S³ SAX-Sky

- Home
- S³-SEX
- S³-SAX
  - Overview
  - SAX-Box
  - SAX-Sky
  - SAX-Sky query
  - SAX-Media
- S³-PUL
- S³-GAL
- S³-EOR
- S³-Tools
- Contacts
- Admin

Overview

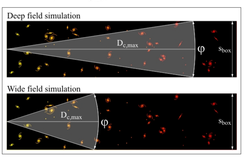
S³-SAX-Sky is a semi-analytic simulation of a *sky field with apparent* emission-line properties of HI and CO from about 2.8×10^8 galaxies. This simulation was obtained by transforming the cubic simulation box with evolving galaxies (see S³-SAX-Box) into a virtual observing cone (Obreschkow et al., 2009d), using techniques similar to those described by Blaizot et al., 2005.

The global characteristics of the simulation are:

- Apparent galaxy properties: position, redshift, line fluxes, line profiles, and disk sizes for HI and various CO lines.
- Intrinsic galaxy properties: all the 62 properties listed in the DeLucia2006a-catalogue, such as absolute magnitudes, colours, star formation rates, etc.
- Completeness: The simulation is complete for galaxies with cold hydrogen masses ($HI+H_2$) above 10^8 solar masses.
- Field-of-view: depends on the selected maximal redshift z_{max}, such as shown in the table below.

Field-of-view

The apparent position of each galaxy is represented by two coordinates "ra" and "dec". The sky field is centred around ra = 0 and dec = 0. The user can specify a range for ra and dec, as well as for the redshift (or comboving distance to the observer). The available range of ra and dec (i.e. the field-of-view), is related to the upper redshift limit z_{max} (or the maximal comoving distance $D_{c,max}$), such as show in the figure below.



Explicitly, the transverse diameter of the simulated sky field equals the comoving side length s_{box} of the cubic simulation box of the S³-SAX-Box simulation, which is identical to the side length of the Millennium simulation. There are two versions of the Millennium simulation, a full simulation with s_{box} = 500/h Mpc = 685 Mpc and a smaller test-version, called the Milli-Millennium simulation, with s_{box} = 62.5/h Mpc = 85.6 Mpc. The corresponding opening angles φ for various values of z_{max} and $D_{c,max}$ are shown in the table below. The for a given value of z_{max} or $D_{c,max}$ the largest available field-of-view is given by |ra|<φ/2 and |dec|<φ/2.

z_{max}	$D_{c,max}$ (Gpc)	Millimillennium s_{box} = 62.5/h Mpc		Millennium s_{box} = 500/h Mpc	
		φ [deg]	φ/2 [deg]	φ [deg]	φ/2 [deg]
0.1	0.403	12.203	6.101	116.486	58.243
0.2	0.789	6.22	3.11	51.448	25.724
0.3	1.158	4.237	2.118	34.402	17.201
0.4	1.51	3.25	1.625	26.225	13.113
0.5	1.844	2.661	1.331	21.412	10.706
0.6	2.16	2.271	1.135	18.243	9.121
0.7	2.46	1.994	0.997	16.002	8.001
0.8	2.745	1.787	0.894	14.336	7.168
0.9	3.013	1.628	0.814	13.051	6.526
1	3.268	1.501	0.751	12.031	6.015
1.2	3.737	1.313	0.656	10.515	5.258
1.4	4.159	1.179	0.59	9.446	4.723
1.5	4.355	1.127	0.563	9.021	4.511
1.6	4.54	1.08	0.54	8.652	4.326
1.8	4.885	1.004	0.502	8.039	4.02
2	5.199	0.943	0.472	7.553	3.777
2.5	5.874	0.835	0.418	6.685	3.343
3	6.425	0.764	0.382	6.111	3.055
3.5	6.886	0.712	0.356	5.702	2.851
4	7.278	0.674	0.337	5.394	2.697
5	7.912	0.62	0.31	4.962	2.481
10	9.659	0.508	0.254	4.064	2.032
15	10.505	0.467	0.233	3.736	1.868
20	11.027	0.445	0.222	3.559	1.78

Data structure and access

We have produced two mock skies, one based on the Millennium simulation (s_{box} = 500/h Mpc = 685 Mpc) and one based on the Millimillennium simulation (s_{box} = 62.5/h Mpc = 85.6 Mpc). For a given redshift z_{max}, the field-of-view (solid angle) of the second mock sky is 64 times smaller. The latter is therefore ideal for testing purposes, since it allows time-efficient SQL-queries.

Each simulated galaxy is specified by a list of properties, which have been stored in two separate tables. In those tables, each row represents exactly one galaxy. Both tables contain the same galaxies in the same order. The columns of the tables represent the different galaxy properties. The first table is called "galaxies_line" (for the Millennium simulation) or "milli_galaxies_line" (for the Millimillennium simulation). It contains the apparent position and emission line properties of the galaxies. The second table, called "galaxies_delu" or "milli_galaxies_delu", contains the intrinsic properties of the DeLucia2006a-catalog, which has been distributed as part of the Millennium Simulation databases. The two tables can be queried simultaneously; *e.g.* it is possible to request all the HI-line fluxes (1st table) of all galaxies with a given absolute blue magnitude (2nd table).

