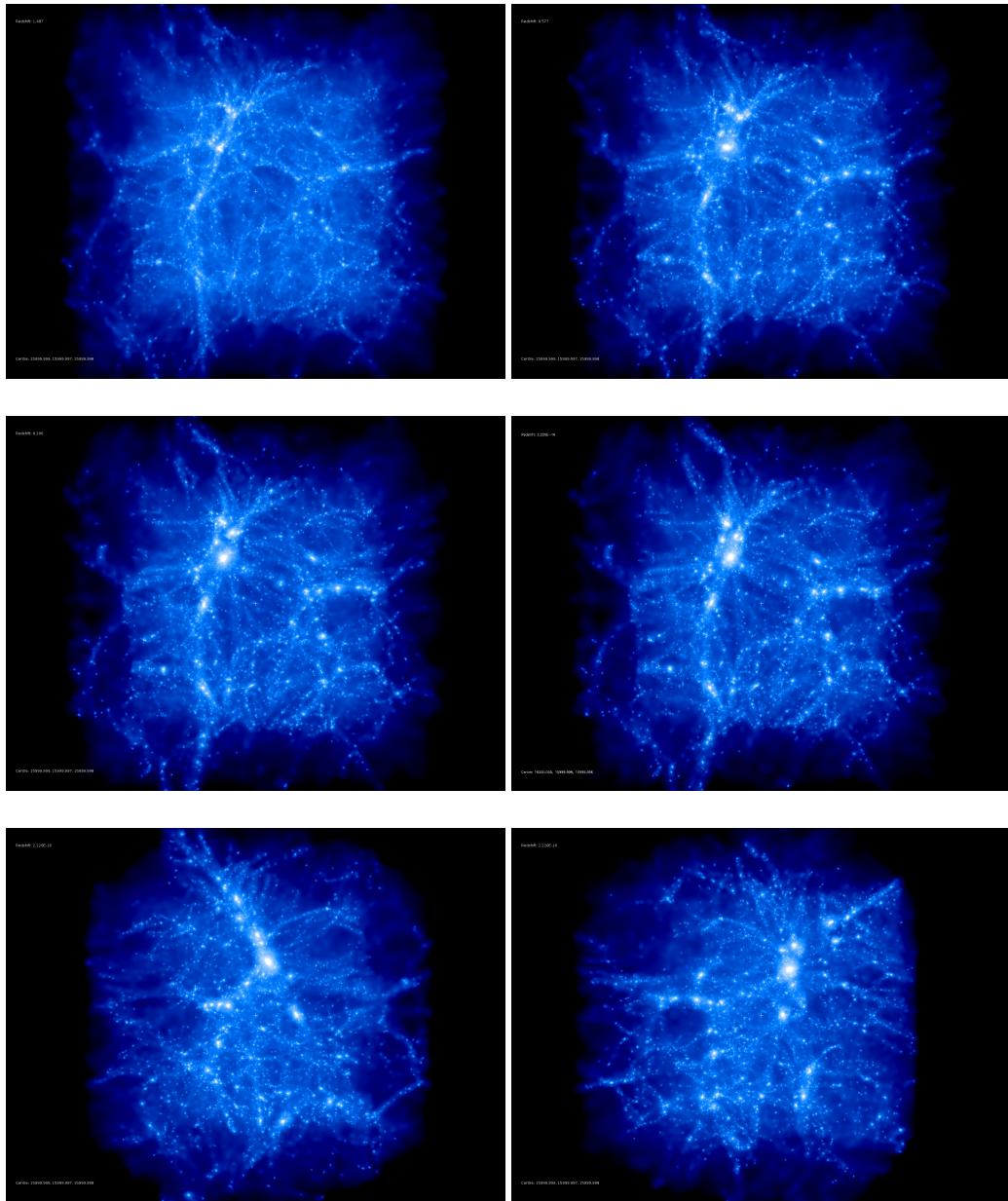
is being rockstarred

### 2.2.13 stages\_18

