

2008 MicroFUN Workshop

MicroFUN Observations at Mt. Lemmon

15–18 Dec 2008 @NZ

Chung-Uk Lee, Seung-Lee Kim

Outlines

- **Mt. Lemmon 1-m robotic telescope**
 - History of the telescope

- **Interactive observation**
 - MicroFUN

- **Future instrument upgrade**
 - New CCD camera

Mt. Lemmon 1-m robotic telescope



Autoscope



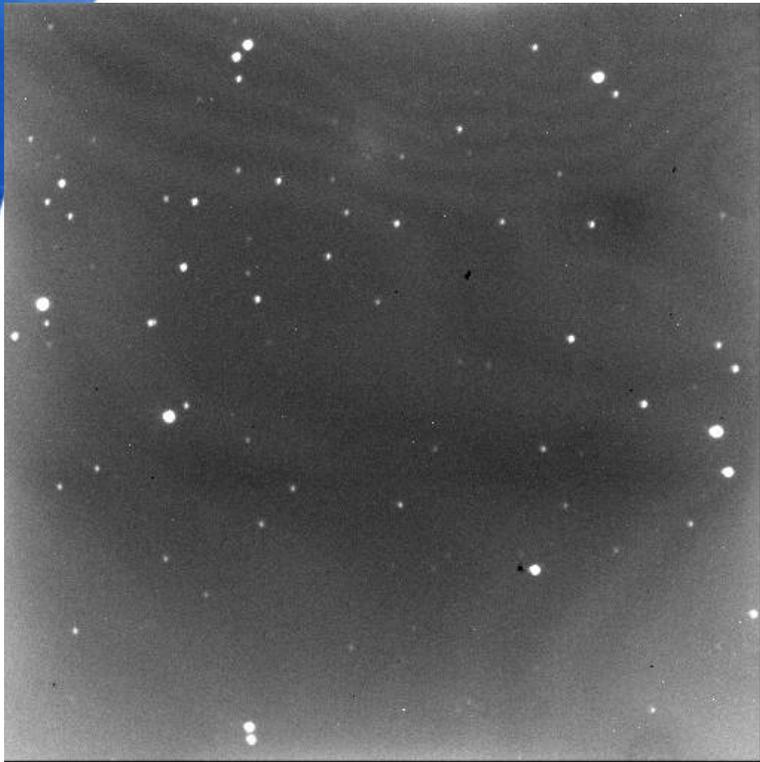
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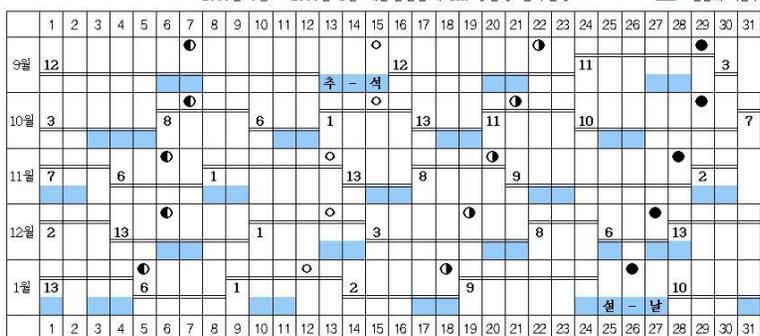


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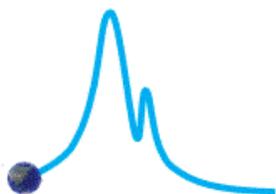
<< 2008년 9월 - 2009년 1월 레온산천문대 1m 망원경 관측일정 >> * □ : 천문대 비군무일



* 관측 기간 중에 GBT 후속관측(4번 과제)이 20회 이내(총 40시간 이내) 수행될 예정이니 협조하여 주시기 바랍니다.
* 9월 1일부터 10월 10일까지 중력렌즈 후속관측(5번 과제)이 매일 1시간씩 수행될 예정이니 협조하여 주시기 바랍니다.

번호	연구 제안자	제 목
1	김진희, 김호일, 안원룡, 이종욱 등	근접쌍성계에서 제3천체의 검출 연구
2	윤대석	광성별 CH Cyg, UV Aur, TX CVn, AG Dra의 특이현상에 대한 측광 관측 연구
3	김용기, 안원룡, I.L. Andronov 등	자기적변 변광성들의 CCD 측광관측
4	Y. Urata, 임명신, 박수중, 진호 등	Follow-up observation of Gamma-Ray Burst afterglows
5	한정호, 박병근, 이종욱	중력렌즈 후속관측 실험
6	박수중, 고현구, 임명신, 이인덕 등	Optical variability observations of SNUQSOs : Classification of new quasars
7	이기원, 이병철, 박명구	SDSS에 나타난 격변변광성 후보들에 대한 후속 관측
8	이우택, 오규동	단주기 겹속쌍성의 측광학적 연구
9	임홍성, 이종욱, 손봉원, 박수중 등	활동성 은하핵의 단주기 측광 변화 연구
10	김승리, R. Silvestri	Search for extrasolar planets around evolved compact pulsators
11	이재우	민기형 겹쌍성의 다중 파장영역 측광관측
12	김승리, 이종욱, 손재혁, 백인경 등	기리점(남쪽물탕-빈개) 또는 신계성단내 반광천체 탐의 (레온산천문대 정기 관측)
13	안원룡, 김호일, 김진희, 이종욱 등	근접쌍성의 강착원(accretion disk) 연구 (레온산천문대 정기 관측)

* 2008년 1/2분기
2008년 12월 11
제출하여 주시.
* 레온산천문대는
관측이 이루어
자세히 정리하
* 레온산천문대
<http://lobo.kaasi>
를 수 있습니다.
* 레온산천문대 ;
경우 관측시간
바랍니다.



