Operations Simulator Tools for Analysis and Reporting
Standard Report for *opsim6.43*
Compared to Design Specifications
Version 3.9.1

Operations Simulation Team
Large Synoptic Survey Telescope

Created October 28, 2012

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1 Introduction

This report is intended to assist in the evaluation of the performance of this simulated survey, *opsim6.43*, which was generated by the Operations Simulator code base. Please be aware that this simulated survey is just one of many that the Operations Simulation (OpSim) team have prepared. The Operations Simulator is currently still under development; many aspects of its performance (with regards to LSST's operations) are still subject to optimization and certainly are subject to change. These modifications could potentially include changes to the number of visits per field, the number of fields on the sky, and almost certainly will include changes in the observational cadence.

This report is not the final word on "how LSST will perform" ten years from now; instead it should be considered as an aid to help users and the OpSim team decide what changes will optimize the scientific return from LSST. Thus this evaluation should be considered a "work in progress". We encourage science collaboration members to provide feedback to the Operations Simulation team, through their collaboration chair, if they have suggestions for additional figures of merit or other methods for evaluation of the Operations Simulator runs.

2 Cadence Design

2.1 Observing Modes

A simulated survey is driven by at least one but usually more "observing modes." An observing mode is a cadence strategy designed to visit and revisit specific fields on the sky in a way that meets a particular science objective. The observing mode is described by a set of parameters specified in one or more a configuration files (*.conf). Visits made by observing modes designed to acquire fields such that the deep cosmology or wide-fast-deep (WFD) science specs of the Science Requirements Document (SRD) are met can be singled out for analysis.

For historical reasons there are currently three types of observing modes: Weak Lensing (WL), SuperNova Sub-Sequence (SNSS), and Weak Lensing Transient Sub-Sequence (WLTSS). These types identify different cadence strategies and while their names originated in the type of science they were initially intended to do, now they simply represent different ways to survey the sky.

A typical simulation may use some or all of the following configuration files.

UniversalProp.conf The "universal" cadence for the WFD survey; covers $\sim$20,000 deg^2 where fields are visited twice per night separated by about 30 minutes on average every few nights in different filters.

Universalnorth.conf Covers the north ecliptic spur (NES) in order to detect solar system objects throughout the ecliptic plane, and uses a similar cadence as UniversalProp.conf with no u or y observations.

SuperNovaSubSeqdeep.conf Consists of 6 field pointings, also known as the "deep drilling" fields, which acquire 10 minutes of exposure time in all bands in rapid sequence, every few nights.

AbiPole.conf Covers the south equatorial pole with a slightly reduced cadence compared to the WFD mode with no y observations.

GalacticPlaneProp.conf Covers the plane of the Milky Way at a reduced cadence compared to the WFD mode.

SCPgalactic.conf Covers the south celestial pole at a reduced cadence compared to the WFD mode and without the 30 min pair requirement.

Standby.conf Essentially the WFD cadence which requests observations only when no other mode requests observations.

Observing Modes in this Survey

ID (propID)	Type (propName)	Name (propConf)	Relative Priority	User Regions (userRegion)
161	WL	GalacticPlaneProp.conf	1.000	233
162	WL	SouthCelestialPole-20.conf	1.000	211
163	WL	Standby.conf	0.001	0
164	SNSS	SuperNovaSubSeqdeep.conf	5.000	6
165	WLTSS	Universal-20-1030.conf	1.100	2549
166	WLTSS	NorthEclipticSpur-20.conf	0.800	420

Table 1: The identification number, type, and name for each observing mode configuration file used in this simulated survey. The identification number is unique to each simulation. Regions of special interest are defined by a list of fields or User Regions; the number of user regions is given along with the relative priority assigned to each mode. If the number of User Regions is zero, the number of fields are defined by the available sky. User Regions are not required to have a one-to-one mapping to the list of field centers used by the Simulator. A selected group of parameters from each configuration file are presented in §B

2.2 Global Settings

Survey Characteristics

Characteristic	Parameter	Value
Run Identifier	sessionHost.sessionID	opsim6.43
Run Start Date	sessionDate	2012-10-18 22:45:00
Code Version	version	2.6.1
Length of Run	nRun	10.0 year(s)
Seeing Data	seeingTbl	SeeingPachon
Seeing Epoch	seeingEpoch	49353
Weather Data	cloudTbl	CloudTololo
Start Day of Weather Data	simStartDay	0.0

Table 2: The values of parameters characterizing this simulated survey are presented. The Seeing Data (seeingTbl) was generated by simulating 10 years of seeing using the seeing distribution from approximately one year of data from Cerro Pachon. The Seeing Epoch (seeingEpoch) is the start date of the seeing measurements in MJD. The Weather Data (cloudTbl) was created based on 10 years of telescope operator observations on Cerro Tololo.

2.3 Benchmarks

Wide-Fast-Deep (WFD) Benchmarks

Row	Benchmark	u	g	r	i	z	y
1	Seeing	0.77	0.73	0.70	0.67	0.65	0.63
2	Sky Brightness	21.80	22.00	21.30	20.00	19.10	17.50
	10 Year Design Specs						
3	Number of Visits	56	80	184	184	160	160
4	Single Visit Depth	23.9	25.0	24.7	24.0	23.3	22.1
5	Coadded Depth	26.1	27.4	27.5	26.8	26.1	24.9
	10 Year Stretch Specs						
6	Number of Visits	70	100	230	230	200	200
7	Single Visit Depth	24.0	25.1	24.8	24.1	23.4	22.2
8	Coadded Depth	26.3	27.5	27.7	27.0	26.2	24.9
	Specs Scaled to Length of Run						
9	Design Number of Visits	56	80	184	184	160	160
10	Stretch Number of Visits	70	100	230	230	200	200

Table 3: A summary of the benchmarks to which many statistics in this document compare. Rows 1 and 2 are the expected median values of seeing (arcsec) and sky brightness (arcsec/mag^2) at zenith (Ivezic et al., astroph/0805.2366v1, Table 1). The Wide-Fast-Deep (WFD) design and stretch specs are listed for a 10-year survey. The design and stretch single visit depths (rows 4 and 7) are the 5σ limiting magnitude for each filter at zenith in new moon with median seeing in AB magnitudes (DocuShare Document-212, "The LSST Science Requirements Document", Table 6). Rows 3 and 5 list the design specification for the number of visits and coadded depth by filter (Document-212, Table 22); Rows 6 and 8 list the stretch specification for the number of visits and coadded depth by filter (Ivezic et al., astroph/0805.2366v1, Table 1). In rows 9 and 10, the design and stretch number of visits are scaled linearly by the length of this run (nRun) and will be identical to rows 3 and 6 for a 10-year simulation. For $nRun < 10$ the scaled value of number of visits is truncated, not rounded, when used in comparison graphs and tables. Currently evaluations of the areal sky coverage are not made directly in this report; however, the design and stretch specifications are 18,000 deg^2 and 20,000 deg^2, respectively.

3 Survey Visits

3.1 A Visit Defined

An observation of a target field is simulated by a "visit." Currently, a visit comprises two 15-second exposures, each exposure requires one second for the shutter action, $t_{shutter}$, and two seconds for the CCD readout, $t_{readout}$. The second readout is assumed to occur while moving to the next field, so the length of each visit for the WFD observing mode, T_{visit}, is 34 seconds where the total integration time on the sky, T_{obs}, is 30 seconds. For other combinations of number of exposures, N_{exp}, and length of exposure, t_{exp}, the total visit time is given by

$$T_{visit} = N_{exp}(t_{exp} + t_{shutter}) + t_{readout}(N_{exp} - 1) \quad (1)$$

3.2 Describing Visits per Field

Characteristics of the Distributions

Observing Mode ID	Filter	Median	Mean ± rms	$+3\sigma$	-3σ	Total
Observing Mode 161	u	30	30.0 ± 0.0	0	0	217
GalacticPlaneProp.conf	g	30	30.0 ± 0.0	0	0	220
	r	30	30.0 ± 0.0	0	0	230
	i	30	30.0 ± 0.0	0	0	230
	z	30	30.0 ± 0.0	0	0	230
	y	30	30.0 ± 0.0	0	0	230
Observing Mode 162	u	30	30.0 ± 0.0	0	0	211
SouthCelestialPole-20.conf	g	30	30.0 ± 0.0	0	0	195
	r	30	30.0 ± 0.0	0	0	211
	i	30	30.0 ± 0.0	0	0	211
	z	30	30.0 ± 0.0	0	0	211
	y	30	30.0 ± 0.0	0	0	211
Observing Mode 163	u	51	50.6 ± 15.0	22	17	2057
Standby.conf	g	49	44.8 ± 17.3	0	0	2272
	r	104	92.7 ± 40.4	0	0	2284
	i	93	78.4 ± 33.0	0	0	2295
	z	103	88.6 ± 43.9	0	0	2435
	y	159	137.7 ± 57.4	0	0	2290
Observing Mode 164	u	0	nan ± nan	0	0	0
SuperNovaSubSeqdeep.conf	g	2550	2443.7 ± 302.6	0	0	7
	r	5100	4895.3 ± 606.4	0	0	7
	i	5100	4880.9 ± 604.0	0	0	7
	z	5081	4848.9 ± 603.0	0	0	7
	y	5050	4811.4 ± 579.7	0	0	7
Observing Mode 165	u	56	56.9 ± 8.6	0	33	2549
Universal-20-1030.conf	g	73	73.6 ± 7.0	59	20	2549
	r	164	164.2 ± 14.9	55	17	2549
	i	163	164.3 ± 15.0	61	11	2549
	z	200	199.3 ± 2.0	0	110	2549
	y	200	199.6 ± 1.4	0	84	2549
Observing Mode 166	u	0	nan ± nan	0	0	0
NorthEclipticSpur-20.conf	g	15	14.8 ± 10.2	4	0	298
	r	29	29.6 ± 22.0	1	0	404
	i	35	35.7 ± 27.3	8	0	375
	z	148	155.8 ± 28.3	0	0	420
	y	0	nan ± nan	0	0	0

Continued on next page

Characteristics of the Distributions *(con't)*

Observing Mode ID	Filter	Median	Mean $\pm$ rms	$+3\sigma$	-3σ	Total
All Observing Modes	u	55	53.6 $\pm$ 13.9	24	3	2980
	g	72	67.5 $\pm$ 114.4	7	0	3296
	r	160	140.5 $\pm$ 227.8	7	0	3417
	i	160	142.0 $\pm$ 229.2	7	0	3379
	z	200	176.0 $\pm$ 223.0	7	0	3550
	y	200	175.1 $\pm$ 231.6	7	0	3229
All Observing Modes	All	851	703.5 $\pm$ 1009.7	7	0	3600

Table 4: The median, mean and standard deviation for number of visits to a field separated by observing mode and by filter. The $+3\sigma$ column shows the number of fields which had a number of visits more than 3σ greater than the median number of visits; the -3σ column shows the number of fields with number of visits fewer than 3σ less than the mean value. The Total column shows the number of fields evaluated in each observing mode/filter combination.

3.3 Visits Acquired in the WFD Observing Mode

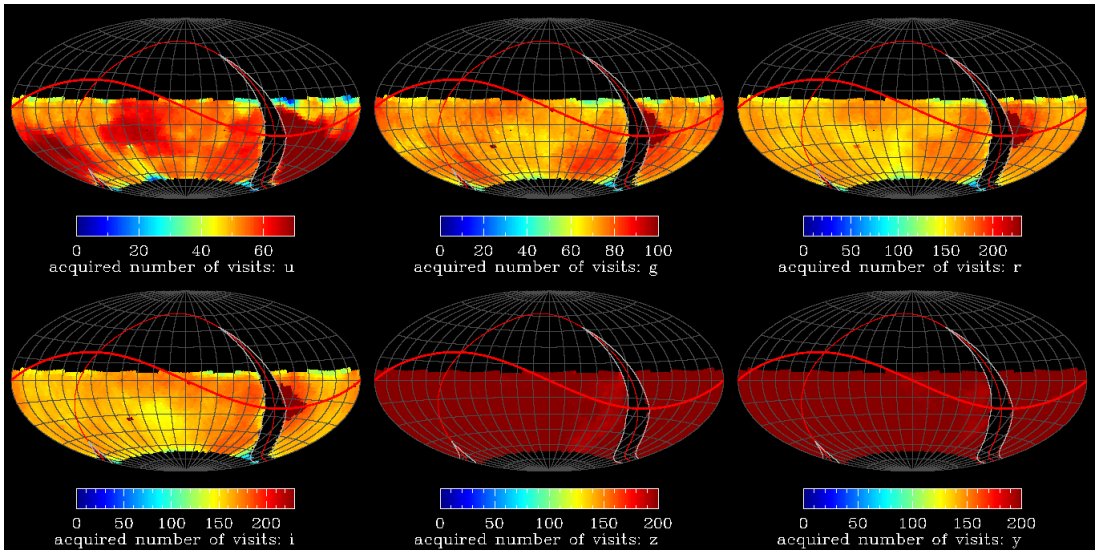

Figure 1: *(opsim6_43_SixVisits-Num.png)* The number of visits acquired for each field is plotted in Aitoff projection for each filter. Only visits acquired by observing modes designed to meet the WFD number of visits are included.

