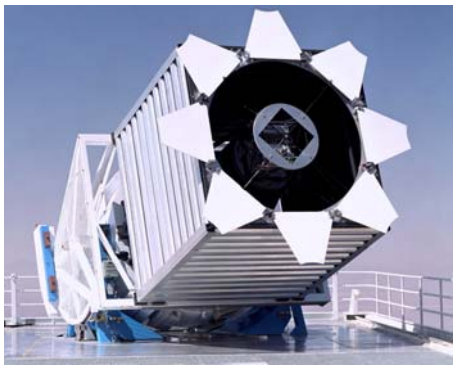
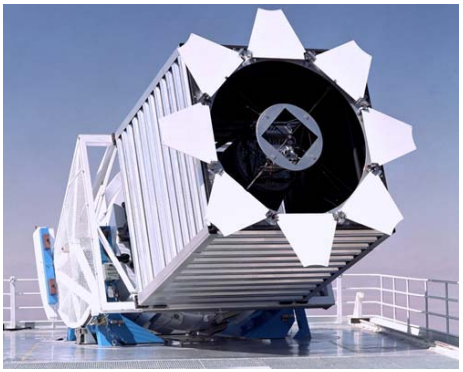
The 3rd SDSS-KSG Workshop

High-1 resort, 2008. 2. 18-20



Korean Scientist Group

KSG
Korean Scientist Group

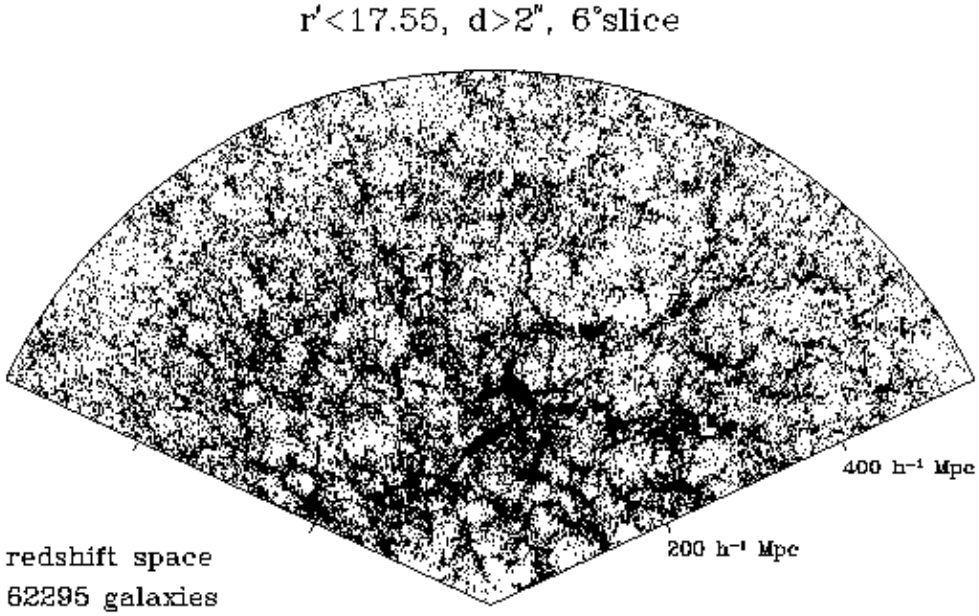


Sloan Digital Sky Survey & Korean Scientist Group

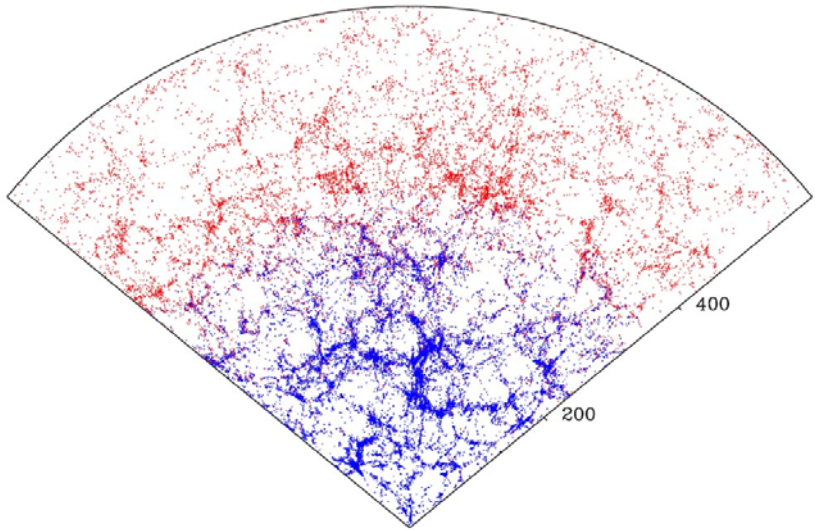
1. SDSS는 1990년대 초에 미국의 Astrophysical Research Consortium (고등연구원 IAS, 프린스톤, 시카고, 존스홉킨스, 뉴멕시코, 와싱톤, 콜로라도 대학)이 주도하여 시작.

2. 우주 구조와 은하 형성 연구 위해 1백만개 외부은하와 10만개 퀘이사의 스펙트럼을 측정하는 거대우주탐사 사업. 현재 미국, 일본, 독일, 한국, 유럽, 중국의 과학자 약 350명이 참여.

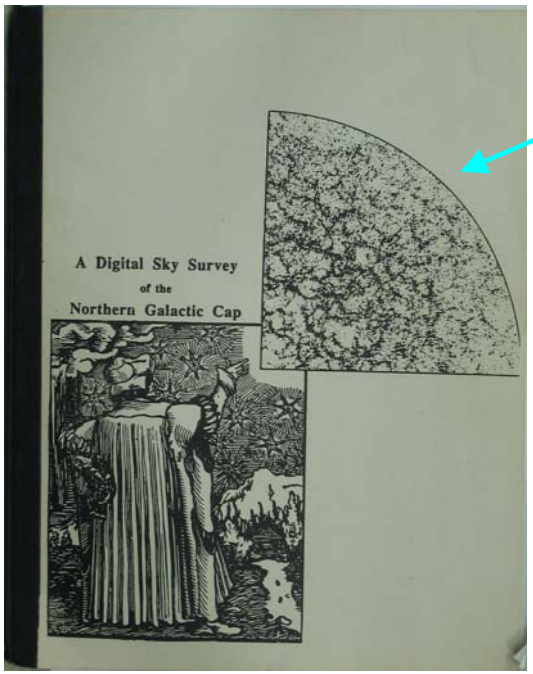
3. SDSSI 2005년 6월까지 주로 외부은하 측광+분광관측, SDSS II는 2008년 7월까지 외부은하와 우리은하, 초신성 탐사 병행.