Autoscope



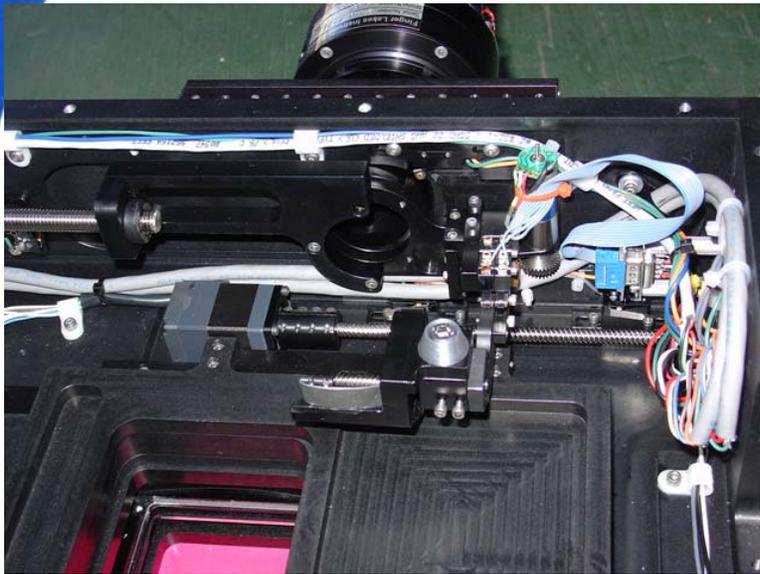
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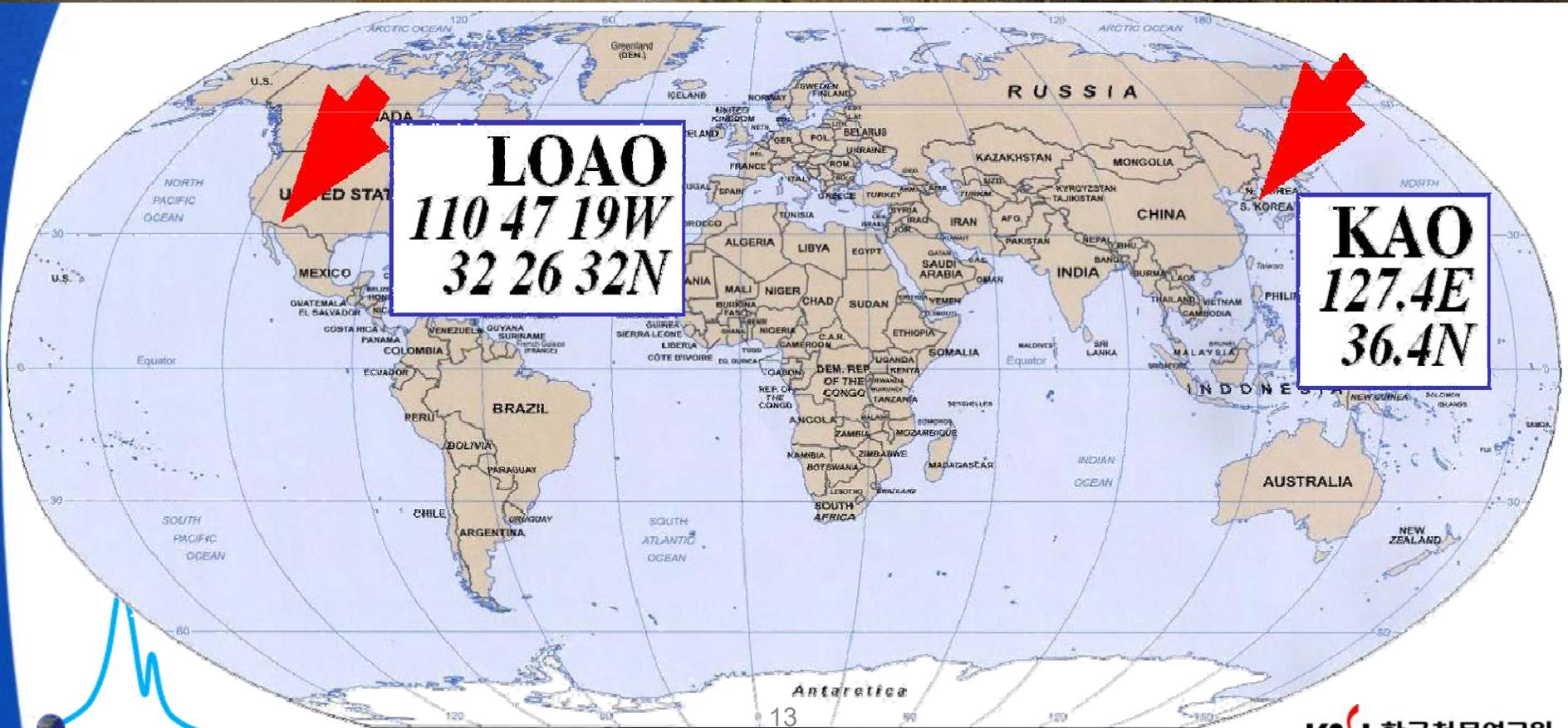
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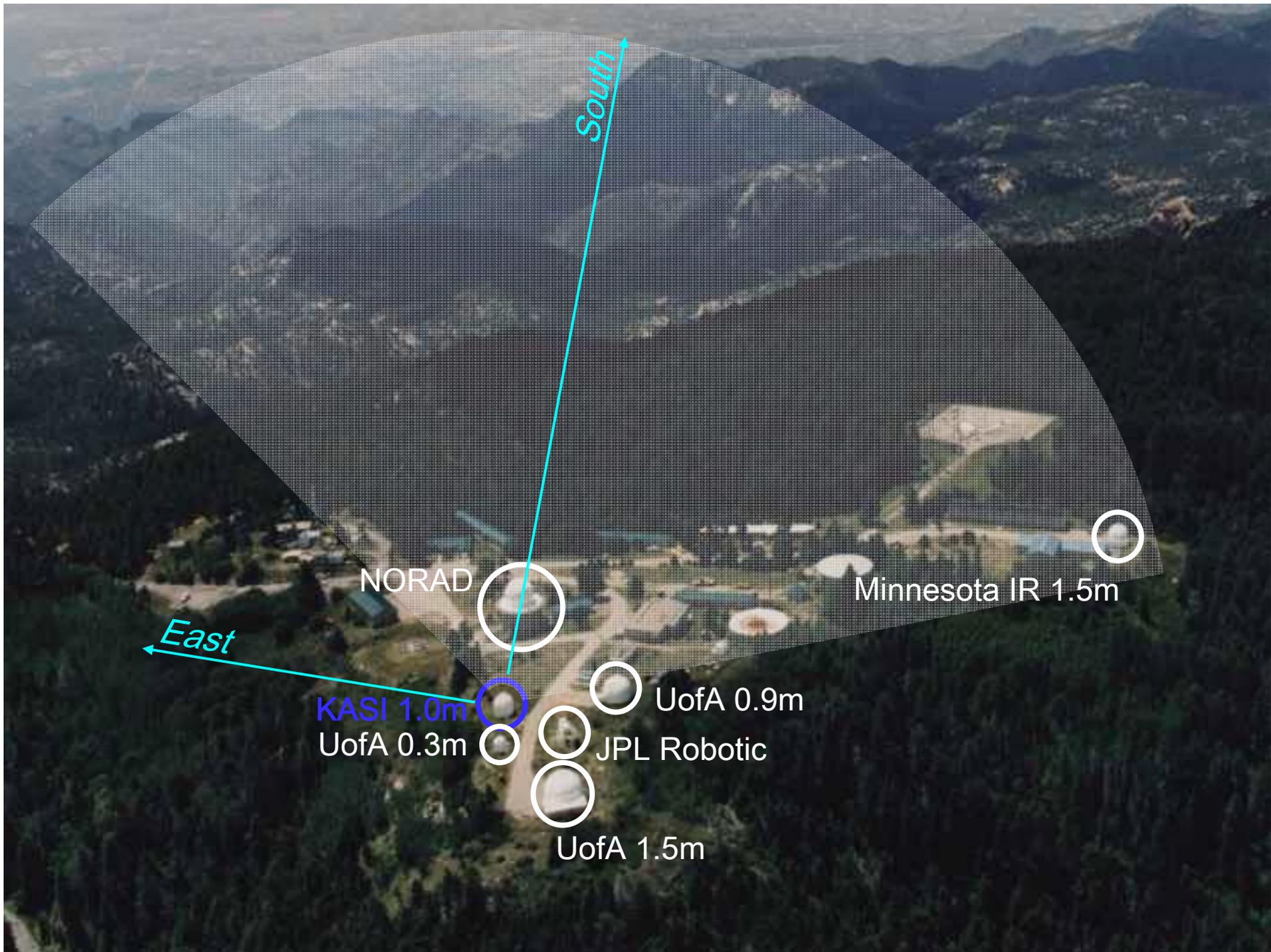
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Mt. Lemmon observatory