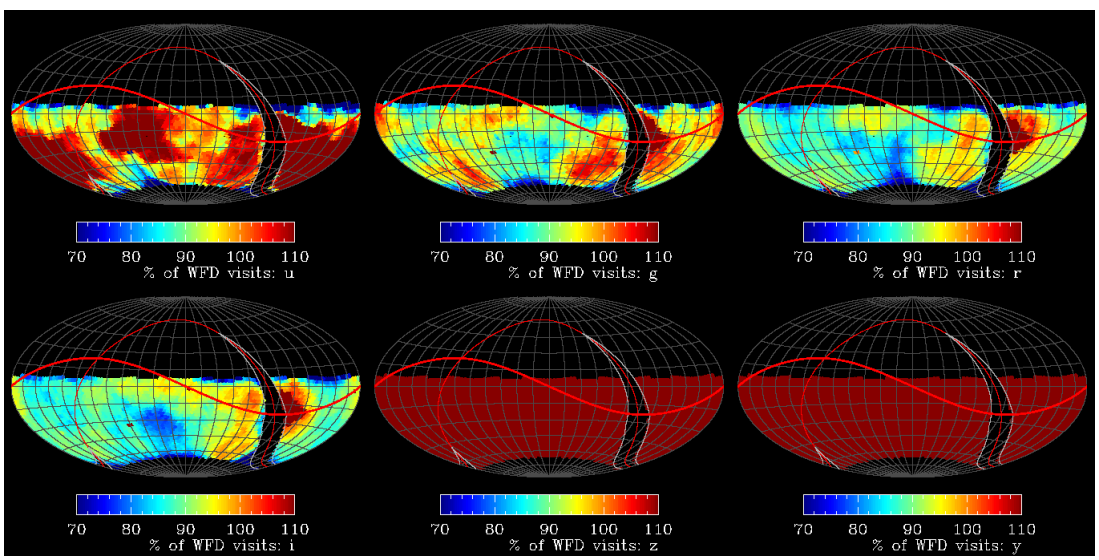

Figure 2: *(opsim6_43_SixVisits.png)* The ratio of the number of visits acquired for each field to the scaled WFD spec value for that filter (see Table 3) is plotted as a percentage in Aitoff projection for each filter. Only visits acquired by observing modes designed to meet the WFD number of visits are included.

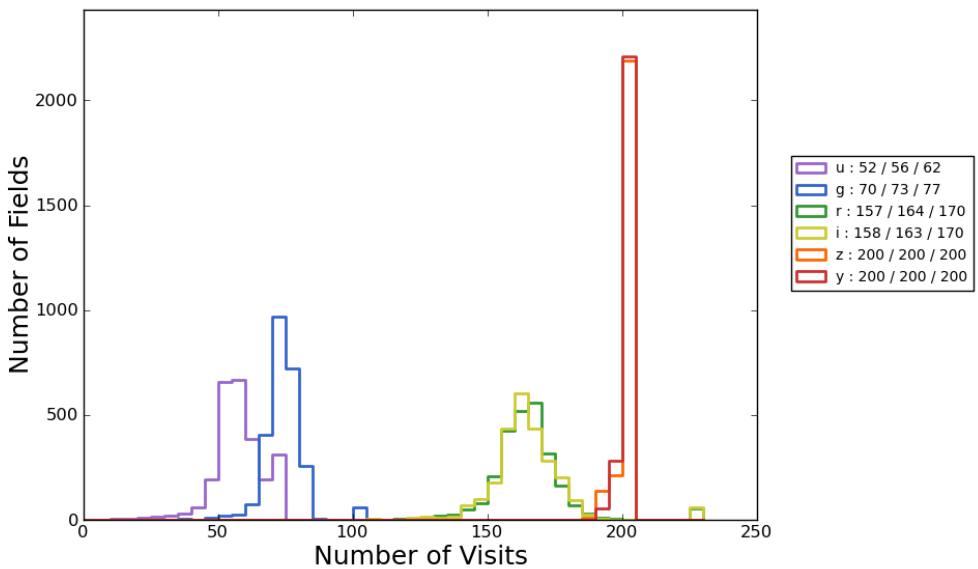

Figure 3: *(opsim6_43_visits_allfilters.png)* The distribution of the number of fields having a given number of visits for each filter. Only visits acquired by modes designed to meet the WFD number of visits are included. The inset box contains the values of the 25th, 50th (median), and 75th percentiles for each curve.

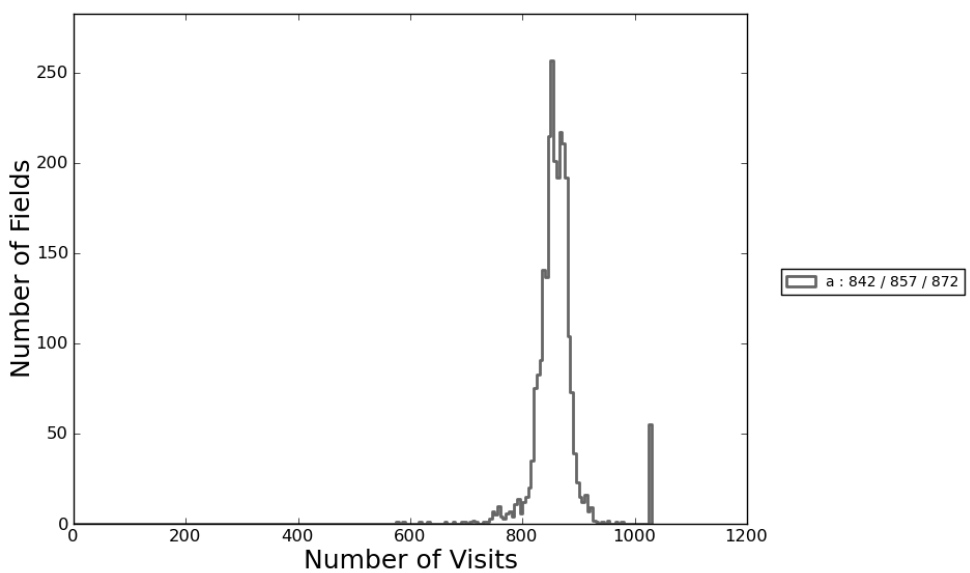

Figure 4: *(opsim6_43_visits_allfilters_all.png)* The distribution of the number of fields having a given number of visits irrespective of filter. Only visits acquired by modes designed to meet the WFD number of visits are included. The inset box contains the values of the 25th, 50th (median), and 75th percentiles.

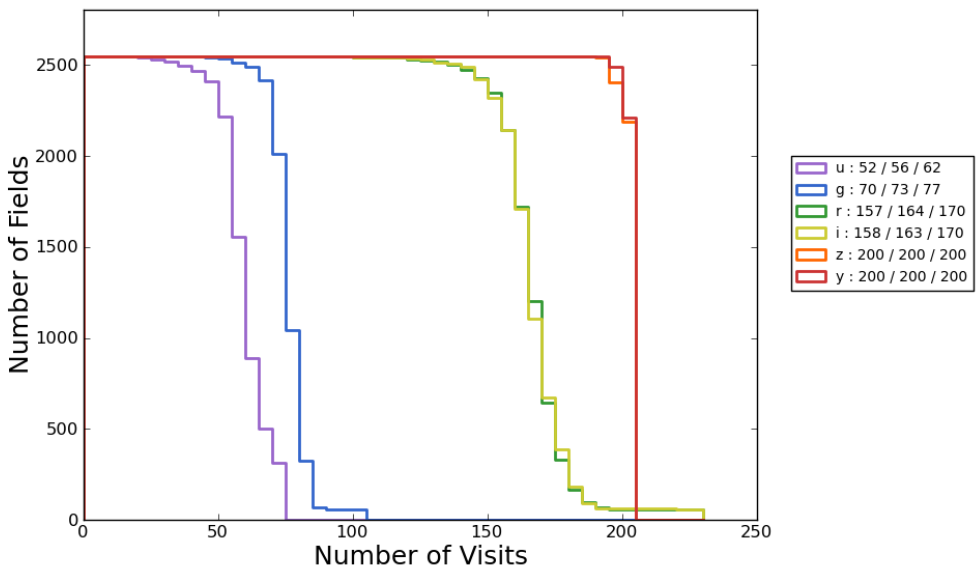

Figure 5: *(opsim6_43_cvisits_allfilters.png)* The cumulative distribution of Figure 3 showing the number of fields having visits $\geq x$ in each filter. Only visits acquired by modes designed to meet the WFD number of visits are included. The inset box contains the values of the 25th, 50th (median), and 75th percentiles for each curve.

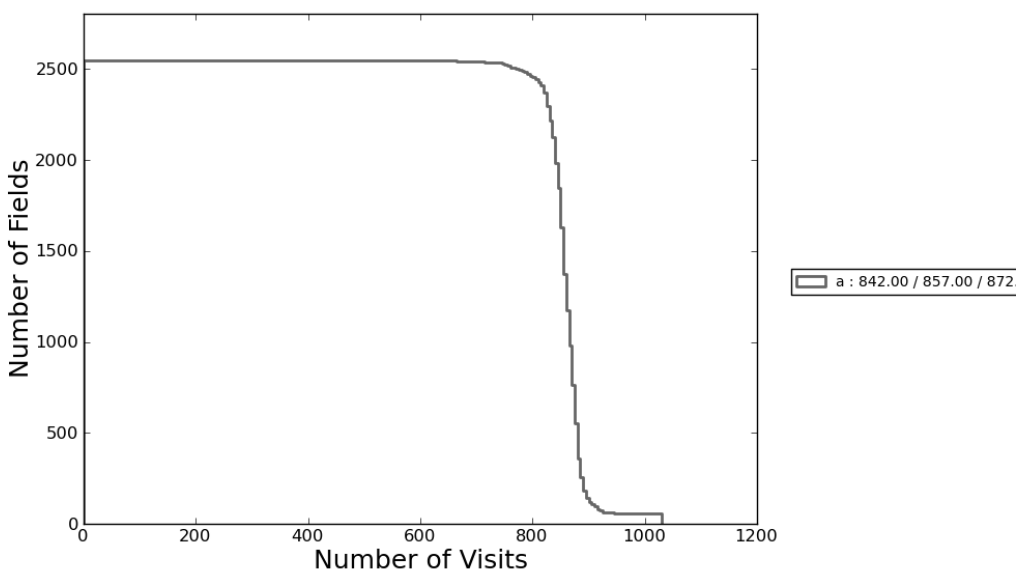

Figure 6: *(opsim6_43_cvisits_allfilters_all.png)* The cumulative distribution of Figure 4 showing the number of fields having visits $\geq x$. Only visits acquired by modes designed to meet the WFD number of visits are included. The inset box contains the values of the 25th, 50th (median), and 75th percentiles for each curve.

Distribution of Fields by Completeness - WFD Observing Mode Only

% Complete	u	g	r	i	z	y	Joint
$100 \leq P$	1403	323	106	99	2549	2549	60
$90 \leq P < 100$	733	1337	976	888	0	0	535
$80 \leq P < 90$	273	771	1301	1378	0	0	1620
$70 \leq P < 80$	58	72	136	154	0	0	226
$60 \leq P < 70$	33	35	21	22	0	0	56
$50 \leq P < 60$	26	7	5	4	0	0	29
$40 \leq P < 50$	9	4	2	2	0	0	8
$30 \leq P < 40$	10	0	2	2	0	0	11
$20 \leq P < 30$	3	0	0	0	0	0	3
$10 \leq P < 20$	1	0	0	0	0	0	1
$0 < P < 10$	0	0	0	0	0	0	0

Table 5: The distribution of the number of fields with a given percent completeness for each filter. A field's completeness is given by the percentage of the number of visits to that field compared to the WFD spec number of visits scaled to the length of this run (see Table 3). Only visits acquired by observing modes designed to meet the WFD number of visits are included. Note that the number of fields that reached or exceeded the above condition is given by the $100 \leq P$ bin. The last column is the joint completeness, which is the number of fields having a percent completeness, P, in *all* filters of *at least* a certain value.

Cumulative Distribution of Fields by Completeness - WFD Observing Mode Only

% Complete	u	g	r	i	z	y	Joint
$100 \leq P$	1403	323	106	99	2549	2549	60
$90 \leq P$	2136	1660	1082	987	2549	2549	595
$80 \leq P$	2409	2431	2383	2365	2549	2549	2215
$70 \leq P$	2467	2503	2519	2519	2549	2549	2441
$60 \leq P$	2500	2538	2540	2541	2549	2549	2497
$50 \leq P$	2526	2545	2545	2545	2549	2549	2526
$40 \leq P$	2535	2549	2547	2547	2549	2549	2534
$30 \leq P$	2545	2549	2549	2549	2549	2549	2545
$20 \leq P$	2548	2549	2549	2549	2549	2549	2548
$10 \leq P$	2549	2549	2549	2549	2549	2549	2549
$0 < P$	2549	2549	2549	2549	2549	2549	2549

Table 6: The cumulative distribution of the number of fields with a given percent completeness for each filter. A field's completeness is given by the percentage of the number of visits to that field compared to the WFD spec number of visits scaled to the length of this run (see Table 3). Only visits acquired by observing modes designed to meet the WFD number of visits are included. Note that the number of fields that reached or exceeded the above condition is given by the $100 \leq P$ bin. The last column is the joint completeness, which is the number of fields having a percent completeness, P, in *all* filters of *at least* a certain value.