5° slice



(Park et al. 2005)



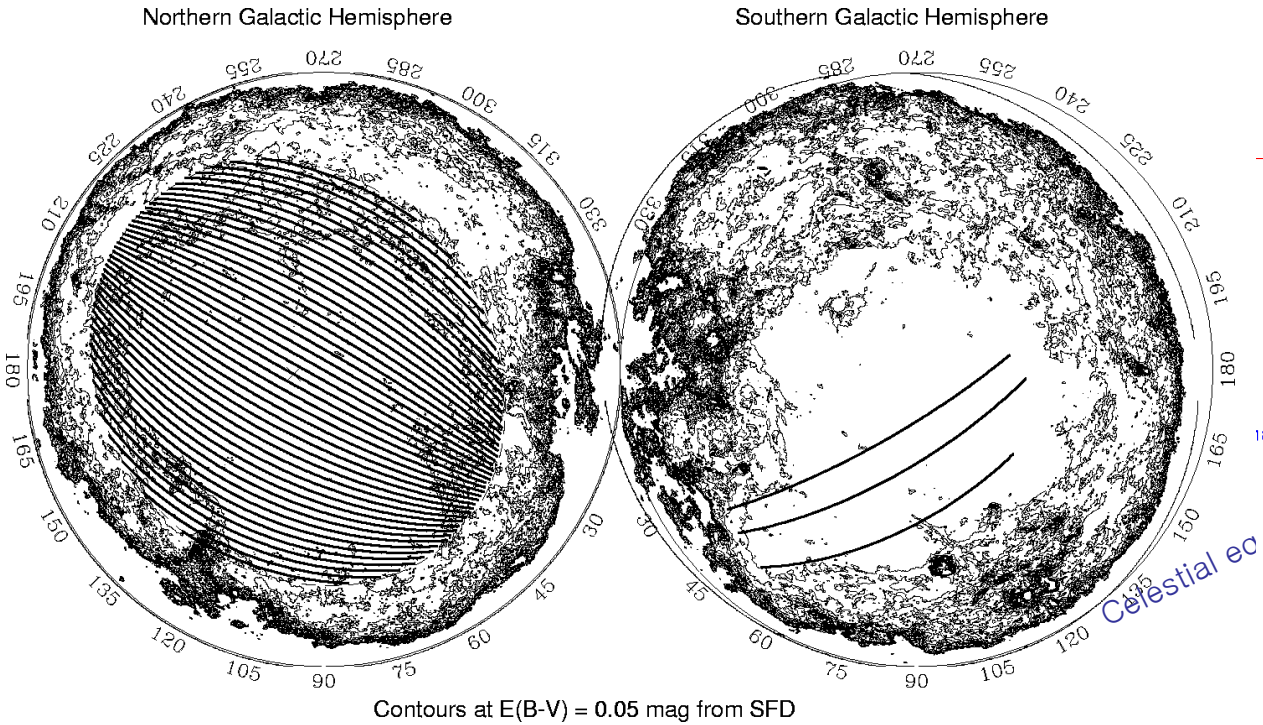
Park & Gott (~1994)

SDSS Project Book

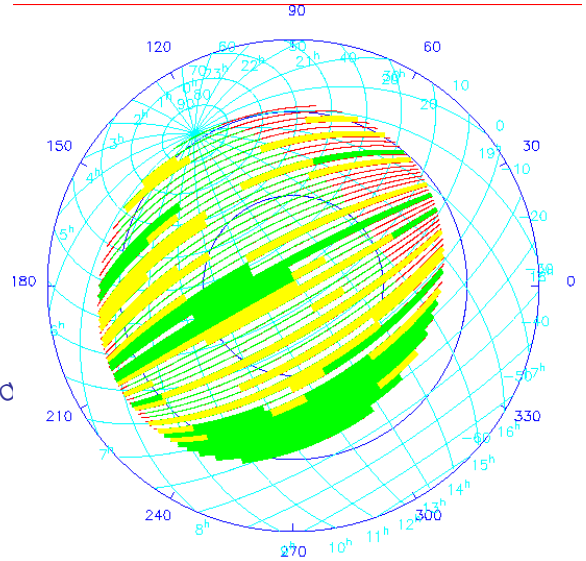
Accuracies of many statistics SDSS would measure have been estimated well before the survey.

Sky Coverage

– Minimize Galactic foreground extinction



Projection on the sky (Galactic coordinates) of the Northern and Southern SDSS surveys. The lines show the individual stripes to be scanned by the imaging camera. The extinction contours of Schlegel, Finkbeiner and Davis (1998).



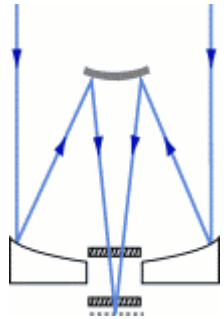
Both equatorial and galactic coordinates are plotted.