South

East

NORAD

Minnesota IR 1.5m

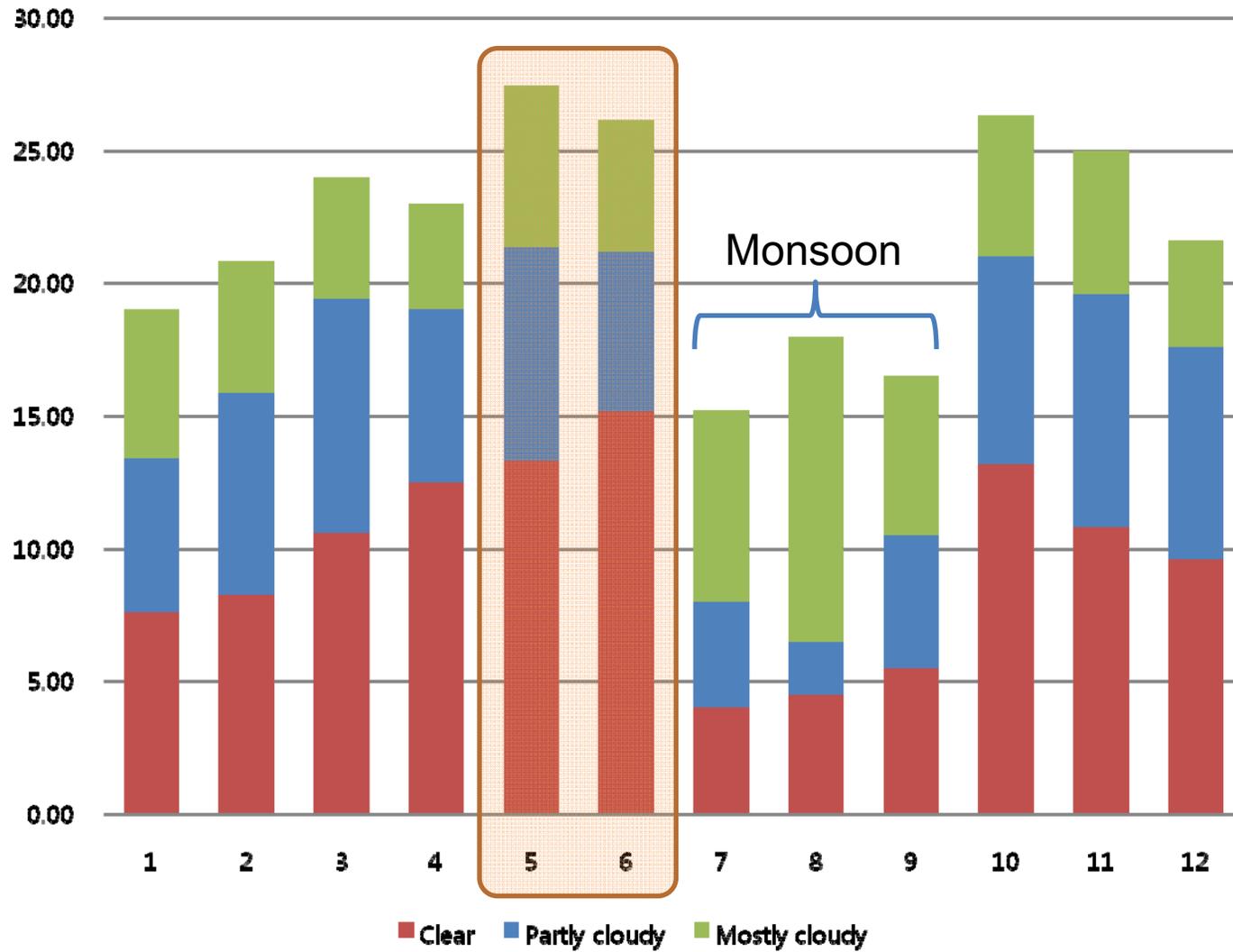
KASI 1.0m
UofA 0.3m

UofA 0.9m

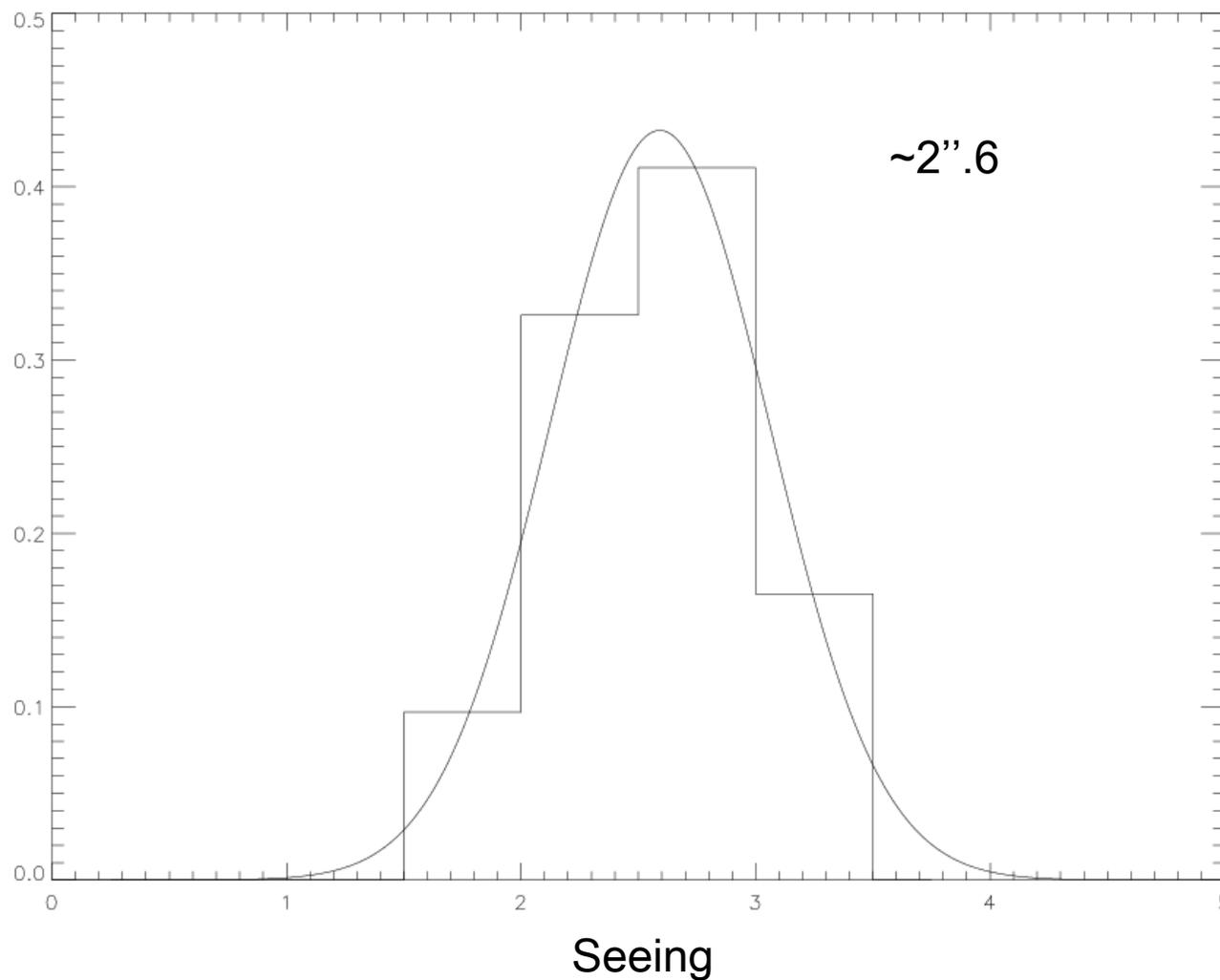
JPL Robotic

UofA 1.5m

Weather statistics for 5 years (2003~2008)