3.4 Visits Acquired for All Observing Modes

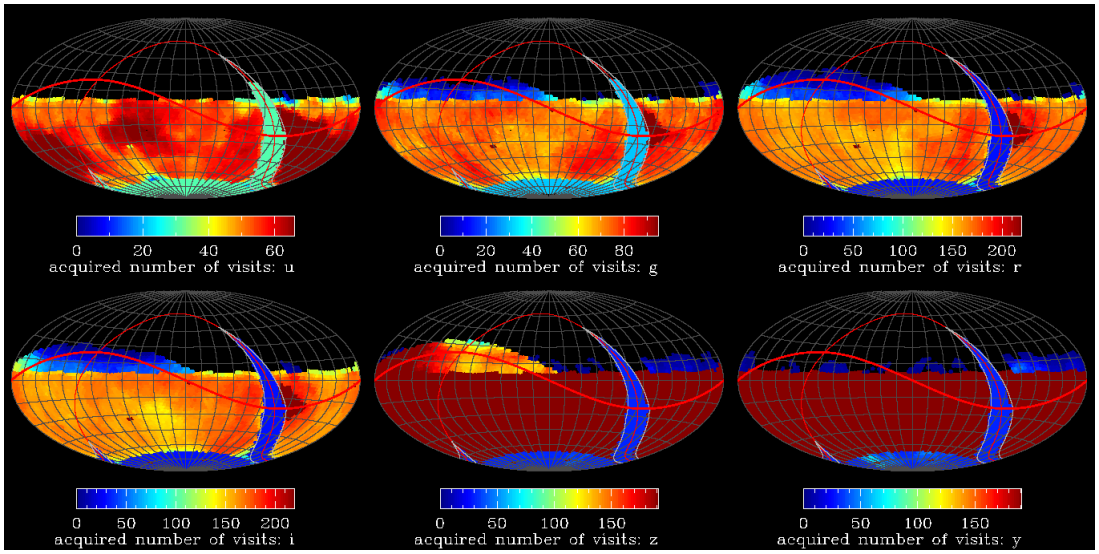

Figure 7: *(opsim6_43_SixVisitsAll-Num.png)* The number of visits acquired for each field is plotted in Aitoff projection for each filter. All visits acquired by all observing modes are included in this plot and are not limited only to observing modes that were designed to meet the WFD number of visits.

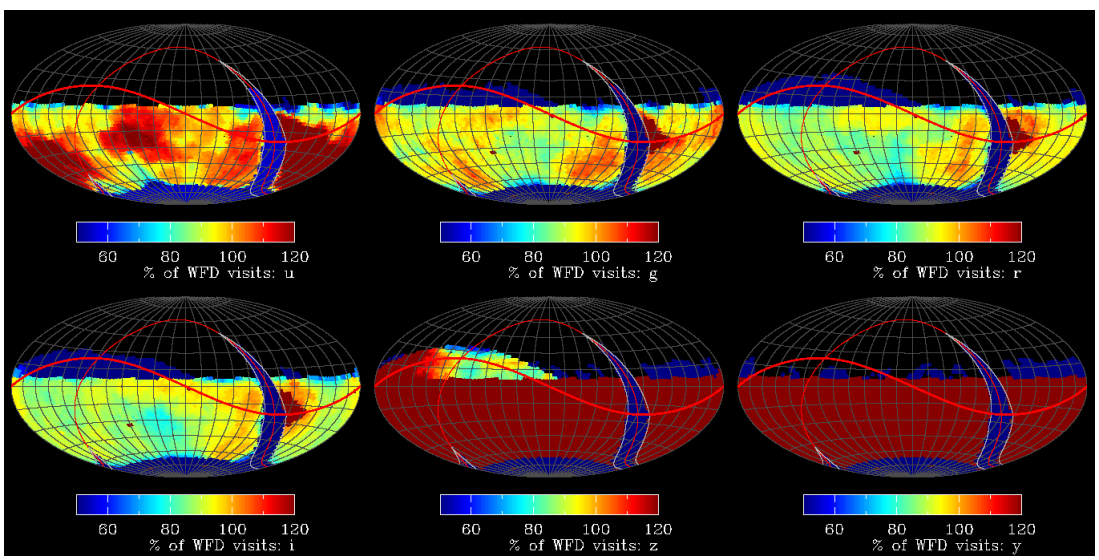

Figure 8: *(opsim6_43_SixVisits-All.png)* The ratio of the number of visits acquired for each field to the scaled WFD spec value for that filter is plotted as a percentage in Aitoff projection for each filter. All visits acquired by all observing modes are included in this plot and are not limited only to modes that were designed to meet the WFD number of visits (see Table 3).

Distribution of Fields by Completeness - All Observing Modes

% Complete	u	g	r	i	z	y	Joint
$100 \leq P$	1412	382	174	109	2711	2551	61
$90 \leq P < 100$	735	1350	1040	937	76	0	612
$80 \leq P < 90$	262	705	1176	1324	145	0	1552
$70 \leq P < 80$	59	69	131	152	22	0	222
$60 \leq P < 70$	33	37	21	31	12	0	61
$50 \leq P < 60$	454	14	11	13	3	0	31
$40 \leq P < 50$	8	18	17	14	2	3	7
$30 \leq P < 40$	11	426	23	32	0	13	20
$20 \leq P < 30$	3	104	120	118	36	108	58
$10 \leq P < 20$	0	74	516	507	409	359	516
$0 < P < 10$	3	117	188	142	134	195	460

Table 7: The distribution of the number of fields with a given percent completeness for each filter. A field's completeness is given by the percentage of the number of visits to that field compared to the scaled WFD spec number of visits (see Table 3). All visits acquired by all observing modes are included and are not limited only to modes that were designed to meet the WFD number of visits. Note that the number of fields that reached or exceeded the above condition is given by the $100 \leq P$ bin. The last column is the joint completeness, which is the number of fields having a percent completeness, P, in *all* filters of *at least* a certain value.

Cumulative Distribution of Fields by Completeness - All Observing Modes

% Complete	u	g	r	i	z	y	Joint
$100 \leq P$	1412	382	174	109	2711	2551	61
$90 \leq P$	2147	1732	1214	1046	2787	2551	673
$80 \leq P$	2409	2437	2390	2370	2932	2551	2225
$70 \leq P$	2468	2506	2521	2522	2954	2551	2447
$60 \leq P$	2501	2543	2542	2553	2966	2551	2508
$50 \leq P$	2955	2557	2553	2566	2969	2551	2539
$40 \leq P$	2963	2575	2570	2580	2971	2554	2546
$30 \leq P$	2974	3001	2593	2612	2971	2567	2566
$20 \leq P$	2977	3105	2713	2730	3007	2675	2624
$10 \leq P$	2977	3179	3229	3237	3416	3034	3140
$0 < P$	2980	3296	3417	3379	3550	3229	3600

Table 8: The cumulative distribution of the number of fields with a given percent completeness for each filter. A field's completeness is given by the percentage of the number of visits to that field compared to the WFD spec number of visits scaled to the length of this run (see Table 3). Only visits acquired by observing modes designed to meet the WFD number of visits are included. Note that the number of fields that reached or exceeded the above condition is given by the $100 \leq P$ bin. The last column is the joint completeness, which is the number of fields having a percent completeness, P, in *all* filters of *at least* a certain value.

4 Survey Depth

4.1 Calculating Sky Brightness

The Operations Simulator uses two methods of calculating the sky brightness at the time of a visit: OpSimSky and ETCSky.

Before each visit, the sky brightness in the V filter, VskyBright, is evaluated using the Johnson V band calculated from the Krisciunas and Schaeffer model, with a few modifications. This model uses the Moon phase, angular distance between the field and the Moon and the field's airmass to calculate added brightness to the zero-Moon, zenith sky brightness (e.g. Krisciunas 1997, PASP, 209, 1181; Krisciunas and Schaefer 1991, PASP, 103, 1033; Benn and Ellison 1998, La Palma Technical Note 115).

From VskyBright there are two different methods to evaluate the sky brightness in a particular band. One method is to take measurements of the color of the sky as a function of lunar phase, and use these to correct VskyBright to a particular filter. This is the approach used for the OpSim sky brightness, OpSimSky.

An alternate method, ETCSky, is to use sky brightness measurements taken at various phases of the moon in many filters and calculate empirical fits to the sky brightness in each band. This method is what has been used to create the LSST Exposure Time Calculator (ETC) and has the advantage of accounting for the fact that the night sky does not behave similarly in all bands by including the angular dependence as a function of filter bandpass.

The plots and tables in this document report the sky brightness from the ETCSky method.

4.2 Single Visit Depth

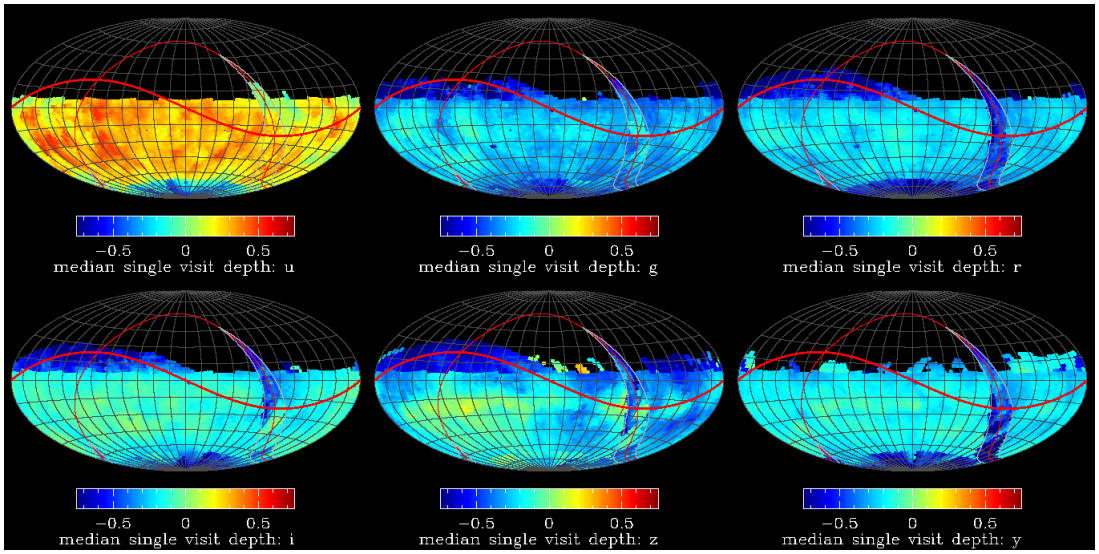

Figure 9: *(opsim6_43_median5sigma.png)* The median of the single visit depth (5σ limiting magnitude) for all visits to a given field is computed, from it the WFD spec value for the single visit depth (see Table 3) is subtracted and the difference is plotted in Aitoff projection for each filter. Fields with a positive value have a median single visit depth deeper than the expected zenith value. The 5σ limiting magnitude for each visit is computed using the sky brightness determined by the ETC algorithm. Visits acquired by all observing modes are included in this plot and are not limited to only observing modes that were designed to meet the WFD number of visits.

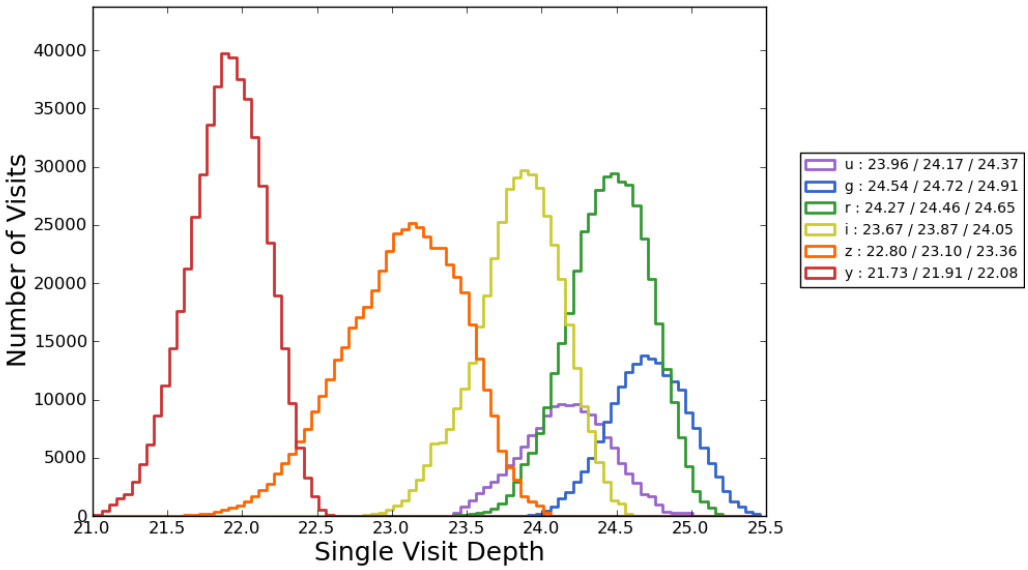

Figure 10: *(opsim6_43_m5_allfilters.png)* The distribution of visits with single visit depth for each filter. Only visits acquired by observing modes designed to meet the WFD number of visits are included. The inset box contains the values of the 25th, 50th (median), and 75th percentiles for each curve.