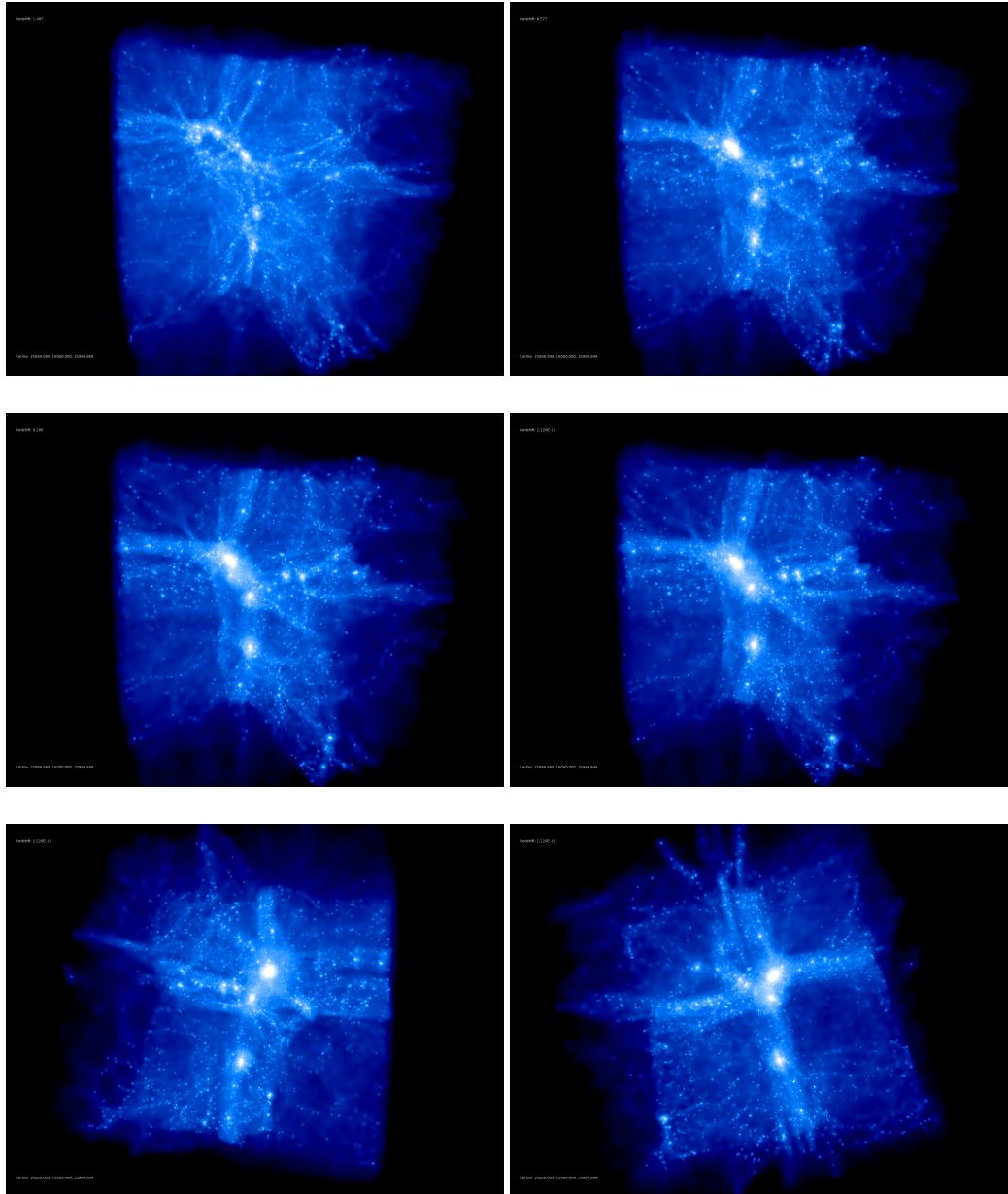


is being rockstarred

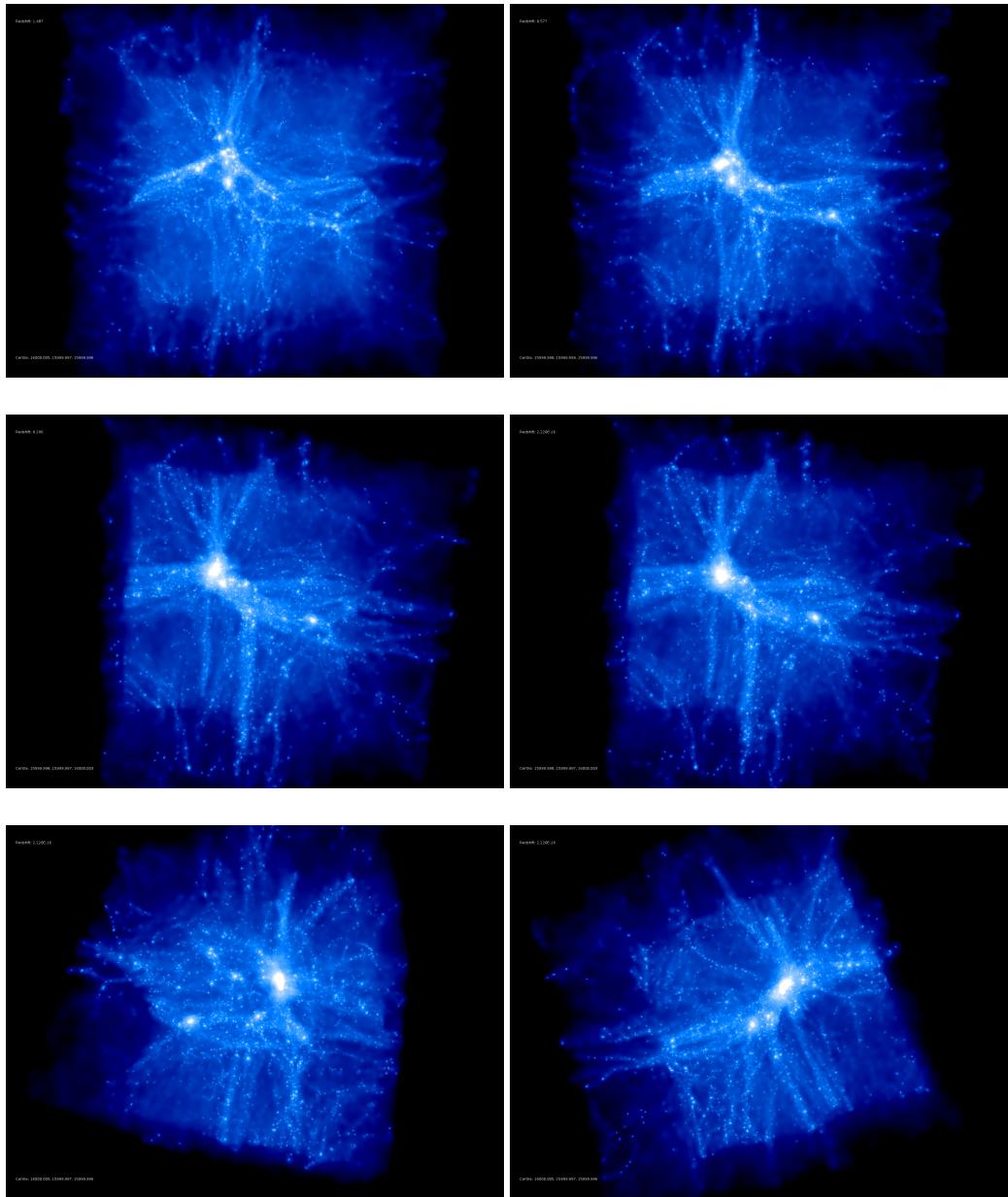
### 2.2.14 stages\_19



### 2.2.15 stages\_20



### 2.2.16 stages\_21



is being rockstarred