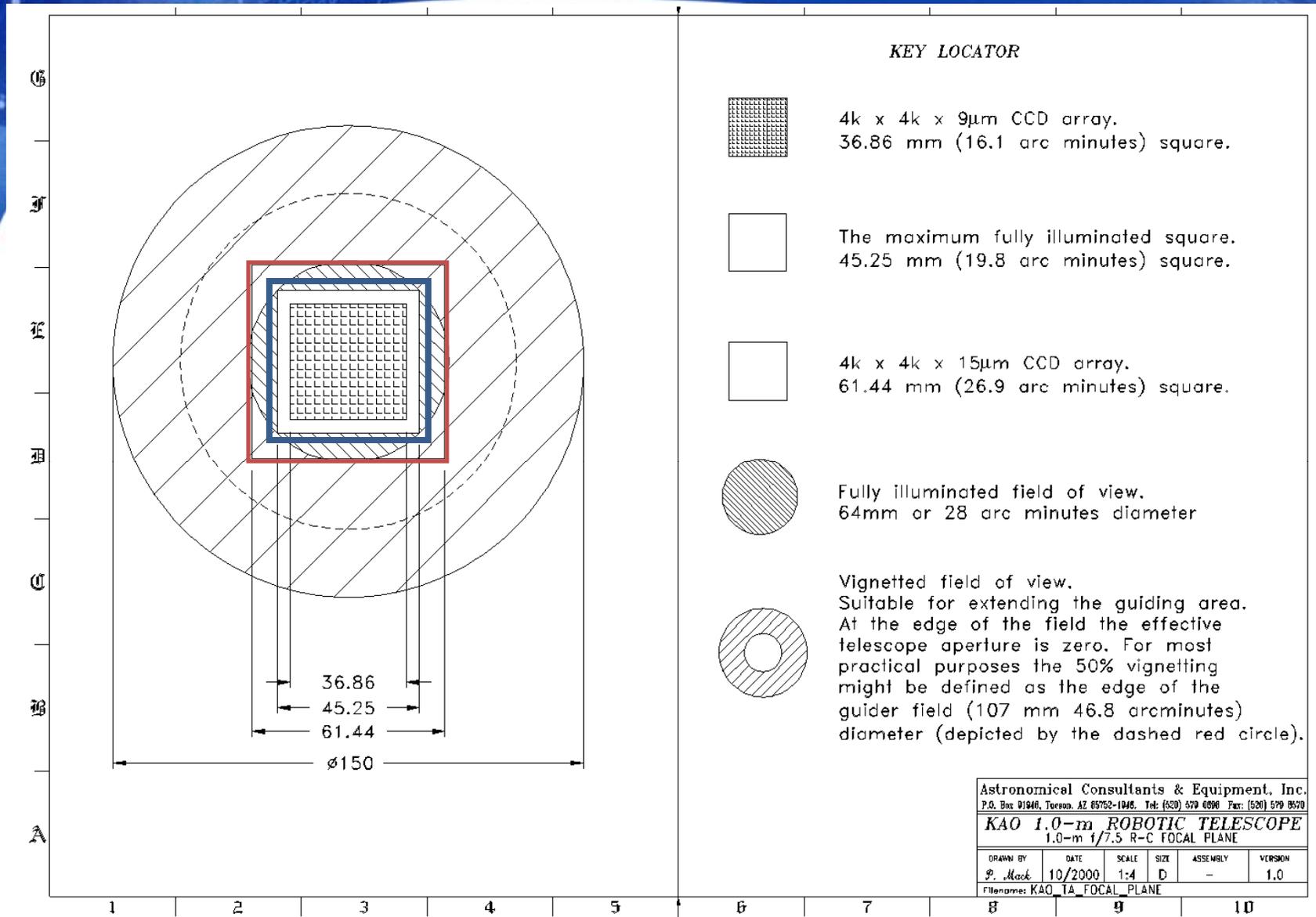
Seeing statistics for 5 years (2003~2008)