Single Visit Depth

Observing Mode ID	Filter	Median	Mean ± rms	$+3\sigma$	-3σ	Total
Observing Mode 161	u	24.075	24.087 ± 0.294	0	3	6510
GalacticPlaneProp.conf	g	24.675	24.667 ± 0.245	0	2	6600
	r	24.165	24.146 ± 0.335	0	2	6900
	i	23.678	23.639 ± 0.359	0	1	6900
	z	22.939	22.875 ± 0.464	0	19	6900
	y	21.555	21.494 ± 0.427	0	0	6900
Observing Mode 162	u	23.622	23.612 ± 0.353	6	0	6330
SouthCelestialPole-20.conf	g	24.521	24.511 ± 0.289	0	11	5850
	r	24.030	24.023 ± 0.287	0	7	6330
	i	23.561	23.532 ± 0.325	0	6	6330
	z	23.101	23.063 ± 0.285	0	41	6330
	y	21.465	21.445 ± 0.397	0	0	6330
Observing Mode 163	u	24.168	24.156 ± 0.297	0	259	104088
Standby.conf	g	24.729	24.721 ± 0.274	0	739	101889
	r	24.486	24.469 ± 0.280	0	1843	211717
	i	23.921	23.908 ± 0.263	0	1126	179907
	z	22.965	22.940 ± 0.370	0	578	215629
	y	21.895	21.884 ± 0.252	0	843	315319
Observing Mode 164	u	0.000	nan ± nan	0	0	0
SuperNovaSubSeqdeep.conf	g	24.214	24.163 ± 0.611	0	0	17106
	r	24.121	24.093 ± 0.448	0	1	34267
	i	23.646	23.629 ± 0.348	0	49	34166
	z	23.129	23.117 ± 0.319	0	47	33942
	y	21.759	21.753 ± 0.305	0	60	33680
Observing Mode 165	u	24.168	24.163 ± 0.288	0	0	144920
Universal-20-1030.conf	g	24.719	24.718 ± 0.261	0	75	187521
	r	24.464	24.453 ± 0.271	0	880	418466
	i	23.865	23.847 ± 0.286	0	800	418714
	z	23.097	23.067 ± 0.395	0	1065	508078
	y	21.907	21.895 ± 0.255	0	931	508704
Observing Mode 166	u	0.000	nan ± nan	0	0	0
NorthEclipticSpur-20.conf	g	24.362	24.316 ± 0.336	0	0	4407
	r	24.097	24.068 ± 0.347	0	0	11958
	i	23.503	23.470 ± 0.350	0	0	13396
	z	22.682	22.652 ± 0.405	0	66	65416
	y	0.000	nan ± nan	0	0	0

Continued on next page

Single Visit Depth *(con't)*

Observing Mode ID	Filter	Median	Mean $\pm$ rms	$+3\sigma$	-3σ	Total
All Observing Modes	u	24.147	24.133 $\pm$ 0.314	0	810	159848
	g	24.690	24.658 $\pm$ 0.346	0	4119	222407
	r	24.433	24.404 $\pm$ 0.320	0	5139	480246
	i	23.839	23.814 $\pm$ 0.309	0	2491	479969
	z	23.056	23.022 $\pm$ 0.415	0	2404	624768
	y	21.895	21.877 $\pm$ 0.273	0	3624	565482
All Observing Modes	All	23.582	23.392 $\pm$ 1.031	0	0	2532720

Table 9: The median, mean and standard deviation of the single visit depth (5σ limiting magnitude) values for all visits separated by observing mode and by filter. The $+3\sigma$ column shows the number of visits which had a single visit depth more than 3σ fainter than the median single visit depth; the -3σ column shows the number of visits with a single visit depth more than 3σ brighter than the median single depth. The Total column shows the number of visits counted toward each observing mode/filter combination.

4.3 Coadded Depth

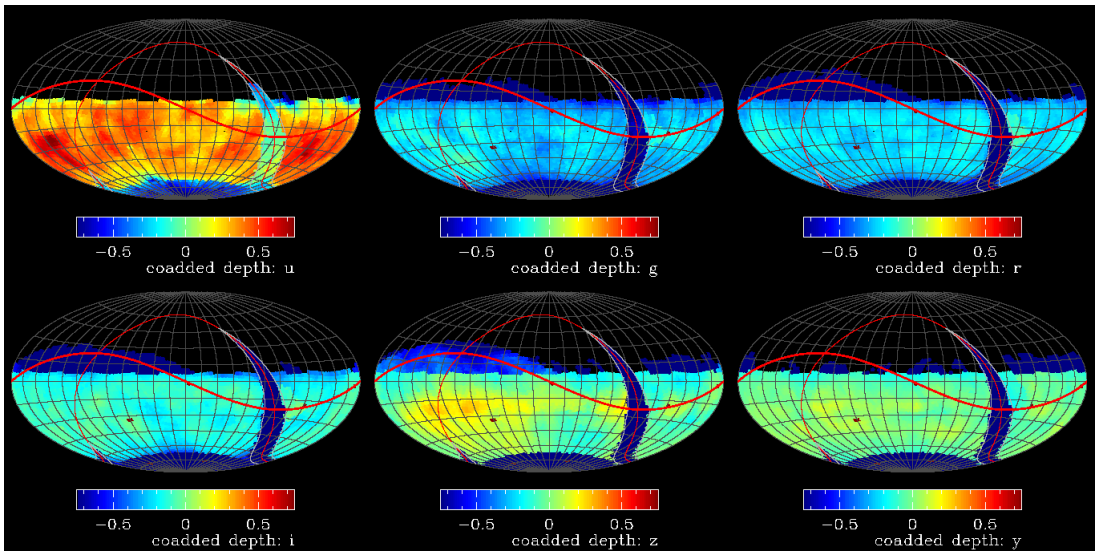

Figure 11: *(opsim6_43_coadded5sigma.png)* The difference between the coadded depth and the WFD spec coadded depth (see Table 3) for each field is plotted in Aitoff projection for each filter. Fields with positive values have a coadded depth deeper than the WFD zenith value. Visits acquired by all observing modes are included in this plot and are not limited only to observing modes that were designed to meet the WFD number of visits.

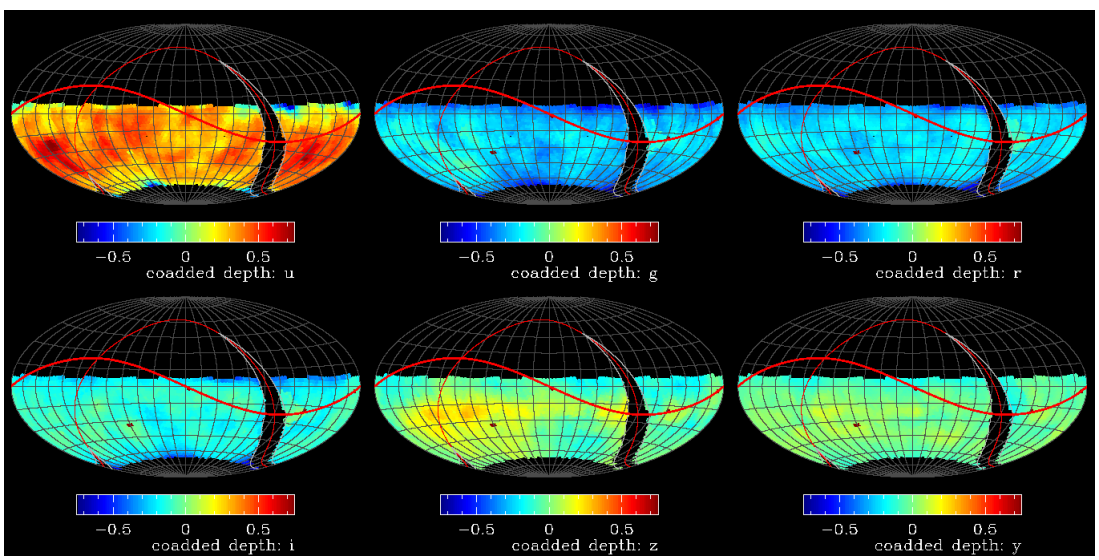

Figure 12: *(opsim6_43_coadded5sigmaWFD.png)* The difference between the coadded depth and the WFD spec coadded depth (see Table 3) for each field is plotted in Aitoff projection for each filter. Fields with positive values have a coadded depth deeper than the WFD zenith value. Only visits acquired by observing modes designed to meet the WFD number of visits are included in this plot.

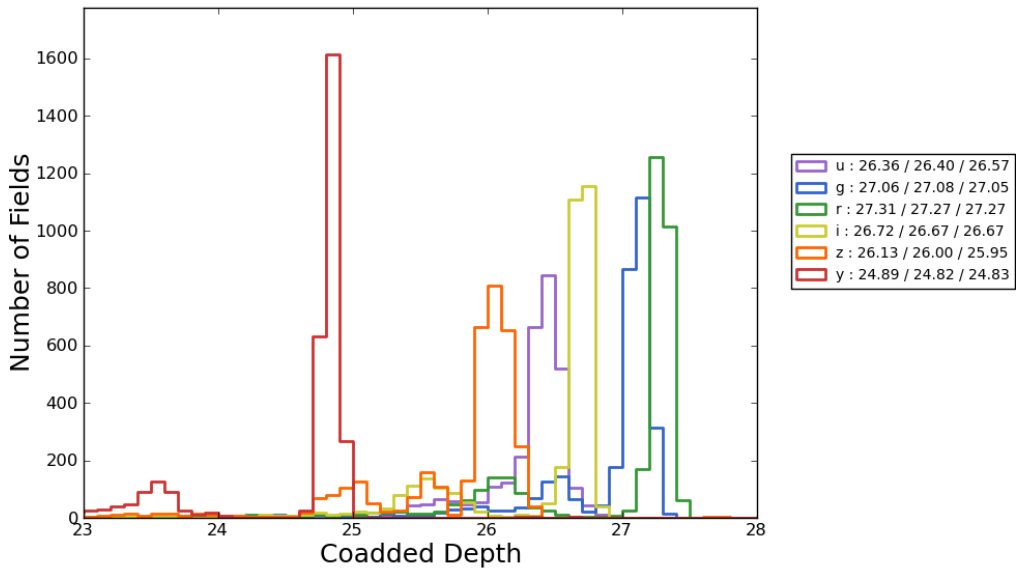

Figure 13: *(opsim6_43_coadded_allfilters.png)* The distribution of fields with coadded depth in each filter. Visits acquired by all observing modes are included in this plot and are not limited only to observing modes that were designed to meet the WFD number of visits. The inset box contains the values of the 25th, 50th (median), and 75th percentiles for each curve.

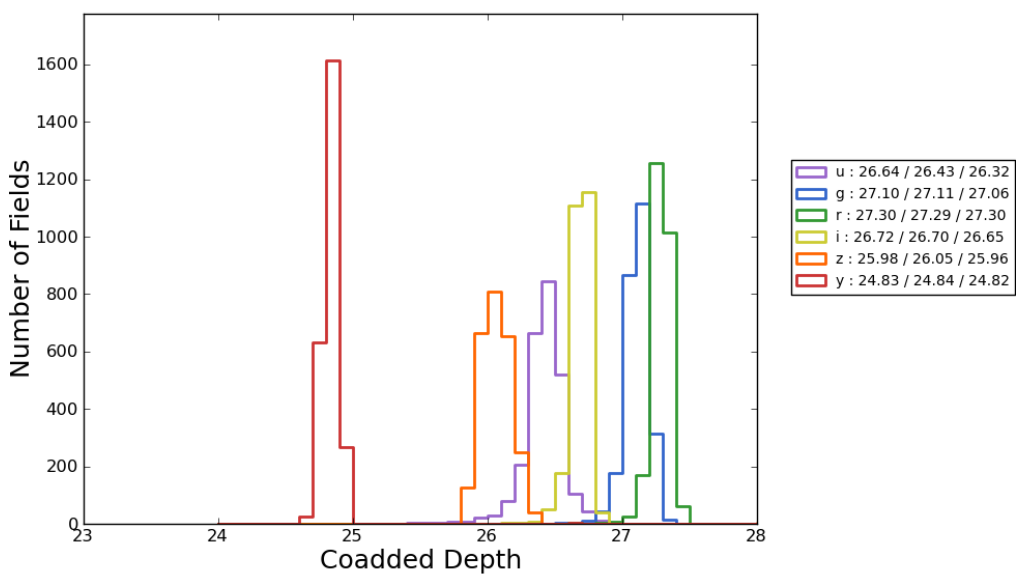

Figure 14: *(opsim6_43_coadded_allfilters_wfd.png)* The distribution of fields with coadded depth in each filter. Only visits acquired by observing modes designed to meet the WFD number of visits are included in this plot. The inset box contains the values of the 25th, 50th (median), and 75th percentiles for each curve.

Coadded Depth

Observing Mode ID	Filter	Median	Mean $\pm$ rms	$+3\sigma$	-3σ	Total
All Observing Modes	u	26.403	26.323 $\pm$ 0.291	0	62	2980
	g	27.085	26.872 $\pm$ 0.566	4	92	3296
	r	27.269	26.916 $\pm$ 0.709	2	70	3417
	i	26.668	26.356 $\pm$ 0.664	3	71	3379
	z	25.999	25.760 $\pm$ 0.627	6	111	3550
	y	24.817	24.492 $\pm$ 0.731	0	89	3229
All Observing Modes	All	26.364	26.123 $\pm$ 1.029	0	210	19851

Table 10: The median, mean and standard deviation of the coadded depth separated by filter for all fields regardless of observing mode. The $+3\sigma$ column shows the number of fields which have a coadded depth more than 3σ fainter than the median coadded depth; the -3σ column shows the number of fields with a coadded depth more than 3σ brighter than the mean coadded depth. The Total column is the number of fields counted toward each filter combination.