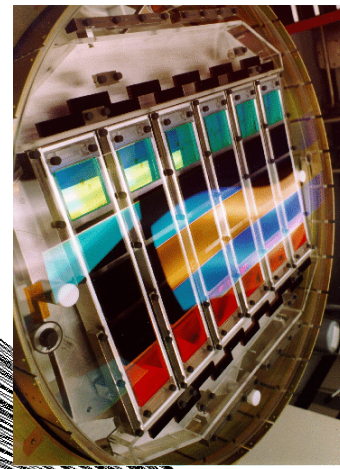
Survey characteristics

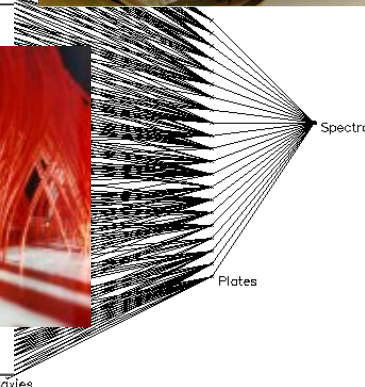
TABLE 1

SDSS EQUIPMENT SUMMARY Stoughton et al. (2002)

Parameter	Value
Telescope and Site: Apache Point Observatory	
Latitude and longitude	N32°46′49.″3, W105°49′13.″5
Elevation	2788 m
Survey telescope	2.5 m diameter, modified Ritchey-Chrétien design; 27% central obscuration
Survey area	North Galactic cap, 10,000 deg^2, minimal Galactic extinction, plus three stripes in south Galactic cap
Instruments	Imaging camera and two double spectrographs
Photometric telescope	20 inch (0.5 m), with one CCD camera, filter wheel, and shutter
Imaging Camera	
Photometric CCDs	30, 2048 × 2048, SITe/Tektronix, 49.2 mm square
CCD read noise	<5 e^- pixel^{-1} (overall system is sky limited)
Image frame size	2048 × 1361 pixels (13.′52 × 8.′98)
Image column separation	25.′17
Detector separation along column	17.′98
Focal-plane image scale	3.616 mm arcmin^{-1}
Detector image scale	3.636 mm arcmin^{-1}
Pixel size and scale	24 μm; 0.″396 pixel^{-1}
Filters	*riuzg* scanned in that order, 71.7 s apart
Integration time	54 s
Operating mode	Time-delay and integrate (" drift scan ")
Field distortion	<0.″1 over entire field
Field size	2.°5
Flux calibration	Standard-star fields at 15° intervals along scans, tied to BD +17°4708, atmospheric extinction determined by PT
Astrometric CCDs	22, 0.25 × 2 inches, above and below CCD columns; *r* filter plus 3 mag neutral density filter, 10.5 s integration time
Spectrographs	
Channels	One red, one blue for each spectrograph
CCDs	SITe/Tektronix (as for imager)
Coverage	3800–6150 Å (blue), 5800–9200 Å (red), $\lambda/\Delta\lambda \approx 1800$
Number of fibers	320 × 2
Fiber diameter	3″
Flux calibration	Standard stars in each field, tied to colors observed with camera
Integration time	45 minutes, in three exposures [nominal (S/N)^2 > 15 pixel^{-1} at g^* = 20.2]
Pixel size	69 km s^{-1}
Wavelength calibration	Hg, Cd, and Ne arc lamps, rms error of 0.07 pixels (10 km s^{-1})
Flat field	Quartz lamps







SDSS-KSG

1. 한국과학자 5인(고등과학원 박창범, 경북대 박명구, 서울대 이명균・임명신, 세종대 성환경)과 연구원 8인으로 KSG를 결성하여 2004.7월에 SDSD-I에 정회원으로 참여. 고등과학원이 KSG 대표기관, ARCSEC연구단 (세종대 SRC)이 국내MOU 파트너로서 참여.

2005.8월에 KSG는 과학자10인(부산대 안홍배, 천문연 천무영, 연세대 변용익, 경희대 김성수, 세종대 채규현)으로 확대하며, SDSS-II사업을 맞이함.

2. SDSS 자료를 연구에 효율적으로 이용하기 위해 2007. 3월 15TB 용량의 SDSS mirror site 개설(고등과학원)

3. KSG 연구자 회의에서 연구발표와 국내 연구자 간의 정보교환과 공동연구협의. 또 연 1~2회의 국내외 SDSS-KSG meeting을 열고 있다.

4. SDSS Collaboration Meeting 참가

KSG Group Meeting장면들

연세대 변용익 /김명진 /설아침

서울대 이명균 /김은혁 이준협 /황나래 박홍수 이종철 김태현 / 임성순

임명신 //이인덕 김민진 고종완 최창수 강유진 심현진

경희대 김성수

천문연 천무영

SDSS-KSG 회원 10 + 8 + 12 + 5 = 35

고등과학원 박창범 /김주한 최윤영 황호성 김영래 Chingangbam /김도균

세종대 성환경 채규현

경북대 박명구 ///한두환

부산대 안홍배 /박원기 //서미라 김은혜

SDSS 가입 기념 국제 워크샵

『The 1st KIAS International Workshop on Cosmology and Structure Formation』 개최 (2004.10.28~29, http://conf.kias.re.kr/cosmology04)

→ 국내외 연사 12명 강연 (김정욱, 박명구, 박창범, 이명균, 임명신-한국, M. Bernardi, R. Sheth, D. Turnshek-미국, U. Pen-캐나다, K. Ng-대만, Y. Suto, Yahata-일본)

2004 SDSS Collaboration Meeting

미국 Pittsburg; 2004. 9. 30 ~ 10. 3

박창범, 최윤영(KIAS), 박명구(경북대)

성과: 1. SDSS 사업관련 각국의 연구진행 상황 파악
2. SDSS의 우주론 연구 자료의 직접 접근과 활용 방법 파악
3. 2006년도 SDSS collaboration meeting 한국개최합의

학회 중에 박창범 교수, Fan, Eisenstein, Vogeley, Strauss, 박명구 교수

Johns Hopkins 대학의 Pope박사로부터 SDSS자료 접근에 대한 설명을 듣는 최윤영박사

2005 SDSS Collaboration Meeting

영국 Portsmouth; 2005. 6. 16 ~ 6. 21

박창범, 김주한, 최윤영(KIAS), 임명신, 이인덕(SNU), 박명구(경북대)

성과: 1. SDSS 탐사관련 한국 과학자(KSG)들의 연구 결과 다수 발표
2. SDSS 관련 각국 연구자(미국, 이태리, 일본 등)들과 공동연구 협의

발표논문:

1. 박창범,김주한,최윤영, 박명구, "Topology of Large Scale Structure in the Sloan Digital Sky Survey"
2. 박창범, 최윤영, "Morphological Classification of Galaxies in the SDSS"
3. 임명신, "Optical-NIR Color Gradient of Early-Type Galaxies: Environmental Dependence"
4. 이인덕, 임명신, 김민진, 강유진, 심현진, T.R. Gordon, "Seoul National University Bright Quasar Survey in Optical Band (SNUQSO)"

1회 SDSS-KSG 국내워크샵

1. SDSS-KSG 하계 워크숍

고등과학원(KIAS)와 SDSS 한국과학자그룹 (KSG)의 SDSS관련 연구발표

일시: 2005. 8. 22- 24, 장소: 안면도

참가자: 고등과학원 5, 서울대 19, 경북대 5, 천문연 4, 연세대 3 등 총 43명

발표: 16편 (http://conf.kias.re.kr/sdssksg05)

2006 Spring SDSS Collaboration Meeting

미국 Santa Fe; 2005. 6. 16 ~ 6. 21

박창범, 최윤영(KIAS)

성과: 1. 한국에서의 fall collaboration meeting 운영 협의 및 참가자 접촉 (Kron, Strauss, Beers etc.)