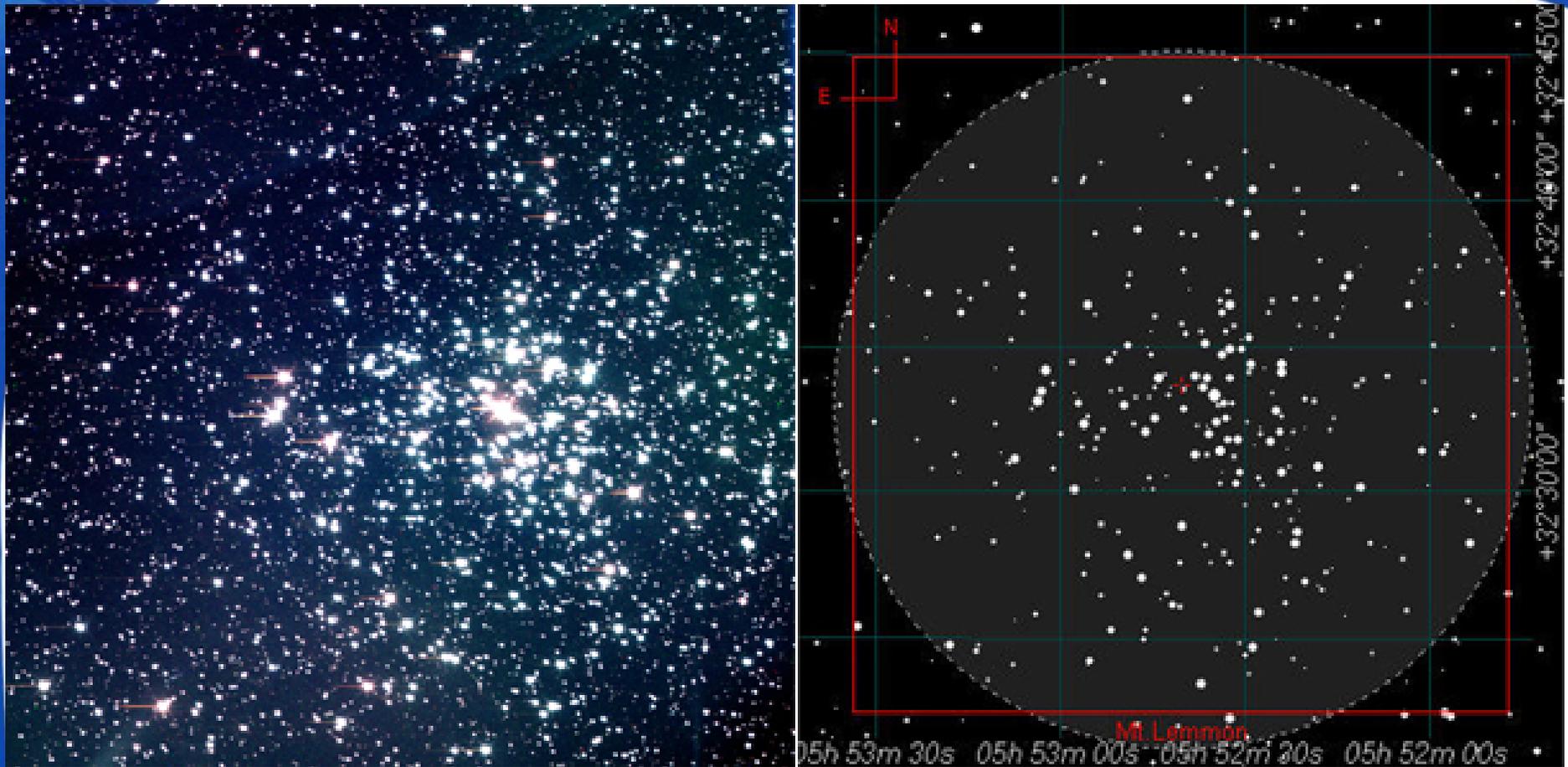
Optical parameters

System Component	Properties	Value in mm
Primary Mirror	Diameter (Physical)	1046
	Diameter (Optical)	1046 with 1000 minimum test area
	Radius of Curvature	5508.9
	Focal Length	2754.5
	Focal Ratio	2.633
	Conic Constant	-1.109198 (weak hyperbola)
Secondary Mirror	Diameter (Physical)	332.4 nominal
	Diameter (Optical)	330.4
	Radius of Curvature	-2606.7
	Conic Constant	-5.638903
System Characteristics	Effective Focal Length	7845
	Effective Focal Ratio	<u>f/7.5</u>
	Field of View (Diameter)	<u>0.466 (28 arcmin)</u>
	Plate Scale	26.25 arcsec/mm
Spacing	Prime Focus Intercept	845.7
	Primary-Secondary space	1908.7
	Back Focal Distance	500