5 Observing Conditions

5.1 Filter Map

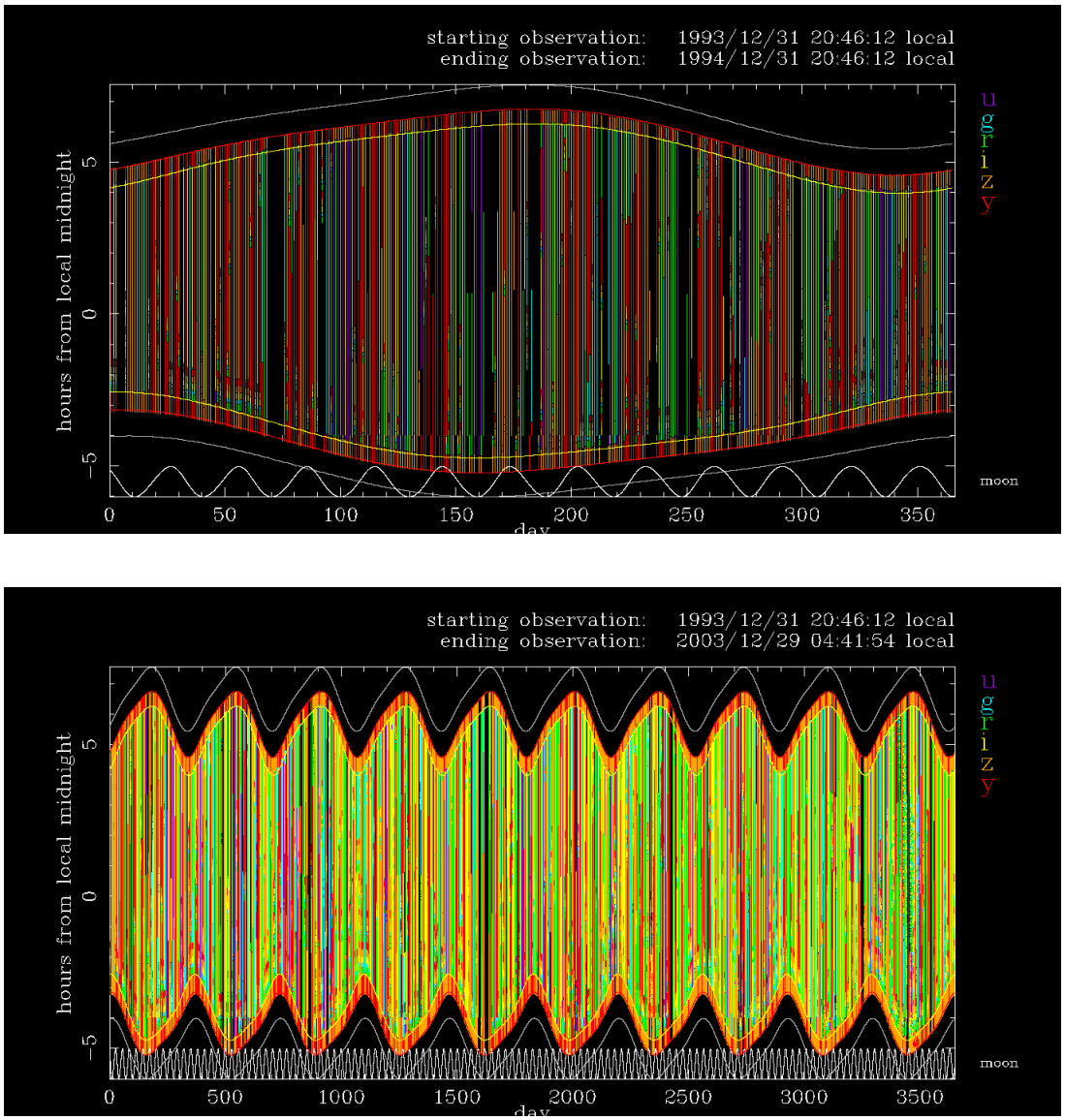

Figure 15: A map of the time spent in each filter in hours from local midnight versus the time of observation in days. The first year of the survey is mapped in the top panel *(opsim6_43_oneyearhourglass.png)* and the entire survey is mapped in the bottom panel *(opsim6_43_hourglass.png)*. The color of the filled area indicates the filter used. The enclosing curves indicate the time of civil, nautical, and astronomical twilight. The phase of the moon is indicated by the white curve along the bottom edge of the plot (arbitrarily scaled).

5.2 Sky Brightness

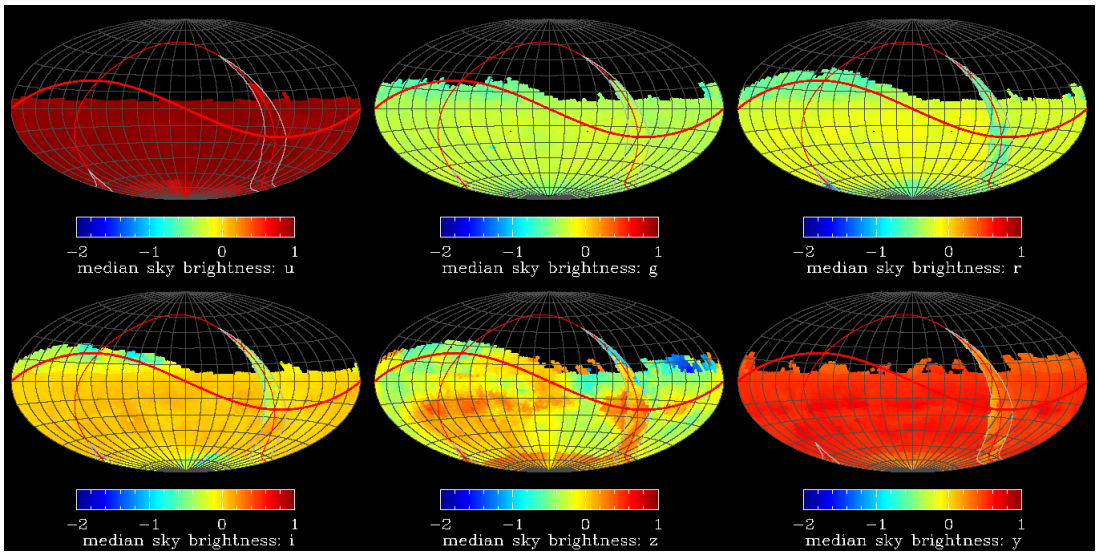

Figure 16: *(opsim6_43_medianskyb.png)*The difference between the median of the sky brightness for all visits to a given field and the expected median no-moon zenith sky brightness at Cerro Pachon for each field is plotted in Aitoff projection for each filter (see Table 3). All visits acquired by all observing modes are included in this plot and are not limited to only observing that were designed to meet the WFD number of visits.

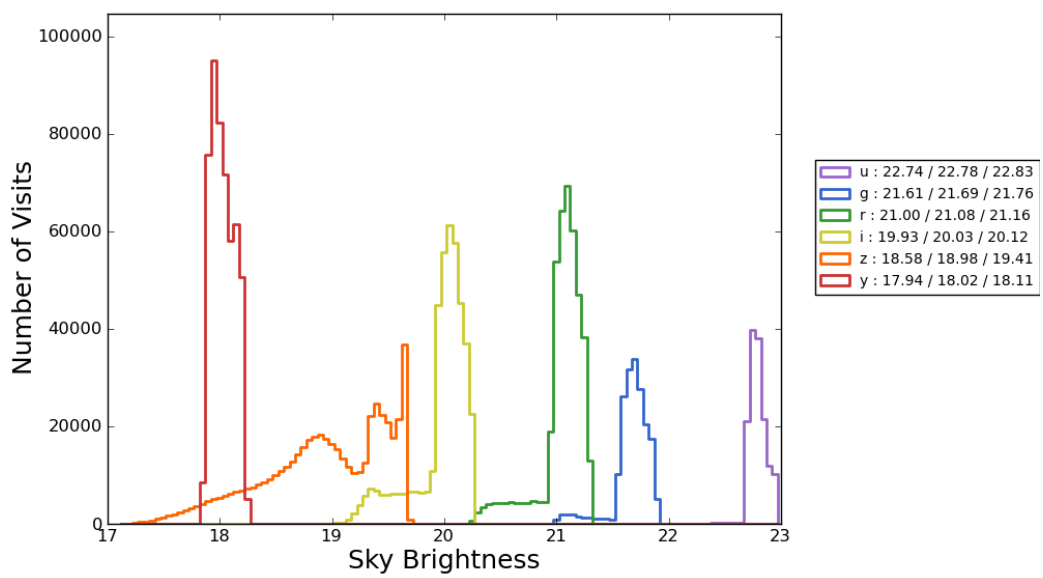

Figure 17: *(opsim6_43_skyb_allfilters.png)* The distribution of fields with sky brightness for each filter. Only visits acquired by observing modes designed to meet the WFD number of visits are included. The inset box contains the values of the 25th, 50th (median), and 75th percentiles for each curve.

Sky Brightness

Observing Mode ID	Filter	Median	Mean ± rms	$+3\sigma$	-3σ	Total
Observing Mode 161	u	22.797	22.777 ± 0.127	0	132	6510
GalacticPlaneProp.conf	g	21.679	21.665 ± 0.132	0	82	6600
	r	20.766	20.742 ± 0.355	0	0	6900
	i	19.871	19.803 ± 0.309	0	0	6900
	z	19.185	18.988 ± 0.573	0	2	6900
	y	17.792	17.805 ± 0.167	0	0	6900
Observing Mode 162	u	22.575	22.577 ± 0.109	0	36	6330
SouthCelestialPole-20.conf	g	21.534	21.539 ± 0.071	0	73	5850
	r	20.819	20.784 ± 0.211	0	138	6330
	i	19.770	19.726 ± 0.226	0	0	6330
	z	19.255	19.228 ± 0.160	0	111	6330
	y	17.831	17.818 ± 0.116	0	0	6330
Observing Mode 163	u	22.781	22.787 ± 0.087	0	825	104088
Standby.conf	g	21.690	21.666 ± 0.165	0	3707	101889
	r	21.098	21.078 ± 0.148	0	6213	211717
	i	20.064	20.057 ± 0.115	0	1883	179907
	z	18.793	18.723 ± 0.503	0	0	215629
	y	18.001	18.012 ± 0.093	0	5	315319
Observing Mode 164	u	0.000	nan ± nan	0	0	0
SuperNovaSubSeqdeep.conf	g	21.293	20.690 ± 1.098	0	0	17106
	r	20.797	20.471 ± 0.707	0	0	34267
	i	19.843	19.714 ± 0.401	0	13	34166
	z	19.302	19.242 ± 0.278	0	100	33942
	y	17.965	17.993 ± 0.140	0	199	33680
Observing Mode 165	u	22.782	22.791 ± 0.077	0	990	144920
Universal-20-1030.conf	g	21.687	21.665 ± 0.161	0	6792	187521
	r	21.084	21.044 ± 0.198	0	12898	418466
	i	20.032	19.965 ± 0.244	0	4209	418714
	z	18.980	18.929 ± 0.549	0	280	508078
	y	18.015	18.027 ± 0.100	0	9	508704
Observing Mode 166	u	0.000	nan ± nan	0	0	0
NorthEclipticSpur-20.conf	g	21.506	21.501 ± 0.121	0	29	4407
	r	20.819	20.805 ± 0.186	0	74	11958
	i	19.786	19.753 ± 0.223	0	45	13396
	z	18.902	18.688 ± 0.552	0	71	65416
	y	0.000	nan ± nan	0	0	0

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Sky Brightness *(con't)*

Observing Mode ID	Filter	Median	Mean $\pm$ rms	$+3\sigma$	-3σ	Total
All Observing Modes	u	22.777	22.779 $\pm$ 0.095	0	2555	159848
	g	21.671	21.583 $\pm$ 0.428	0	5994	222407
	r	21.068	20.989 $\pm$ 0.312	0	10464	480246
	i	20.017	19.936 $\pm$ 0.270	0	5156	479969
	z	19.009	18.923 $\pm$ 0.547	0	1317	624768
	y	18.009	18.019 $\pm$ 0.110	0	3725	565482
All Observing Modes	All	19.660	19.782 $\pm$ 1.461	0	0	2532720

Table 11: The median, mean and standard deviation of the sky brightness values for all visits separated by observing mode and by filter. The $+3\sigma$ column shows the number of visits which had a sky brightness more than 3σ fainter than the median single visit depth; the -3σ column shows the number of visits with a sky brightness more than 3σ brighter than the median sky brightness. The Total column shows the number of visits counted toward each observing mode/filter combination.

5.3 Seeing

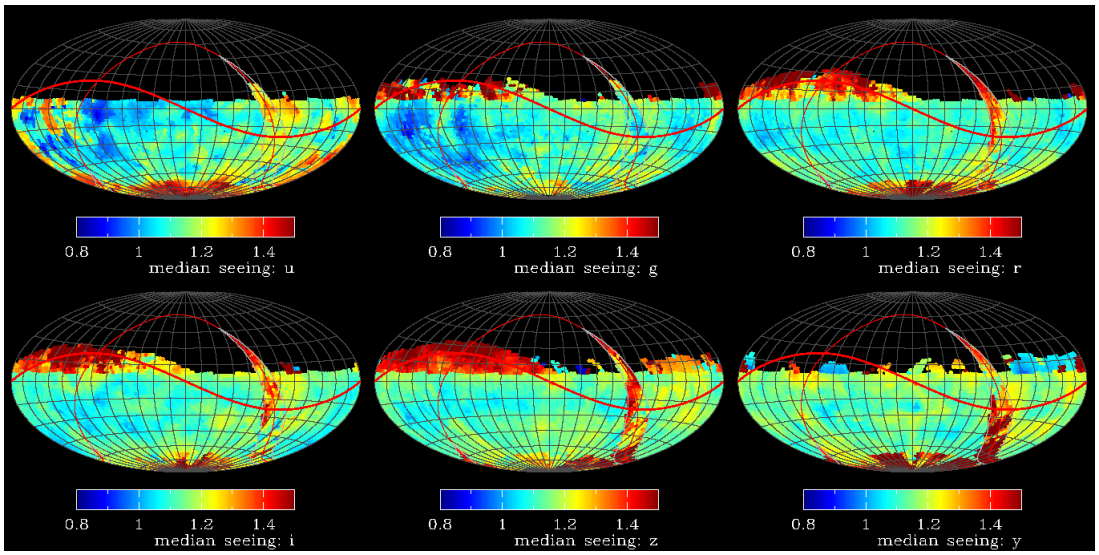

Figure 18: *(opsim6_43_medianseeing.png)* The ratio of the median seeing for all visits to a given field to the expected median zenith seeing (see Table 3, but of course many fields cannot reach zenith) is calculated and is plotted in Aitoff projection for each filter. All visits acquired by all observing modes are included in this plot and are not limited to only observing modes that were designed to meet the WFD number of visits.