2. Void 공동연구 협의.

3. Environment효과, Morphology bias 연구 발표

발표논문

1. CB Park, YY Choi, Environment-Dependence of Galaxy Properties

2. YY Choi, CB Park, Morphology Dependence of Topology of Large Scale Structure

2006 Fall SDSS Collaboration Meeting

한국 Seoul; 2006. 9. 22 ~ 9. 24

Hosted by KSG. LOC by Prof. MS Im etc.

성과: 1. SDSS 한국 과학자(KSG)들의 연구 결과 다수 발표

2. Collaboration meeting 한국천문학자들에게 공개

3. SEGUE 현황 & 자료 (http://astro.snu.ac.kr/~sdss)

발표논문(plenary session):

1. CB Park, Large Scale Structure and Galaxy Properties
2. HM Lee, All Sky IR Space Telescope, Akari
3. YS Lee, SEGUE Globular Cluster Studies
4. MS Im, Multi-Wavelength View of Early-Type Galaxies
5. MG Lee, Formation of Early-Type Galaxies

SDSS Collaboration Meeting 2006 Seoul

Seoul National University, September 22-24, 2006

2007 Spring SDSS Collaboration Meeting

미국 Drexel Univ.; 2007. 3. 28 ~ 4. 1

안홍배(PNU), 박창범, 김주한, 최윤영(KIAS)

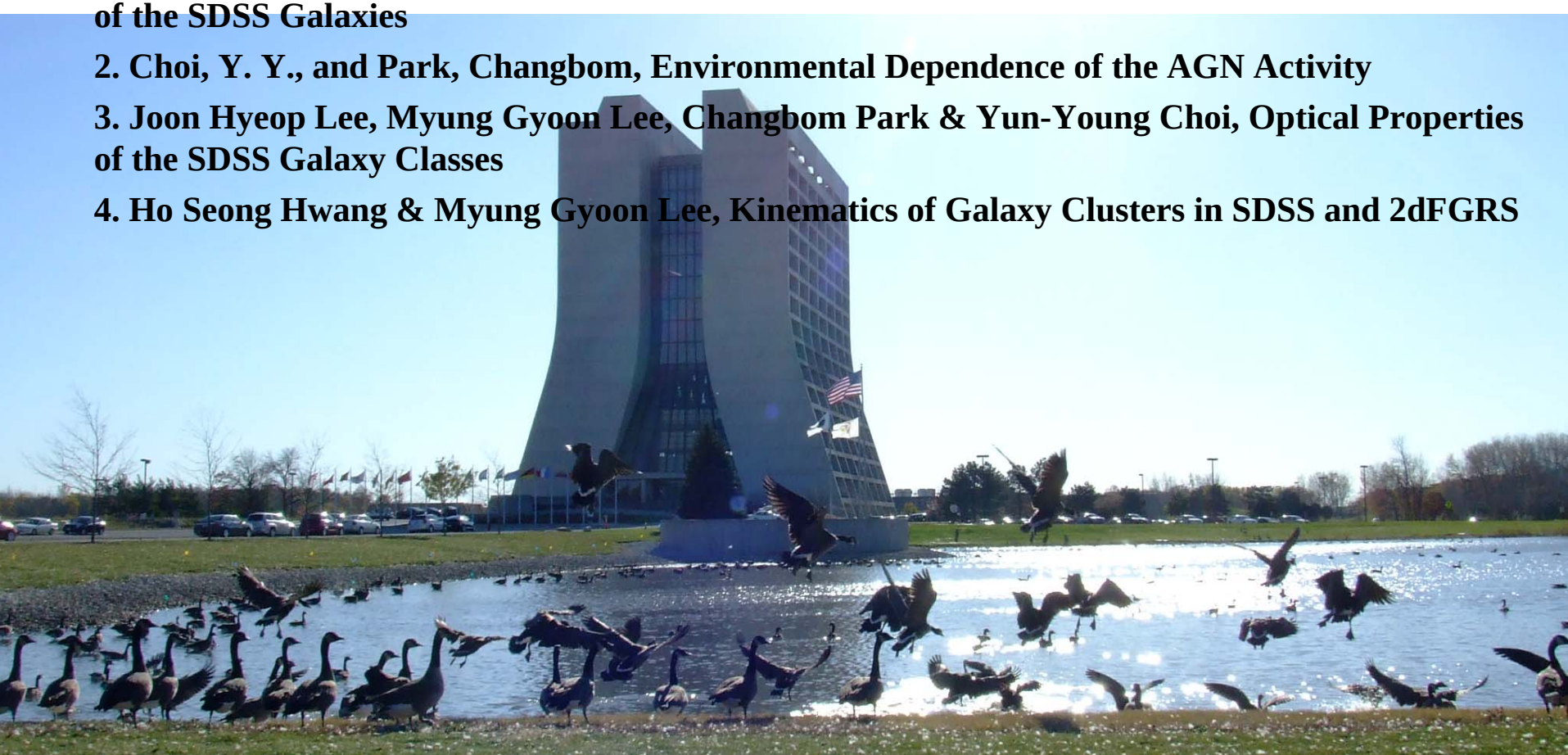
1. Choi, Y.-Y. (speaker) & Park, Changbom, Topology of Luminous Red Galaxies
2. Kim, Juhan. (speaker) & Park, Changbom, Environment dependence of dark halos in the LCDM universe