Focal plane and CCD selection

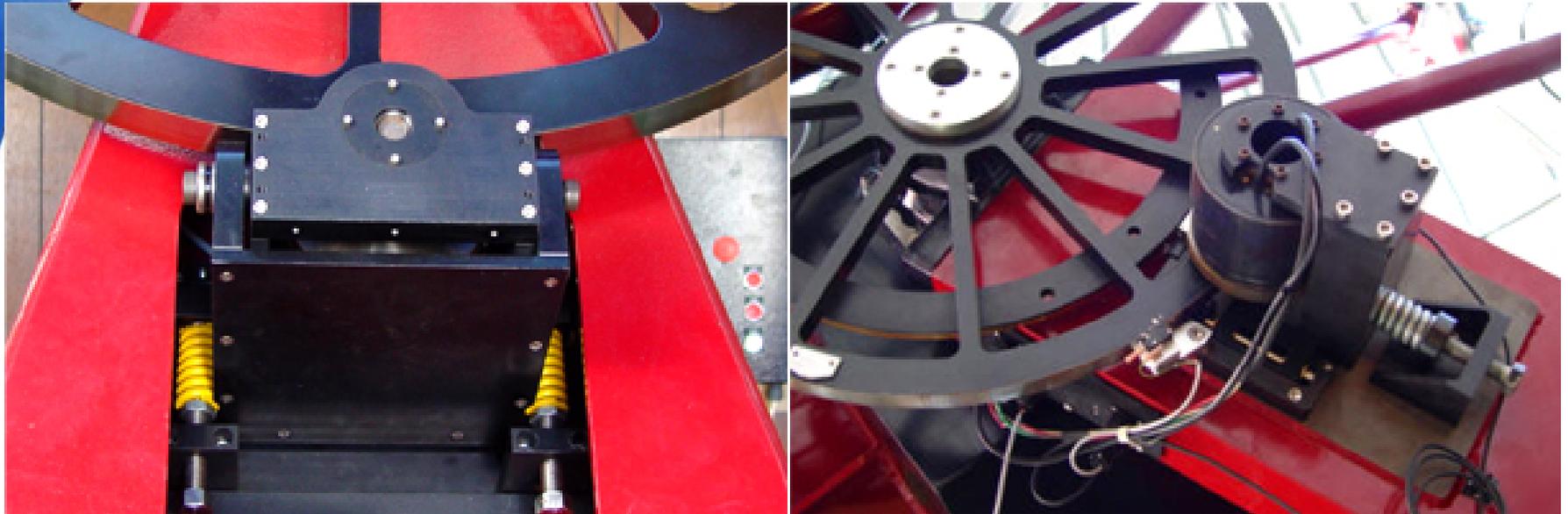


Field of View



< 약 22.2분각의 시야를 갖는 M37과 성도와의 비교 (05 52.4, +32 33, 6.2m) >

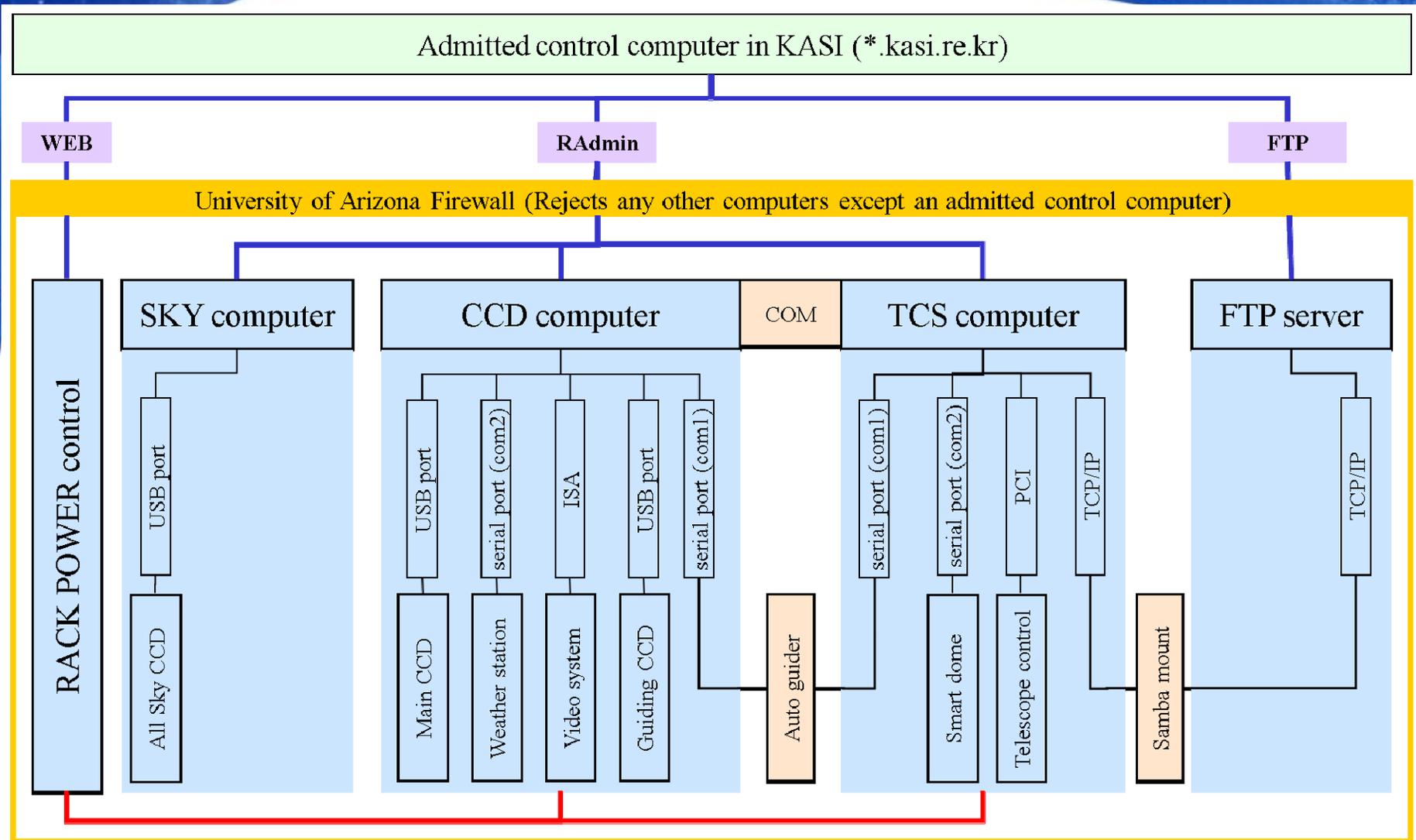
Frictional disk



- No Periodic error

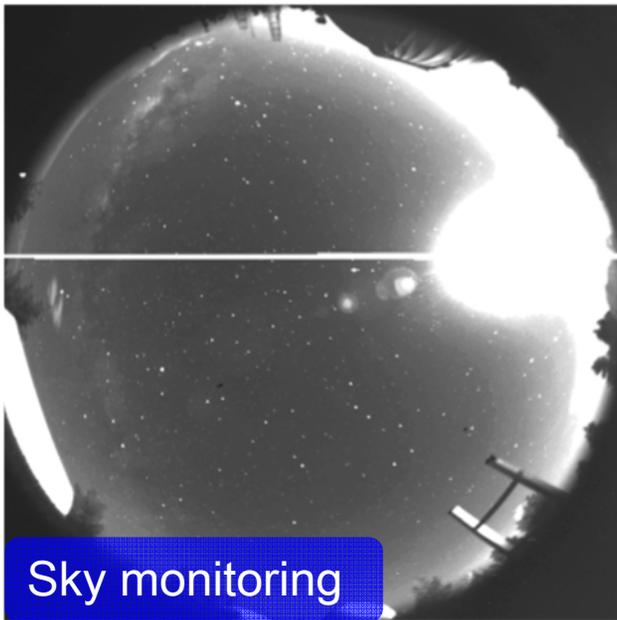


Connections between computers