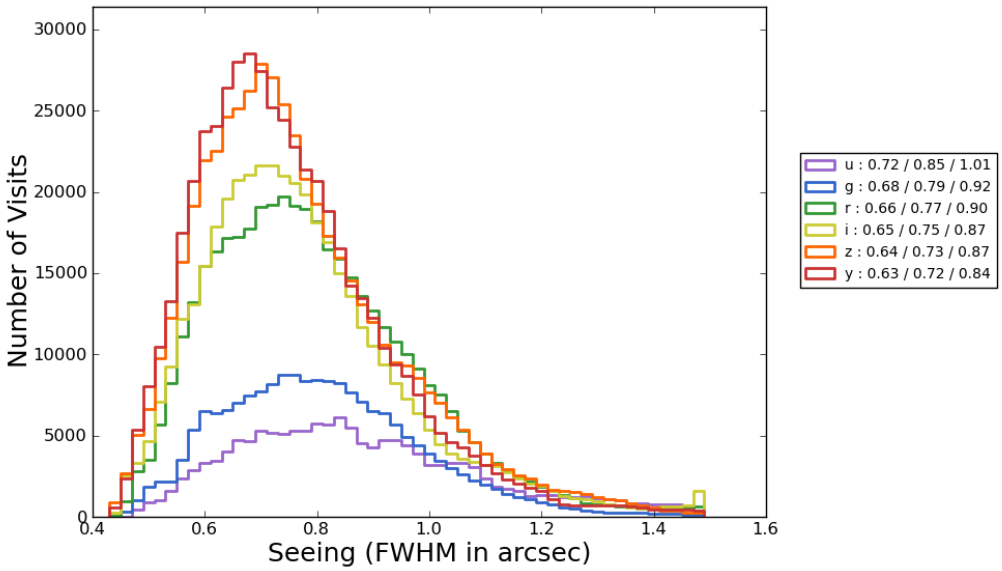

Figure 19: *(opsim6_43_seeing_allfilters.png)* The distribution of visits with seeing for each filter. Only visits acquired by observing modes designed to meet the WFD number of visits are included. The inset box contains the values of the 25th, 50th (median), and 75th percentiles for each curve.

Seeing

Observing Mode ID	Filter	Median	Mean ± rms	$+3\sigma$	-3σ	Total
Observing Mode 161	u	0.924	0.932 ± 0.210	50	0	6510
GalacticPlaneProp.conf	g	0.815	0.836 ± 0.164	48	0	6600
	r	0.862	0.896 ± 0.222	90	0	6900
	i	0.821	0.867 ± 0.231	61	0	6900
	z	0.864	0.930 ± 0.274	135	0	6900
	y	0.880	0.994 ± 0.362	33	0	6900
Observing Mode 162	u	1.054	1.117 ± 0.319	79	0	6330
SouthCelestialPole-20.conf	g	0.851	0.886 ± 0.238	93	0	5850
	r	0.980	1.004 ± 0.220	61	0	6330
	i	0.860	0.908 ± 0.232	65	0	6330
	z	0.811	0.862 ± 0.200	58	0	6330
	y	0.972	1.042 ± 0.353	29	0	6330
Observing Mode 163	u	0.845	0.883 ± 0.222	293	0	104088
Standby.conf	g	0.789	0.811 ± 0.194	1011	0	101889
	r	0.769	0.802 ± 0.210	2834	0	211717
	i	0.739	0.770 ± 0.189	2817	0	179907
	z	0.748	0.786 ± 0.195	1802	0	215629
	y	0.726	0.754 ± 0.170	3843	0	315319
Observing Mode 164	u	0.000	nan ± nan	0	0	0
SuperNovaSubSeqdeep.conf	g	0.810	0.846 ± 0.219	210	0	17106
	r	0.810	0.846 ± 0.219	420	0	34267
	i	0.810	0.846 ± 0.219	420	0	34166
	z	0.809	0.846 ± 0.218	407	0	33942
	y	0.810	0.846 ± 0.217	389	0	33680
Observing Mode 165	u	0.848	0.880 ± 0.217	0	0	144920
Universal-20-1030.conf	g	0.794	0.810 ± 0.175	1513	0	187521
	r	0.773	0.797 ± 0.181	4472	0	418466
	i	0.748	0.779 ± 0.186	6675	0	418714
	z	0.735	0.768 ± 0.180	5742	0	508078
	y	0.724	0.753 ± 0.170	6539	0	508704
Observing Mode 166	u	0.000	nan ± nan	0	0	0
NorthEclipticSpur-20.conf	g	0.930	1.039 ± 0.358	0	0	4407
	r	0.921	0.984 ± 0.291	117	0	11958
	i	0.894	0.990 ± 0.343	0	0	13396
	z	0.935	0.973 ± 0.245	548	0	65416
	y	0.000	nan ± nan	0	0	0

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Seeing *(con't)*

Observing Mode ID	**Filter**	**Median**	**Mean $\pm$ rms**	$+3\sigma$	-3σ	**Total**
All Observing Modes	u	0.860	0.894 $\pm$ 0.228	656	0	159848
	g	0.800	0.822 $\pm$ 0.194	2321	0	222407
	r	0.783	0.814 $\pm$ 0.206	6365	0	480246
	i	0.758	0.793 $\pm$ 0.202	8158	0	479969
	z	0.757	0.798 $\pm$ 0.206	7052	0	624768
	y	0.730	0.764 $\pm$ 0.186	8755	0	565482
All Observing Modes	All	0.765	0.801 $\pm$ 0.204	33569	0	2532720

Table 12: The median, mean and standard deviation of the seeing values for all visits separated by observing mode and by filter. The $+3\sigma$ column shows the number of visits which had a seeing more than 3σ greater than the median seeing; the -3σ column shows the number of visits with a seeing more than 3σ smaller than the median seeing. The Total column shows the number of visits counted toward each observing mode/filter combination.

5.4 Airmass

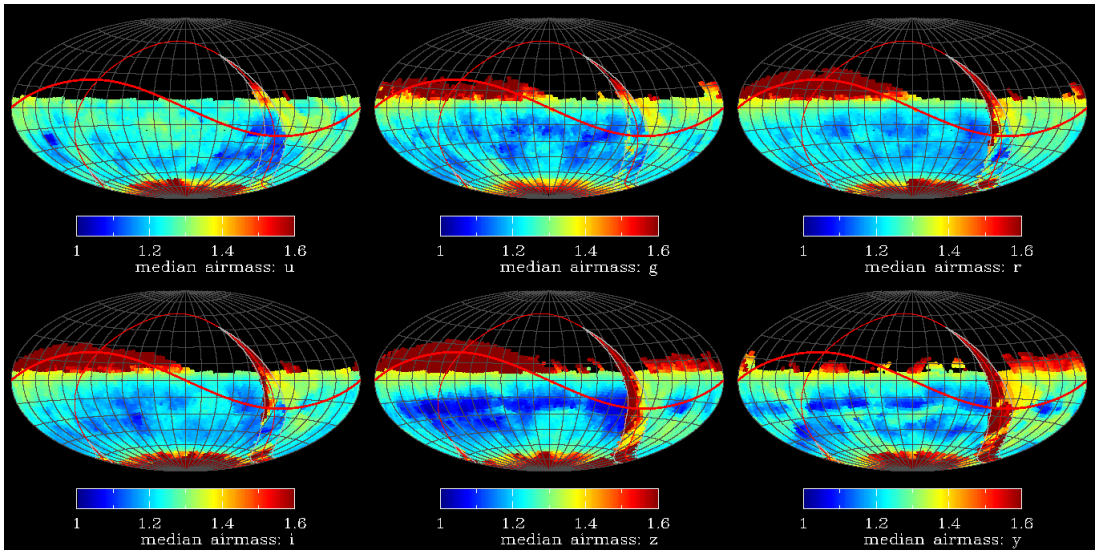

Figure 20: *(opsim6_43_medianairmass.png)* The median of the airmass for the visits to each field is plotted in Aitoff projection for each filter. All visits acquired by all observing modes are included in this plot and are not limited to only observing modes that were designed to meet the WFD number of visits.

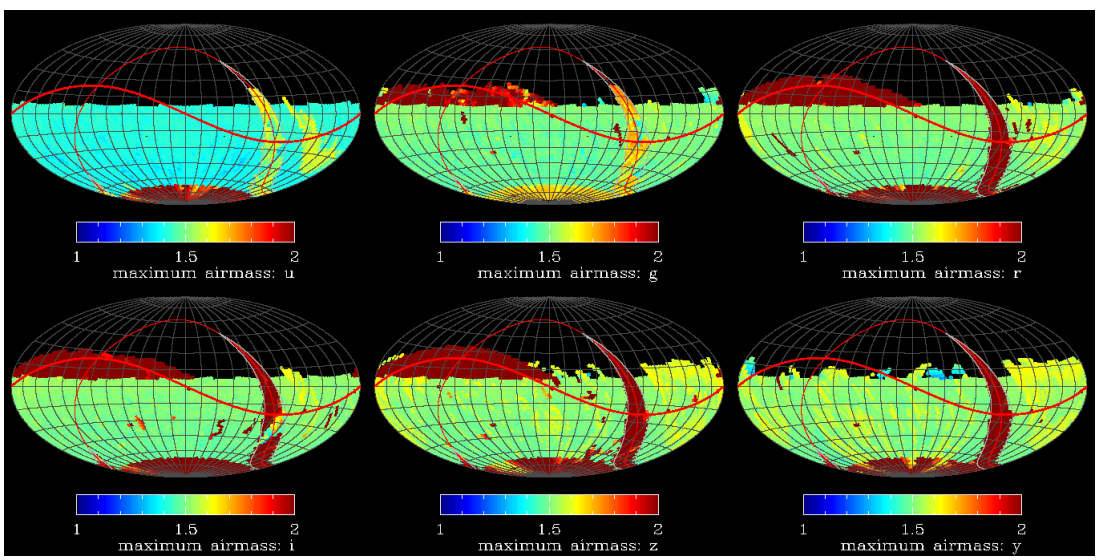

Figure 21: *(opsim6_43_maxairmass.png)* The maximum of the airmass for the visits to each field is plotted in Aitoff projection for each filter. All visits acquired by all observing modes are included in this plot and are not limited to only observing modes that were designed to meet the WFD number of visits.

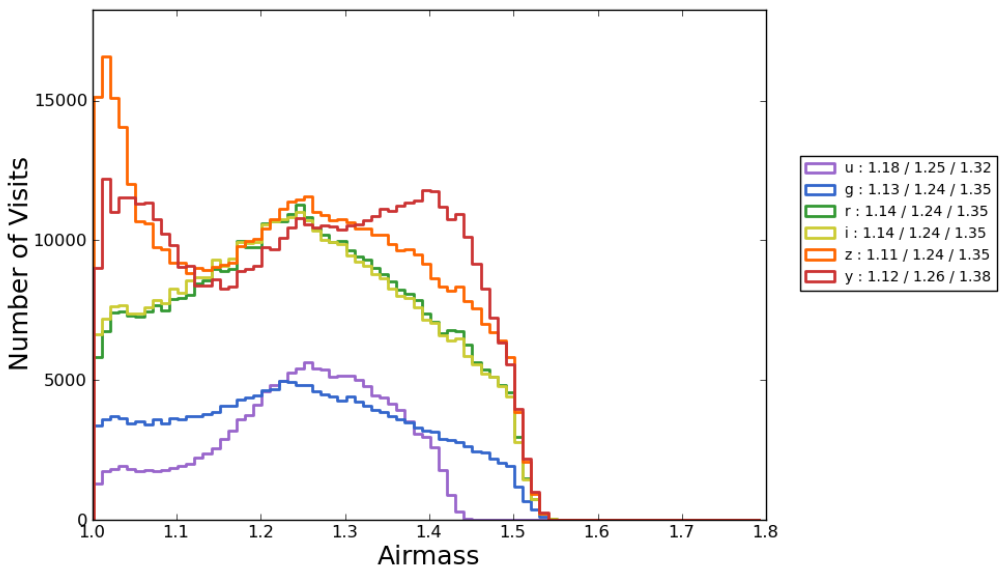

Figure 22: *(opsim6_43_airmass_allfilters.png)* The distribution of fields with airmass for each filter. Only visits acquired by observing modes designed to meet the WFD number of visits are included. The legend contains the values of the 25th, 50th (median), and 75th percentiles for each curve.

Airmass

Observing Mode ID	Filter	Median	Mean ± rms	$+3\sigma$	-3σ	Total
Observing Mode 161	u	1.212	1.247 ± 0.161	0	0	6510
GalacticPlaneProp.conf	g	1.264	1.296 ± 0.188	0	0	6600
	r	1.403	1.591 ± 0.478	0	0	6900
	i	1.354	1.524 ± 0.440	0	0	6900
	z	1.595	1.716 ± 0.431	0	0	6900
	y	1.717	1.760 ± 0.407	0	0	6900
Observing Mode 162	u	1.633	1.647 ± 0.228	0	0	6330
SouthCelestialPole-20.conf	g	1.525	1.518 ± 0.125	0	0	5850
	r	1.681	1.729 ± 0.311	0	0	6330
	i	1.693	1.742 ± 0.311	0	0	6330
	z	1.639	1.688 ± 0.283	1	0	6330
	y	1.635	1.699 ± 0.289	0	0	6330
Observing Mode 163	u	1.255	1.247 ± 0.111	337	0	104088
Standby.conf	g	1.231	1.236 ± 0.138	2	0	101889
	r	1.234	1.239 ± 0.135	13	0	211717
	i	1.228	1.233 ± 0.134	26	0	179907
	z	1.268	1.267 ± 0.139	31	0	215629
	y	1.279	1.271 ± 0.140	5	0	315319
Observing Mode 164	u	0.000	nan ± nan	0	0	0
SuperNovaSubSeqdeep.conf	g	1.417	1.380 ± 0.264	6	0	17106
	r	1.420	1.400 ± 0.286	0	0	34267
	i	1.393	1.365 ± 0.252	131	0	34166
	z	1.373	1.352 ± 0.246	275	0	33942
	y	1.362	1.345 ± 0.253	342	0	33680
Observing Mode 165	u	1.253	1.242 ± 0.104	0	0	144920
Universal-20-1030.conf	g	1.240	1.242 ± 0.137	16	0	187521
	r	1.245	1.247 ± 0.135	30	0	418466
	i	1.241	1.243 ± 0.135	39	0	418714
	z	1.236	1.235 ± 0.146	61	0	508078
	y	1.258	1.252 ± 0.145	9	0	508704
Observing Mode 166	u	0.000	nan ± nan	0	0	0
NorthEclipticSpur-20.conf	g	1.574	1.613 ± 0.251	0	0	4407
	r	1.736	1.771 ± 0.330	0	0	11958
	i	1.712	1.763 ± 0.348	0	0	13396
	z	1.961	1.956 ± 0.321	0	0	65416
	y	0.000	nan ± nan	0	0	0

Continued on next page

Airmass *(con't)*

Observing Mode ID	Filter	Median	Mean $\pm$ rms	$+3\sigma$	-3σ	Total
All Observing Modes	u	1.259	1.261 $\pm$ 0.140	2722	0	159848
	g	1.254	1.268 $\pm$ 0.172	2370	0	222407
	r	1.257	1.282 $\pm$ 0.203	9843	0	480246
	i	1.253	1.277 $\pm$ 0.199	9398	0	479969
	z	1.273	1.328 $\pm$ 0.293	18770	0	624768
	y	1.269	1.271 $\pm$ 0.179	6018	0	565482
All Observing Modes	All	1.262	1.288 $\pm$ 0.219	58681	0	2532720

Table 13: The median, mean and standard deviation of the airmass values for all visits separated by observing mode and by filter. The $+3\sigma$ column shows the number of visits which had an airmass more than 3σ greater than the median airmass; the -3σ column shows the number of visits with an airmass more than 3σ smaller than the median airmass. The Total column shows the number of visits counted toward each observing mode/filter combination.