2007 Fall SDSS Collaboration Meeting

미국 Fermi Lab.; 2007. 11. 3 ~ 11. 5

박창범, 김주한, 최윤영, 박원기, 황호성(KIAS), 이준협(SNU)

1. Park, Changbom, Choi, Y.-Y., and Gott, J. R., Morphology and Luminosity Transformation of the SDSS Galaxies
2. Choi, Y. Y., and Park, Changbom, Environmental Dependence of the AGN Activity
3. Joon Hyeop Lee, Myung Gyoon Lee, Changbom Park & Yun-Young Choi, Optical Properties of the SDSS Galaxy Classes
4. Ho Seong Hwang & Myung Gyoon Lee, Kinematics of Galaxy Clusters in SDSS and 2dFGRS



SDSS Data Release plans

DAS and CAS release to the SDSS collaboration

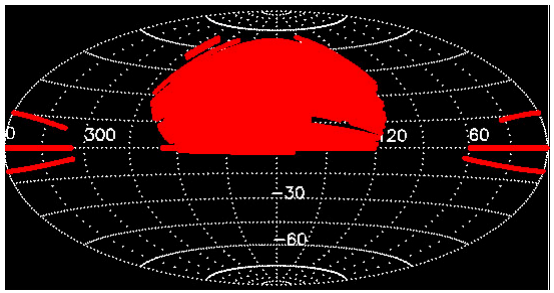
Public DR6 (July 1, 2007): data through summer 2006

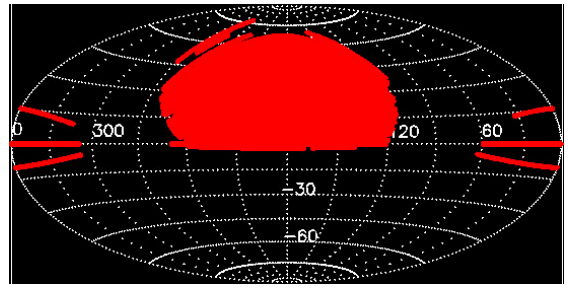
Internal DR7-1 (Feb. 15, 2008): data through summer 2007

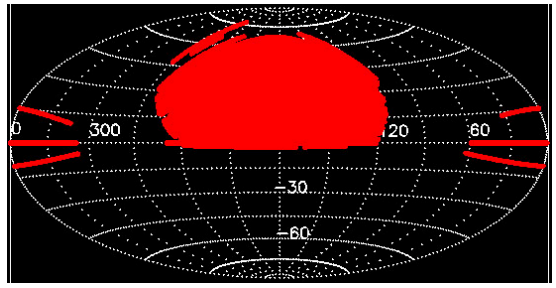
Internal DR7-2 (Oct. 1, 2008): All data through the end of SDSS-II

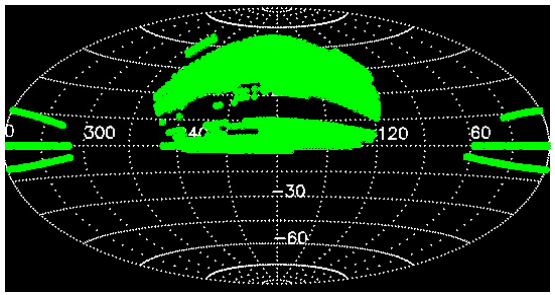
Public DR7 (Oct. 31, 2008): All data through the end of SDSS-II

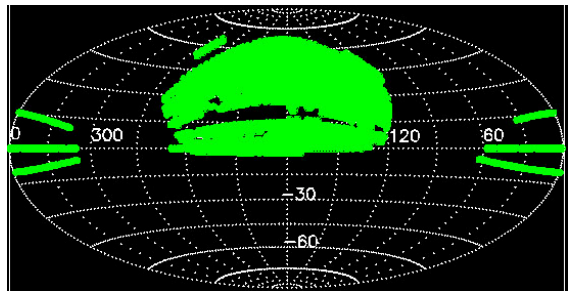
DR5 DR6 DR7.1

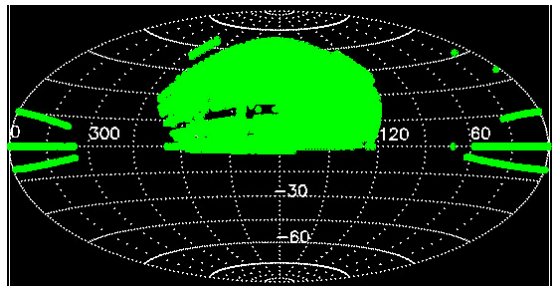








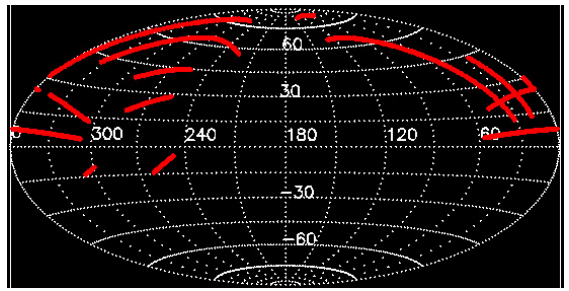


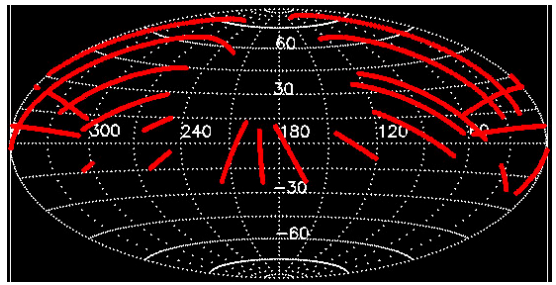


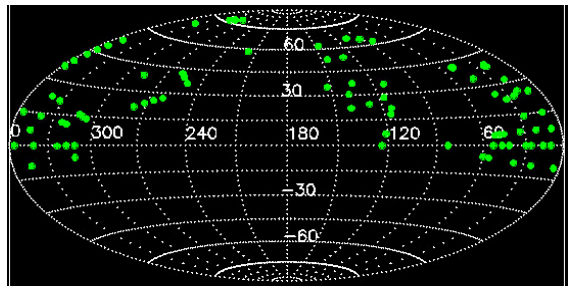
SDSS Data Release 7.1

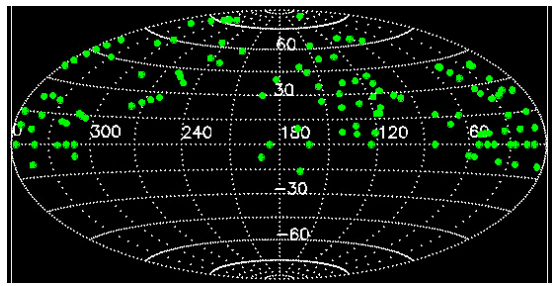
DAS and CAS release to the SDSS collaboration (Feb. 15, 2008)

will be public on ?, 2008.