The tables "galaxies_line", "milli_galaxies_line", "galaxies_delu", and "milli_galaxies_delu" can be queried on this page.

Structure of the tables "galaxies_line" and "milli_galaxies_line"

Column	Property	Type	Description	Unit
1	id	BIGINT	Unique galaxy identifier in the mock sky	-
2	galaxyid	BIGINT	Galaxy identifier in the "DeLucia2006a" catalog of the Millennium Database	-
3	box	INT	Box index in the mock observing cone	-
4	ra	FLOAT	Right ascension	deg
5	dec	FLOAT	Declination	deg
6	distance	FLOAT	Comoving distance to the object	Mpc
7	zapparent	FLOAT	Apparent redshift (including Dopple correction)	-
8	hubbletype	FLOAT	Numerical Hubble type along the RC2 sequence -6,...,10	-
9	himass	FLOAT	HI-mass	Msun
10	h2mass	FLOAT	H2-mass	Msun
11	hiintflux	FLOAT	Velocity-integrated line flux of HI-line	Jy km/s
12	cointflux_1	FLOAT	Velocity-integrated line flux of CO(1-0)-line	Jy km/s
13	cointflux_2	FLOAT	Velocity-integrated line flux of CO(2-1)-line	Jy km/s
14	cointflux_3	FLOAT	Velocity-integrated line flux of CO(3-2)-line	Jy km/s
15	cointflux_4	FLOAT	Velocity-integrated line flux of CO(4-3)-line	Jy km/s
16	cointflux_5	FLOAT	Velocity-integrated line flux of CO(5-4)-line	Jy km/s
17	cointflux_6	FLOAT	Velocity-integrated line flux of CO(6-5)-line	Jy km/s
18	cointflux_7	FLOAT	Velocity-integrated line flux of CO(7-6)-line	Jy km/s
19	cointflux_8	FLOAT	Velocity-integrated line flux of CO(8-7)-line	Jy km/s
20	cointflux_9	FLOAT	Velocity-integrated line flux of CO(9-8)-line	Jy km/s
21	cointflux_10	FLOAT	Velocity-integrated line flux of CO(10-9)-line	Jy km/s
22	diskpositionangle	FLOAT	Position angle measured from north towards east	rad
23	diskinclination	FLOAT	Inclination : 0=face-on, pi/2=edge-on	rad
24	gasscaleradius	FLOAT	Exponential scale radius of the cold gas disk (HI+H2+He)	kpc
25	rmolc	FLOAT	H2/HI surface density ratio at the disk center ("Rmolc" in the paper)	-
26	hiaxisratio	FLOAT	Minor axis/major axis for HI	-
27	himajoraxis_msunpc	FLOAT	HI-radius where Sigma_HI = 1 Msun/pc^2	arcsec
28	himajoraxis_max	FLOAT	HI-radius where Sigma_HI is maximal	arcsec
29	himajoraxis_50max	FLOAT	HI-radius where Sigma_HI is at 50% of its maximum	arcsec
30	himajoraxis_10max	FLOAT	HI-radius where Sigma_HI is at 10% of its maximum	arcsec
31	himajoraxis_halfmass	FLOAT	HI-radius containing half of the HI-mass	arcsec
32	h2axisratio	FLOAT	Minor axis/major axis for H2	-
33	h2majoraxis_msunpc	FLOAT	H2-radius where Sigma_H2 = 1 Msun/pc^2	arcsec
34	h2majoraxis_50max	FLOAT	H2-radius where Sigma_H2 is at 50% of its maximum	arcsec
35	h2majoraxis_10max	FLOAT	H2-radius where Sigma_H2 is at 10% of its maximum	arcsec
36	h2majoraxis_halfmass	FLOAT	H2-radius containing half of the H2-mass	arcsec
37	balancemajoraxis	FLOAT	Radius where Sigma_HI = Sigma_H2	arcsec
38	hilumcenter	FLOAT	Normalized central luminosity density at rest-frame (already corrected for the galaxy inclination according to eq. (11) in Obreschkow et al., 2009d)	s/km
39	hilumpeak	FLOAT	Normalized peak luminosity density at rest-frame (already corrected for the galaxy inclination according to eq. (12) in Obreschkow et al., 2009d)	s/km
40	hiwidthpeak	FLOAT	Line width between the two horns of the HI-line profile (already corrected for the galaxy inclination according to eq. (10) in Obreschkow et al., 2009d)	km/s
41	hiwidth50	FLOAT	Line width at 50% of peak luminosity density (already corrected for the galaxy inclination according to eq. (9) in Obreschkow et al., 2009d)	km/s
42	hiwidth20	FLOAT	Line width at 20% of peak luminosity density (already corrected for the galaxy inclination according to eq. (9) in Obreschkow et al., 2009d)	km/s
43	columcenter	FLOAT	Normalized central luminosity density at rest-frame (already corrected for the galaxy inclination according to eq. (11) in Obreschkow et al., 2009d)	s/km
44	columpeak	FLOAT	Normalized peak luminosity density at rest-frame (already corrected for the galaxy inclination according to eq. (12) in Obreschkow et al., 2009d)	s/km
45	cowidthpeak	FLOAT	Line width between the two horns of the molecular line profile (already corrected for the galaxy inclination according to eq. (10) in Obreschkow et al., 2009d)	km/s
46	cowidth50	FLOAT	Line width at 50% of peak luminosity density (already corrected for the galaxy inclination according to eq. (9) in Obreschkow et al., 2009d)	km/s
47	cowidth20	FLOAT	Line width at 20% of peak luminosity density (already corrected for the galaxy inclination according to eq. (9) in Obreschkow et al., 2009d)	km/s
48	cofillingfactor	FLOAT	0...1 Filling factor of CO in velocity+space	-