6 Slew Statistics

6.1 Inter-Visit Time

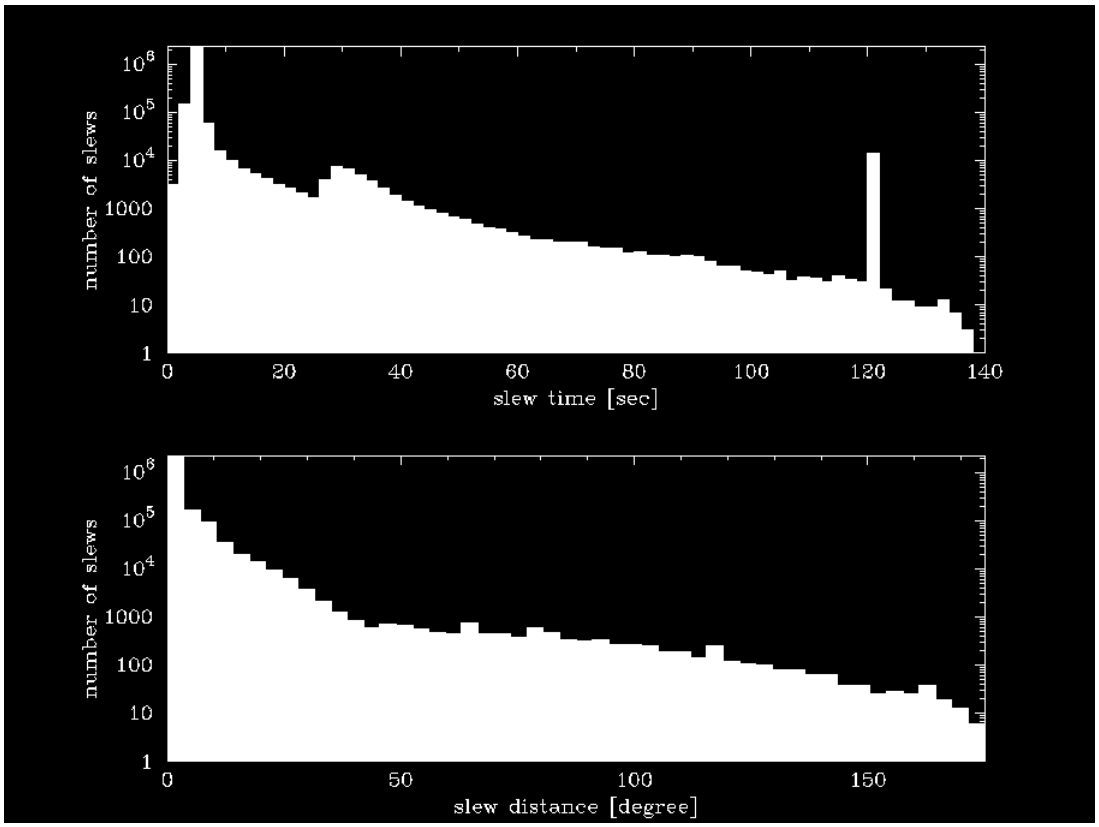

Figure 23: The logarithmic distribution of slew time and slew distance, where “slew” means the time between completing an integration at one field and beginning an integration at the next field.

A Visits Requested by Observing Mode

A.1 GalacticPlaneProp.conf

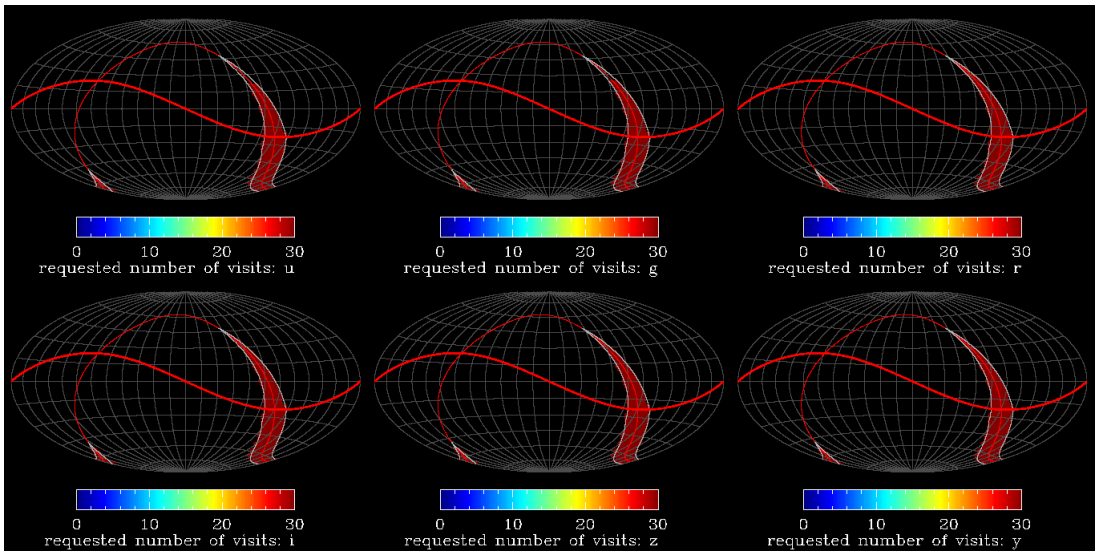

Figure 24: *(opsim6_43_SixVisits-Num-161.png)* The total number of visits acquired for each field requested by observing mode GalacticPlaneProp.conf is plotted in Aitoff projection for each filter.

A.2 SouthCelestialPole-20.conf

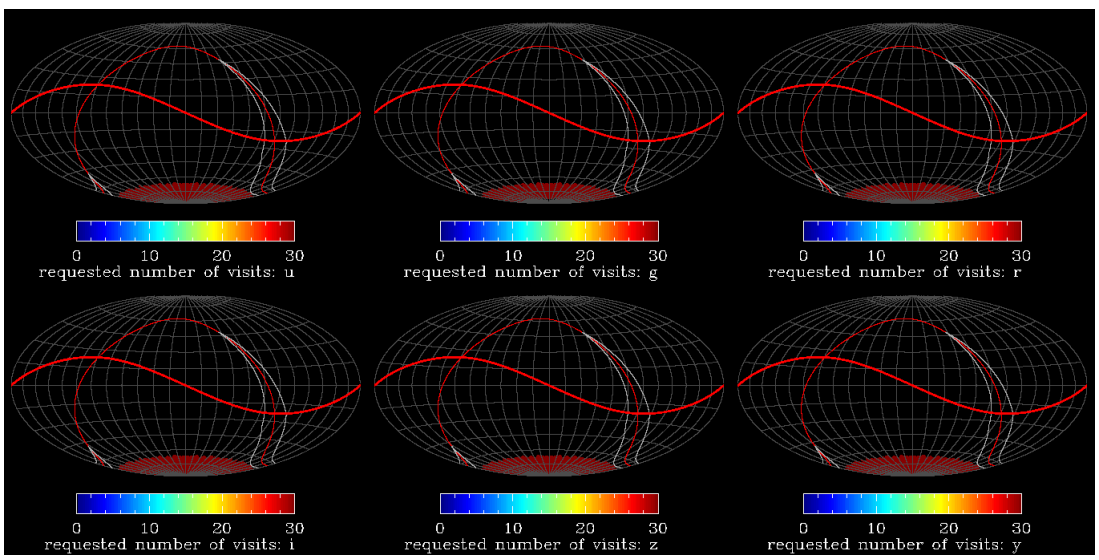

Figure 25: *(opsim6_43_SixVisits-Num-162.png)* The total number of visits acquired for each field requested by observing mode SouthCelestialPole-20.conf is plotted in Aitoff projection for each filter.

A.3 Standby.conf

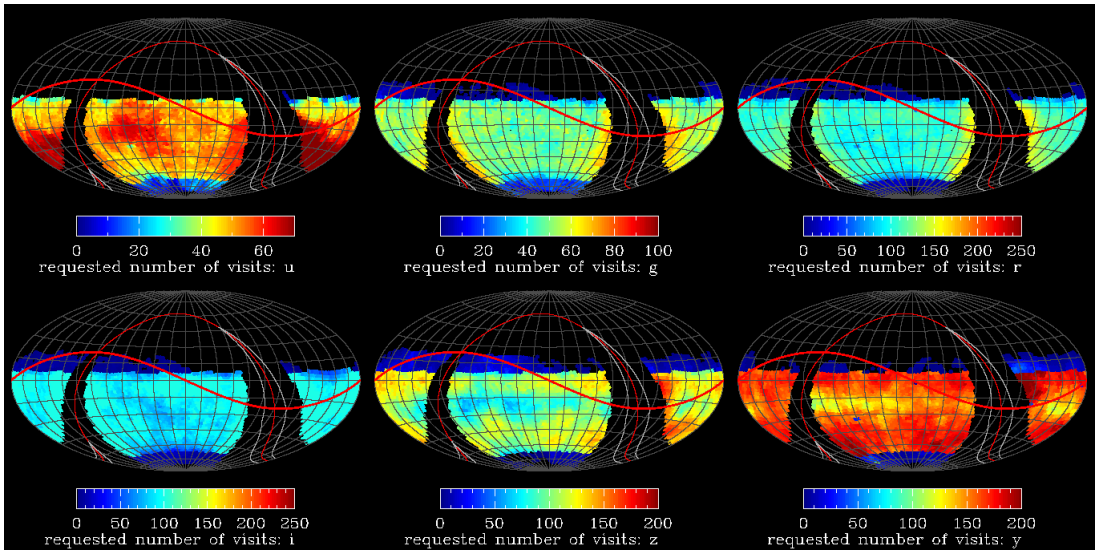

Figure 26: *(opsim6_43_SixVisits-Num-163.png)* The total number of visits acquired for each field requested by observing mode Standby.conf is plotted in Aitoff projection for each filter.

A.4 SuperNovaSubSeqdeep.conf

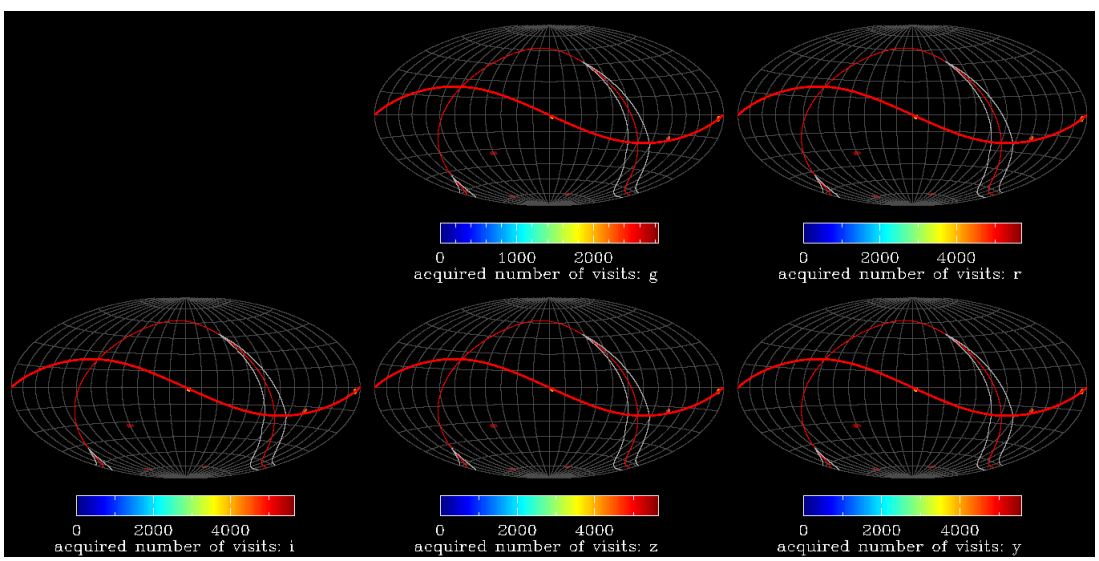

Figure 27: *(opsim6_43_SixVisits-Num-164.png)* The total number of visits acquired for each field requested by observing mode SuperNovaSubSeqdeep.conf is plotted in Aitoff projection for each filter.