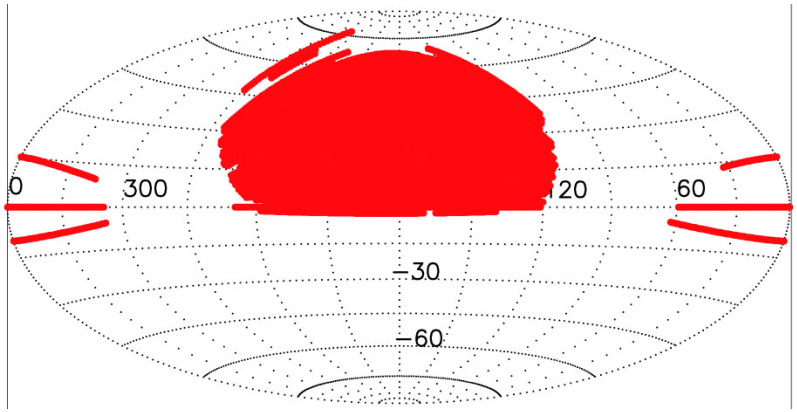


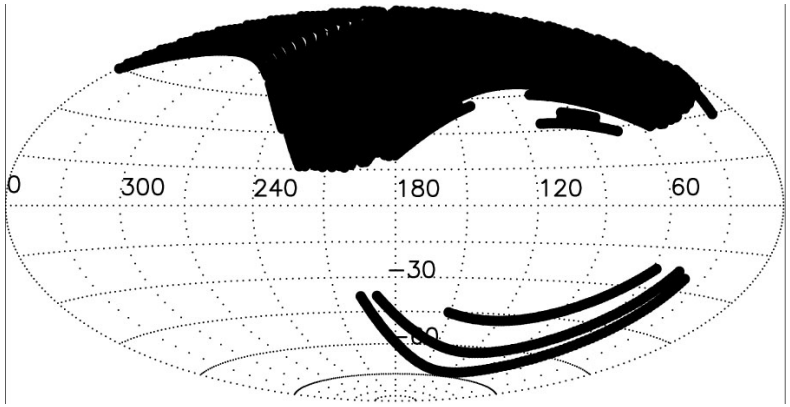






DR7.1 Legacy Imaging



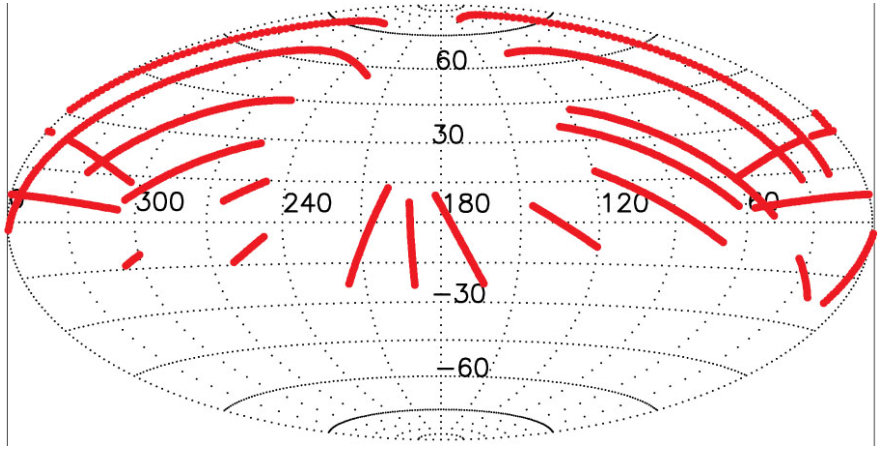


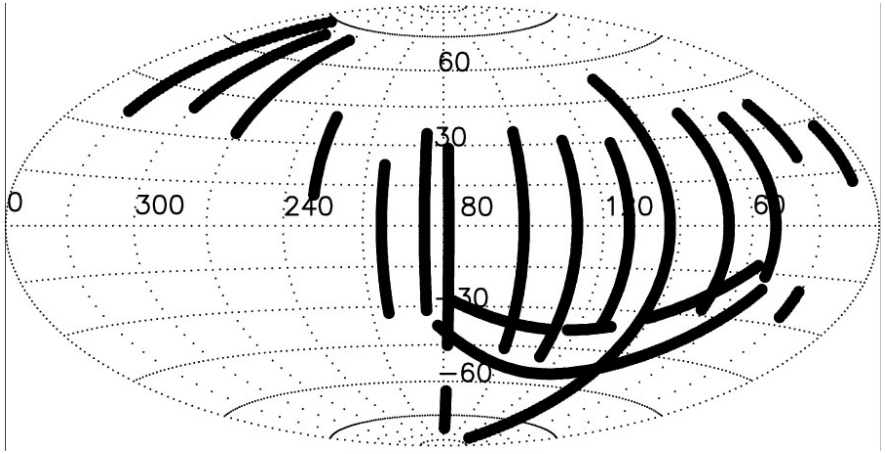
Galactic

Imaging

Footprint area	Total cataloged in CAS	10825 sq. deg.
	Legacy	8417 sq. deg.
	SEGUE	2500 sq. deg. of images in DAS 2408 sq. deg. of catalogs in CAS
	Supernova Survey	~300 sq. deg., repeated >40 times
	M31 / Perseus scan	26 sq. deg.
	Low galactic latitude fields ("Orion" runs)	832 sq. deg.
Imaging catalog	340 million unique objects (SEGUE: 110 million, Legacy: 230 million)	
Data volume	images	12.0 TB
	catalogs (DAS, fits format)	3 TB
	catalogs (CAS, SQL database)	4 TB
Average wavelengths and magnitude limits (95% detection repeatability for point sources)	*u*	3551Å, 22.0
	g	4686Å, 22.2
	r	6165Å, 22.2
	i	7481Å, 21.3
	z	8931Å, 20.5
PSF width	1.4" median in *r*	
Pixel size	0.396"	
Exposure time for each pixel	53.9 s	
Photometric calibration	**Regular CAS and DAS**	*r* 2%, *u-g* 3%, *g-r* 2%, *r-i* 2%, *i-z* 3%
	Only Ubercal table in CAS	*r* 1%, *u-g* 2.2%, *g-r* 1.5%, *r-i* 1.5%, *i-z* 1.5%
Astrometry	< 0.1" rms absolute per coordinate	