Structure of the tables "galaxies_delu" and "milli_galaxies_delu"

(columns identical to the DeLucia2006a catalogue, with the exception of our additional index "id")

Column	Property	Type	Description
1	id	BIGINT	Unique galaxy identifier in the mock sky
2	galaxyid	BIGINT	see DeLucia2006a
3	lastprogenitorid	BIGINT	see DeLucia2006a
4	descendantid	BIGINT	see DeLucia2006a
5	haloid	BIGINT	see DeLucia2006a
6	subhaloid	BIGINT	see DeLucia2006a
7	fofid	BIGINT	see DeLucia2006a
8	treeid	BIGINT	see DeLucia2006a
9	firstprogenitorid	BIGINT	see DeLucia2006a
10	nextprogenitorid	BIGINT	see DeLucia2006a
11	type	TINYINT	see DeLucia2006a
12	snapnum	INT	see DeLucia2006a
13	redshift	FLOAT	see DeLucia2006a
14	centralmvir	FLOAT	see DeLucia2006a
15	phkey	INT	see DeLucia2006a
16	x	FLOAT	see DeLucia2006a
17	y	FLOAT	see DeLucia2006a
18	z	FLOAT	see DeLucia2006a
19	zcurveindex	INT	see DeLucia2006a
20	ix	INT	see DeLucia2006a
21	iy	INT	see DeLucia2006a
22	iz	INT	see DeLucia2006a
23	velx	FLOAT	see DeLucia2006a
24	vely	FLOAT	see DeLucia2006a
25	velz	FLOAT	see DeLucia2006a
26	np	INT	see DeLucia2006a
27	mvir	FLOAT	see DeLucia2006a
28	rvir	FLOAT	see DeLucia2006a
29	vvir	FLOAT	see DeLucia2006a
30	vmax	FLOAT	see DeLucia2006a
31	coldgas	FLOAT	see DeLucia2006a
32	stellarmass	FLOAT	see DeLucia2006a
33	bulgemass	FLOAT	see DeLucia2006a
34	hotgas	FLOAT	see DeLucia2006a
35	ejectedmass	FLOAT	see DeLucia2006a
36	blackholemass	FLOAT	see DeLucia2006a
37	metalscoldgas	FLOAT	see DeLucia2006a
38	metalsstellarmass	FLOAT	see DeLucia2006a
39	metalsbulgemass	FLOAT	see DeLucia2006a
40	metalshotgas	FLOAT	see DeLucia2006a
41	metalsejectedmass	FLOAT	see DeLucia2006a
42	sfr	FLOAT	see DeLucia2006a
43	sfrbulge	FLOAT	see DeLucia2006a
44	xraylum	FLOAT	see DeLucia2006a
45	diskradius	FLOAT	see DeLucia2006a
46	coolingradius	FLOAT	see DeLucia2006a
47	mag_b	FLOAT	see DeLucia2006a
48	mag_v	FLOAT	see DeLucia2006a
49	mag_r	FLOAT	see DeLucia2006a
50	mag_i	FLOAT	see DeLucia2006a
51	mag_k	FLOAT	see DeLucia2006a
52	mag_bbulge	FLOAT	see DeLucia2006a
53	mag_vbulge	FLOAT	see DeLucia2006a
54	mag_rbulge	FLOAT	see DeLucia2006a
55	mag_ibulge	FLOAT	see DeLucia2006a
56	mag_kbulge	FLOAT	see DeLucia2006a
57	mag_bdust	FLOAT	see DeLucia2006a
58	mag_vdust	FLOAT	see DeLucia2006a
59	mag_rdust	FLOAT	see DeLucia2006a
60	mag_idust	FLOAT	see DeLucia2006a
61	mag_kdust	FLOAT	see DeLucia2006a
62	massweightedage	FLOAT	see DeLucia2006a
63	random	INT	see DeLucia2006a