A.5 Universal-20-1030.conf

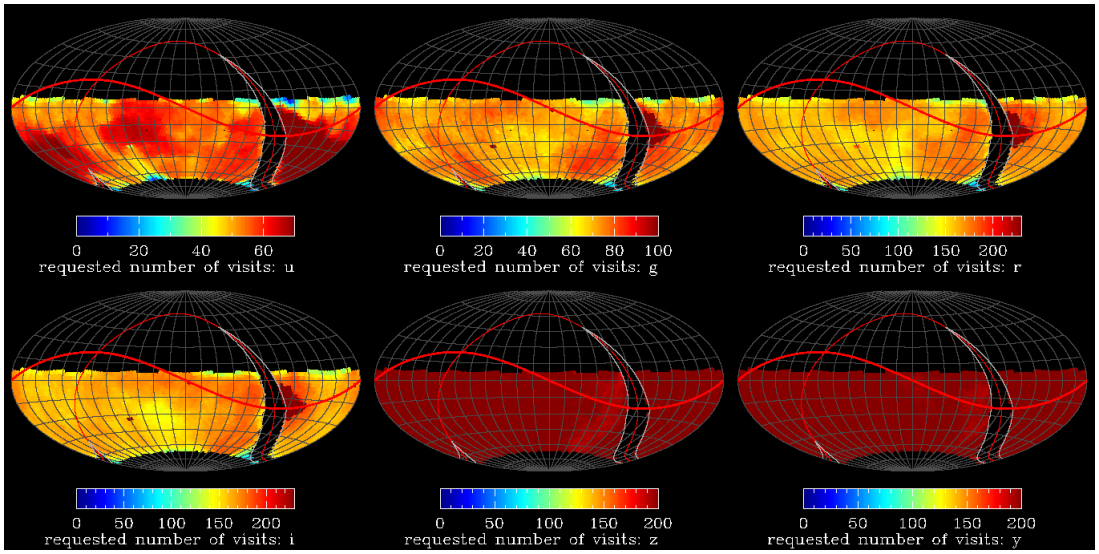

Figure 28: *(opsim6_43_SixVisits-Num-165.png)* The total number of visits acquired for each field requested by observing mode Universal-20-1030.conf is plotted in Aitoff projection for each filter.

A.6 NorthEclipticSpur-20.conf

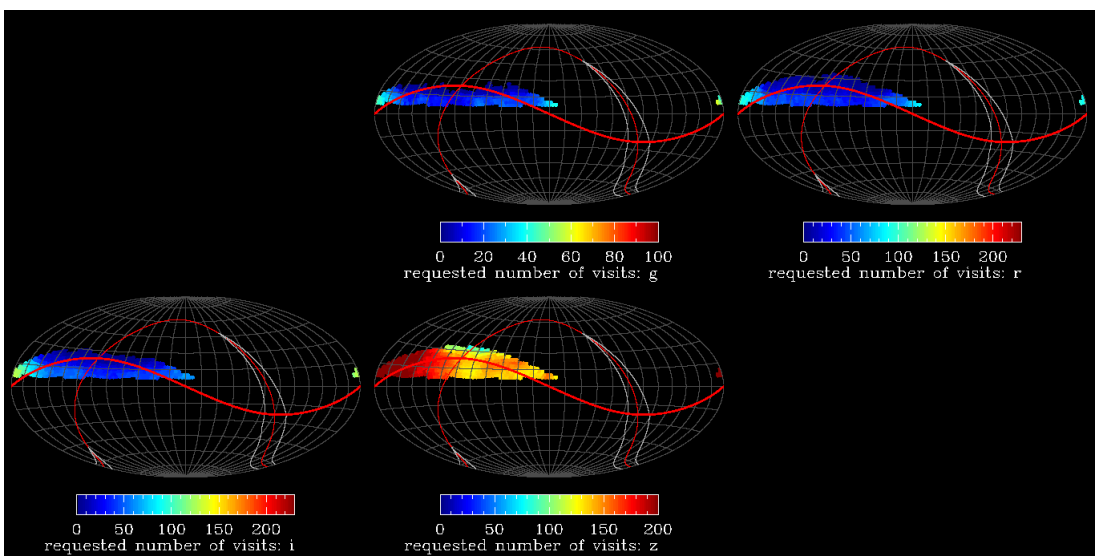

Figure 29: *(opsim6_43_SixVisits-Num-166.png)* The total number of visits acquired for each field requested by observing mode NorthEclipticSpur-20.conf is plotted in Aitoff projection for each filter.

B Configuration File Specifications

A particular observing mode may be implemented by one or more configuration files. In this section a selected group of parameters from each configuration file are displayed. While not scientifically interesting, this illustrates how the observing cadence may be directed.

B.1 GalacticPlaneProp.conf

Details

Parameter	Value					
Observing Time Details						
Visit Time	34.0					
NVisits	3.					
MaxNeedAfterOverflow	0.0					
Observing Condition Restrictions						
MaxAirmass	2.5					
MaxSeeing	2.					
minTransparency	0.7					
TwilightBoundary	-12.					
Target Ranking Parameters						
ProgressToStartBoost	1.00					
MaxBoostToComplete	0.00					
RelativeProposalPriority	1.0					
MaxProximityBonus	0.5					
RankScale	0.1					
AcceptSerendipity	True					
AcceptConsecutiveObs	True					
Observing Filter Details						
Filter	g	r	i	z	y	u
Filter_Visits	30	30	30	30	30	30
Filter_MaxSeeing	3.0	2.0	2.0	2.0	3.0	2.0
Filter_MinBrig	21.15	20.00	19.50	17.50	16.00	21.20
Filter_MaxBrig	30.00	30.00	30.00	21.40	21.40	30.00

Table 14: A value of '?' indicates that that parameter was not defined or was not applicable for this observing mode.

B.2 SouthCelestialPole-20.conf

Details

Parameter	Value					
Observing Time Details						
Visit Time	34.0					
NVisits	3.					
MaxNeedAfterOverflow	0.0					
Observing Condition Restrictions						
MaxAirmass	2.5					
MaxSeeing	2.					
minTransparency	0.7					
TwilightBoundary	-12.					
Target Ranking Parameters						
ProgressToStartBoost	1.00					
MaxBoostToComplete	0.00					
RelativeProposalPriority	1.0					
MaxProximityBonus	0.5					
RankScale	0.1					
AcceptSerendipity	True					
AcceptConsecutiveObs	True					
Observing Filter Details						
Filter	g	r	i	z	y	u
Filter_Visits	30	30	30	30	30	30
Filter_MaxSeeing	3.0	2.0	2.0	2.0	3.0	3.0
Filter_MinBrig	21.15	20.00	19.50	17.50	16.00	21.00
Filter_MaxBrig	30.00	30.00	30.00	21.40	21.40	30.00

Table 15: A value of '?' indicates that that parameter was not defined or was not applicable for this observing mode.

B.3 Standby.conf

Details

Parameter	Value					
Observing Time Details						
Visit Time	34.0					
NVisits	30.					
MaxNeedAfterOverflow	0.001					
Observing Condition Restrictions						
MaxAirmass	1.6					
MaxSeeing	1.5					
minTransparency	.7					
TwilightBoundary	-12.					
Observing Area Definitions						
taperL	?					
taperB	?					
peakL	?					
deltaLST	60.0					
maxReach	90.0					
Target Ranking Parameters						
ProgressToStartBoost	1.00					
MaxBoostToComplete	0.00					
RelativeProposalPriority	0.001					
MaxProximityBonus	0.5					
RankScale	0.01					
AcceptSerendipity	False					
AcceptConsecutiveObs	?					
Observing Filter Details						
Filter	u	g	r	i	z	y
Filter_Visits	70	100	250	250	200	200
Filter_MaxSeeing	2.5	2.5	2.5	2.5	2.5	2.5
Filter_MinBrig	21.00	21.00	20.50	20.25	17.50	17.50
Filter_MaxBrig	30.00	30.00	30.00	30.00	21.00	21.00

Table 16: A value of '?' indicates that that parameter was not defined or was not applicable for this observing mode.

B.4 SuperNovaSubSeqdeep.conf

Details

Parameter	Value				
Observing Time Details					
Visit Time	34.0				
NVisits	?				
MaxNeedAfterOverflow	?				
Observing Condition Restrictions					
MaxAirmass	2.0				
MaxSeeing	2.0				
minTransparency	.7				
TwilightBoundary	-12.				
Target Ranking Parameters					
ProgressToStartBoost	?				
MaxBoostToComplete	?				
RelativeProposalPriority	5.0				
MaxProximityBonus	0.5				
RankScale	?				
AcceptSerendipity	False				
AcceptConsecutiveObs	True				
Observing Filter Details					
Filter	g	r	i	z	y
Filter_MinBrig	19.00	19.00	19.00	17.50	17.50
Filter_MaxBrig	30.00	30.00	30.00	30.00	30.00
Sequence Specifications					
MaxNumberActiveSequences	100				
RestartLostSequences	True				
RestartCompleteSequences	True				
MasterSubSequence	main				
SubSeqName	main				
SubSeqFilters	r,g,i,z,y				
SubSeqExposures	20,10,20,20,20				
SubSeqEvents	20				
SubSeqMaxMissed	3				
SubSeqInterval	5*24*60*60				
SubSeqWindowStart	-0.30				
SubSeqWindowMax	0.30				
SubSeqWindowEnd	0.50				

Table 17: A value of '?' indicates that that parameter was not defined or was not applicable for this observing mode.

B.5 Universal-20-1030.conf

Details

Parameter	Value					
Observing Time Details						
Visit Time	34.0					
NVisits	?					
MaxNeedAfterOverflow	?					
Observing Condition Restrictions						
MaxAirmass	1.5					
MaxSeeing	1.5					
minTransparency	.7					
TwilightBoundary	-12.					
Target Ranking Parameters						
ProgressToStartBoost	0.90					
MaxBoostToComplete	10.00					
RelativeProposalPriority	1.1					
MaxProximityBonus	0.1					
RankScale	?					
AcceptSerendipity	True					
AcceptConsecutiveObs	False					
Observing Filter Details						
Filter	u	g	r	i	z	y
Filter_MaxSeeing	1.5	1.5	1.5	1.5	1.5	1.5
Filter_MinBrig	21.30	21.00	20.25	19.50	17.00	16.50
Filter_MaxBrig	30.00	30.00	30.00	30.00	21.00	21.00
Sequence Specifications						
MaxNumberActiveSequences	10000					
RestartLostSequences	False					
RestartCompleteSequences	False					
MasterSubSequence	?					
SubSeqName	u	g	r	i	z	y
SubSeqFilters	u	g	r	i	z	y
SubSeqExposures	1	1	1	1	1	1
SubSeqEvents	70	100	230	230	200	200
SubSeqMaxMissed	0	0	0	0	0	0
SubSeqInterval	0	30*60	30*60	30*60	30*60	0
SubSeqWindowStart	0	-0.5	-0.5	-0.5	-0.5	0
SubSeqWindowMax	0	0.5	0.5	0.5	0.5	0
SubSeqWindowEnd	0	1.0	1.0	1.0	1.0	0

Table 18: A value of '?' indicates that that parameter was not defined or was not applicable for this observing mode.

B.6 NorthEclipticSpur-20.conf

Details

Parameter	Value					
Observing Time Details						
Visit Time	34.0					
NVisits	?					
MaxNeedAfterOverflow	?					
Observing Condition Restrictions						
MaxAirmass	2.5					
MaxSeeing	1.5					
minTransparency	.7					
TwilightBoundary	-12.					
Target Ranking Parameters						
ProgressToStartBoost	0.90					
MaxBoostToComplete	10.00					
RelativeProposalPriority	0.8					
MaxProximityBonus	0.1					
RankScale	?					
AcceptSerendipity	True					
AcceptConsecutiveObs	False					
Observing Filter Details						
Filter	u	g	r	i	z	y
Filter_MaxSeeing	2.0	2.0	2.0	2.0	2.0	1.5
Filter_MinBrig	21.30	21.00	20.25	19.50	17.00	16.50
Filter_MaxBrig	30.00	30.00	30.00	30.00	21.00	21.00
Sequence Specifications						
MaxNumberActiveSequences	10000					
RestartLostSequences	False					
RestartCompleteSequences	False					
MasterSubSequence	?					
SubSeqName	g	r	i	z		
SubSeqFilters	g	r	i	z		
SubSeqExposures	1	1	1	1		
SubSeqEvents	100	230	230	200		
SubSeqMaxMissed	0	0	0	0		
SubSeqInterval	30*60	30*60	30*60	30*60		
SubSeqWindowStart	-0.5	-0.5	-0.5	-0.5		
SubSeqWindowMax	0.5	0.5	0.5	0.5		
SubSeqWindowEnd	1.0	1.0	1.0	1.0		

Table 19: A value of '?' indicates that that parameter was not defined or was not applicable for this observing mode.

C Engineering Specifications

Site Characteristics

Characteristic	Parameter	Value
Site Information	siteConf	./SiteCP.conf
Site Latitude	latitude	-29.666667 deg
Site Longitude	longitude	-70.59 deg
Site Elevation	height	2737. m
Atmospheric Pressure	pressure	1010. millibars
Ambient Temperature	temperature	12. °C
Relative Humidity	relativeHumidity	0.

Table 20: A list of settings pertaining to the selected site (siteConf) which is Cerro Pachon.

Camera Characteristics

Characteristic	Parameter	Value
Field of View	fov	3.5 degrees
Total Readout Time (sec)	Readout_Time	2.0 sec
System Seeing	systemSeeingFactor	? arcsec
Seeing Epoch	seeingEpoch	49353
Filter Information	Filter_MountTime	8*3600.0 sec
	Filter_MoveTime	120.0 sec
	Filter_Mounted	g
	Filter_Mounted	r
	Filter_Mounted	i
	Filter_Mounted	z
	Filter_Mounted	y
	Filter_Pos	r
	Filter_Removable	y
	Filter_Removable	z
	Filter_Unmounted	u

Table 21: A list of settings pertaining to the camera. Only 5 filters may be mounted per night as 8 hours are required to swap out the sixth.