DR7.1 SEGUE
Imaging



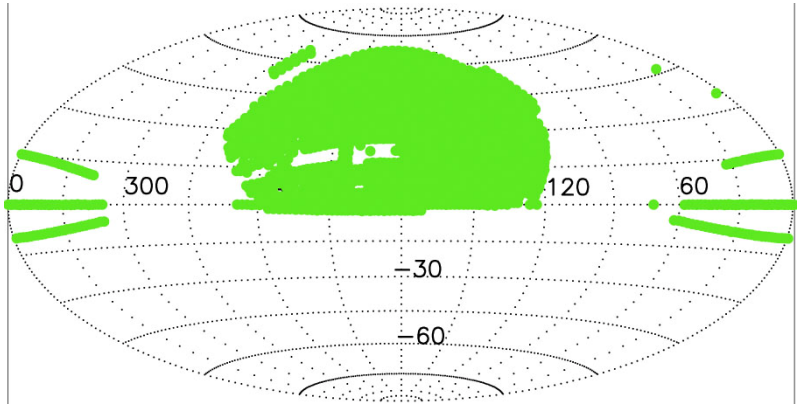


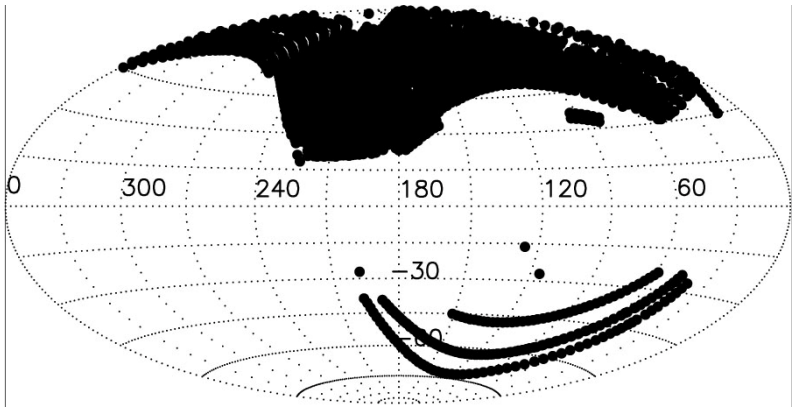
Galactic

Imaging

Footprint area	Total cataloged in CAS	10825 sq. deg.
	Legacy	8417 sq. deg.
	SEGUE	2500 sq. deg. of images in DAS 2408 sq. deg. of catalogs in CAS
	Supernova Survey	~300 sq. deg., repeated >40 times
	M31 / Perseus scan	26 sq. deg.
	Low galactic latitude fields ("Orion" runs)	832 sq. deg.
Imaging catalog	340 million unique objects (SEGUE: 110 million, Legacy: 230 million)	
Data volume	images	12.0 TB
	catalogs (DAS, fits format)	3 TB
	catalogs (CAS, SQL database)	4 TB
Average wavelengths and magnitude limits (95% detection repeatability for point sources)	*u*	*g*	*r*	*i*	z
	3551Å	4686Å	6165Å	7481Å	8931Å
	22.0	22.2	22.2	21.3	20.5
PSF width	1.4" median in *r*				
Pixel size	0.396"				
Exposure time for each pixel	53.9 s				
Photometric calibration	**Regular CAS and DAS**				
	r	*u-g*	*g-r*	*r-i*	*i-z*
	2%	3%	2%	2%	3%
	Only Ubercal table in CAS				
	r	*u-g*	*g-r*	*r-i*	*i-z*
	1%	2.2%	1.5%	1.5%	1.5%
Astrometry	< 0.1" rms absolute per coordinate				

DR7.1 Legacy Spectro





Galactic

Spectroscopy

Spectroscopic area	Total	8250 sq. deg.
	Legacy	7470 sq. deg.
	SEGUE	780 sq. deg.
Wavelength coverage	3800-9200Å	
Resolution	1800-2200	
Signal-to-noise	>4 per pixel at *g*=20.2	
Redshift accuracy	30 km/sec rms for main galaxy sample (from repeat observations)	
RV accuracy (systematics, for stars)	5 km/s systematics (SEGUE plate-to-plate wavelength solutions)	
RV accuracy (random errors, for stars)	2.5 km/s rms (SEGUE matched plate comparisons, near g=18th mag)	
Target magnitude limits for main samples	Galaxies: Petrosian *r* <17.77 Quasars: PSF *i* <19.1 (20.2 for objects likely at z>2.3)	

Spectroscopic catalog

Class	N(total)	N(main)	N (SEGUE)
All	1,402,880	1,253,120	149,760
Galaxies	857,062	856,347	715
Quasars (z <2.3)	102,514	101,346	1,168
Quasars (z ≥2.3)	8,573	8,030	543
M stars and later	72,688	67,797	4,891
Other stars	261,467	133,320	128,147
Sky spectra	76,782	64,579	12,203
Unknown	23,794	21,701	2,093

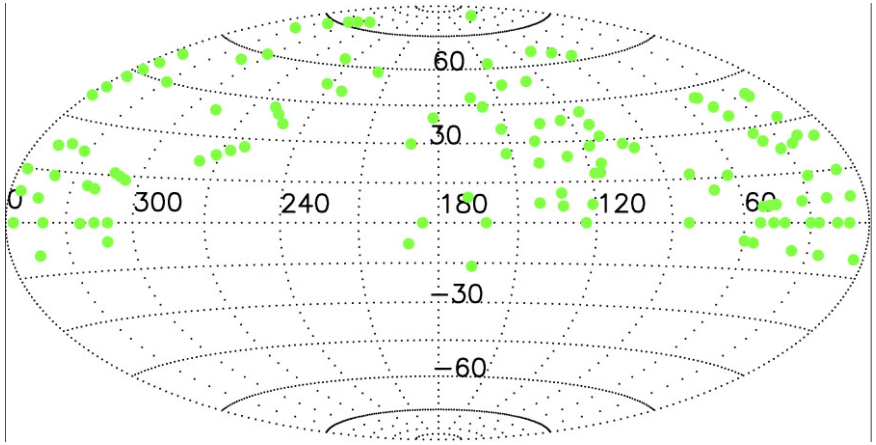
640 spectra are observed simultaneously on one *plate*. There are:

- 1656 Legacy ("main-survey") plates,
- 64 repeat observations ("extra plates") of 55 distinct Legacy plates,
- 238 observations of 230 distinct special plates, and
- 234 observations of 227 distinct special plates taken under SEGUE.

Data volume	calibrated spectra ("2d")	100 GB
	spectra, redshifts, line measurements ("1d")	260 GB

DR7.1 SEGUE

Spectro



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Workshop 일정

행사 전반: 김소영씨 (고등과학원)

프로그램: 박원기 박사

	18일
14:30 - 15:00	워크샵 등록
	세션 1-1 (좌장: 김성수)
15:00 - 15:10	박창범 The SDSS Project
15:10 - 15:30	임명신 Sciences of the SDSS-III Survey
15:30 - 15:55	박창범 Effects of Large and Small-scale environments on Galaxy Properties
15:55 - 16:15	안홍배 Morphology and Environment of Nearby Galaxies
16:15 - 16:30	이광호 Environment of the SDSS Barred Galaxies
16:30 - 16:45	휴식
	세션 1-2 (좌장: 이수창)
16:45 - 17:05	최윤영 Environmental Dependence of AGN Activity
17:05 - 17:25	김주한 Subhalo-Galaxy Correspondence Model
17:25 - 17:40	김태선 The Intrinsic Axis Ratio Distribution of Early-type Galaxies
17:40 – 17:55	염범석 High Redshift Simulations using the GALEX Ultraviolet Images of Nearby Galaxies
17:55 - 18:15	김은혁 Galactic Globular Clusters in SDSS
18:30 -	저녁식사

	19일
	세션 2-1 (좌장: 박창범)
9:30 - 10:00	김정욱 Neutrino Physics and Cosmology
10:00 - 10:20	고병원 Dark Matter Candidates in Particle Physics
10:20 - 10:40	이석천 Large Scale Structure and Modified Gravity
10:40 - 11:00	김영래 Cosmological Parameter Estimation from LSS Topology
11:00 - 11:15	휴식
	세션 2-2 (좌장: 박수종)
11:15 - 11:40	이형목 Preliminary results of NEP Wide Survey of AKARI
11:40 - 11:55	김수아 Multi-field Inflation
11:55 - 12:15	채규현 Dark Energy, Halo Mass Functions and Lens Statistics
12:15 - 14:00	사진촬영 / 점심식사
	세션 2-3 (좌장: 윤석진)
14:00 – 14:25	이석영 Specific star formation rates of SDSS galaxies compared with semi-analytic models
14:25 - 14:45	Schawinski The Star Formation and Black Hole Accretion Histories of SDSS Early-type Galaxies
14:45 - 15:05	이준협 Multiwavelength Properties of the SDSS Galaxies in Various Classes
15:05 - 15:20	조정연 Internal Extinction of the SDSS Galaxies
15:20 – 15:40	윤주헌 A Demography of Galaxies in Galaxy Clusters with the Spectro-photometric density measurement
15:40 - 15:55	휴식
	세션 2-4 (좌장: 이석영)
15:55 - 16:10	한두환 Type Ia Supernovae in the SDSS Stripe 82
16:10 - 16:30	박원기 The SDSS DR7 and the KIAS SDSS mirror
16:30 - 16:45	이윤희 The Nuclear Regions of Nearby Galaxies
16:45 - 17:00	김석 Ultraviolet properties of Early-Type dwarf Galaxies in the Virgo Cluster.
17:00 - 17:20	천무영 Forerunner Instruments before GMT
17:20 - 17:40	박수종 MIR Camera for Japanese Space IR Telescope SPICA
17:40 - 18:15	박창범 Discussion for the Future Collaborations & Closing Remarks
18:30 -	저녁식사

The Sloan Digital Sky Survey: Astroids to Cosmology

Chicago, August 15-18, 2008

Working group meeting: August 19, 2008

1 internal + 1 external invited review talks

4-6 contributed talks, posters

The solar system

Asteroids and asteroid families
Kuiper belt objects

Stars

White dwarfs and cataclysmic variables
Low mass stars and sub-stellar objects
Low metallicity stars
Stellar variability

The Milky Way and its neighbors

Parameters of the Milky Way
Substructure
Stellar populations
Milky Way satellites
Andromeda and its satellites

Galaxies

Joint distribution of observed galaxy properties
Correlations of stellar mass, metallicity, age
Evolution of luminous galaxies
Dark matter halos from weak lensing and satellite dynamics
Strong lensing
Environmental dependence of galaxy properties

Quasars, absorption systems, and the intergalactic medium

Quasar luminosity function
Quasar clustering
Quasar physics (spectra, variability, black hole masses)
Damped absorbers and Lyman-limit systems
Metal-line absorbers
The Lyman-alpha forest and cosmological implications

Supernovae and supernova cosmology

Cosmological constraints
Systematics of supernova cosmology
Supernova rates Supernova physics

Large scale structure and galaxy clusters

Large scale power spectrum and its implications
Clustering as a function of galaxy type
Galaxy-galaxy lensing and cluster-galaxy lensing
Redshift-space distortions and M/L ratios
Halo modeling: implications for galaxy formation and evolution
Clustering and masses of galaxy clusters