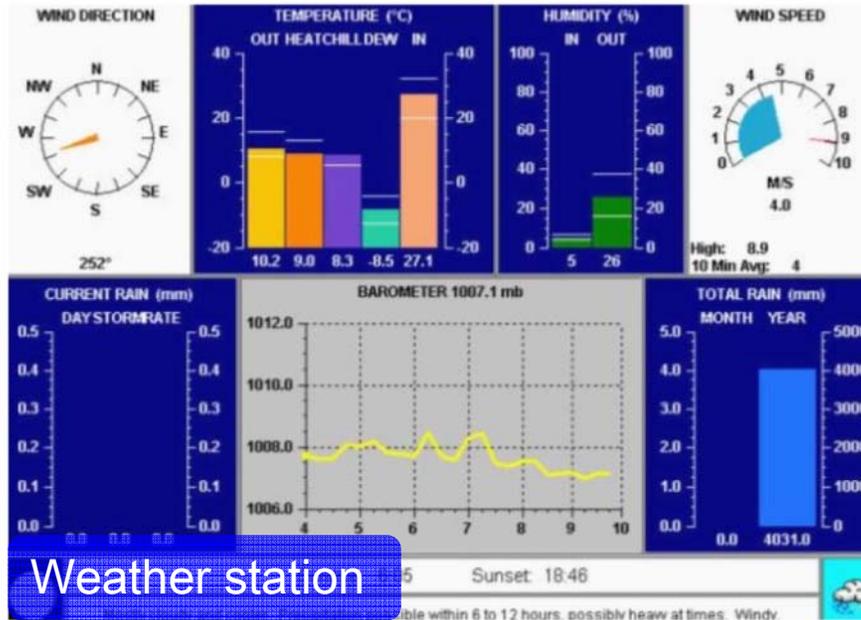




Interactive observation for μ FUN



Sky monitoring



Weather station



Clock sync



Guiding

CIVIL DATE: 22:17:24.0 MST Thu Apr 05, 2007

UTC DATE: 05:17:24.0 UTC Fri Apr 06, 2007

SIDEREAL: 10:59:42.8

System OK

Positions:

Instrumental	R.A.	Dec.
	07:04:37.2	+26:24:55.2
HA	Sec (Z)	
2007 26	03:46:06	1:525
AZ	ALT	
MAGNIFY	276:24:58	40:57:58

ACE Flex pointing corrections: KAO_E_20031022.Flx

40 Grid Points Add Grid Point 0 neighbors

GO TO: 07:04:08.7, +26:26:11, 2000.00, +0.000, +0.000

STOP: 2990 78Bet Gem 3712, DO Dra

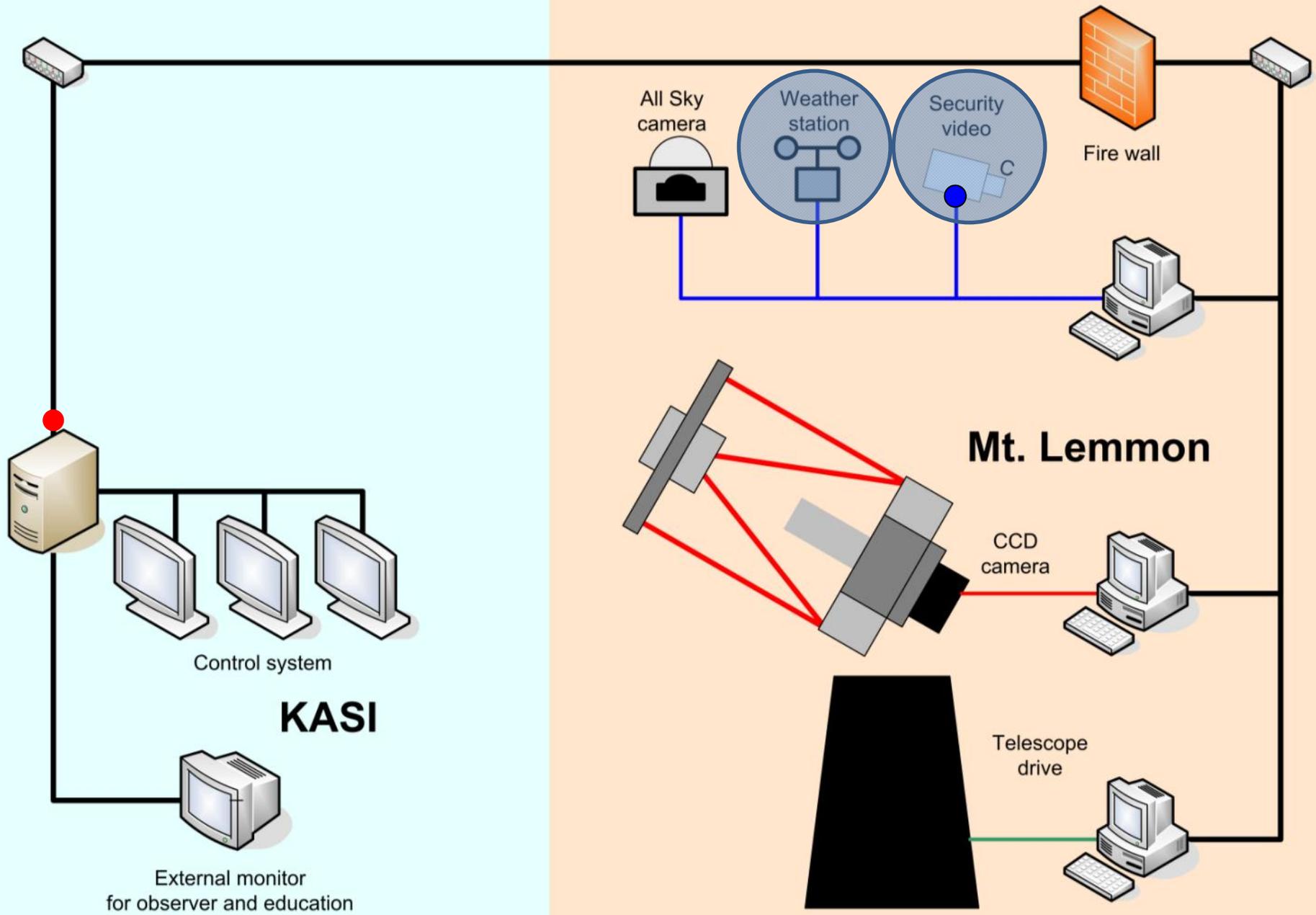
INSTRUMENTS: CCD Shutter Opened

WHEEL 1: R103, WHEEL 2: Empty, AUTOGUIDER: OFF

GO TO FOCUS: 19550

Image Type: Light, Detector: Finger Lakes 204 204, Binning: 1x1, 2x2, 4x4, 8x8, 16x16, 32x32, 64x64, 128x128, 256x256, 512x512, 1024x1024, 2048x2048, 4096x4096, 8192x8192, 16384x16384, 32768x32768, 65536x65536, 131072x131072, 262144x262144, 524288x524288, 1048576x1048576, 2097152x2097152, 4194304x4194304, 8388608x8388608, 16777216x16777216, 33554432x33554432, 67108864x67108864, 134217728x134217728, 268435456x268435456, 536870912x536870912, 1073741824x1073741824, 2147483648x2147483648, 4294967296x4294967296, 8589934592x8589934592, 17179869184x17179869184, 34359738368x34359738368, 68719476736x68719476736, 137438953472x137438953472, 274877906944x274877906944, 549755813888x549755813888, 1099511627776x1099511627776, 2199023255552x2199023255552, 4398046511104x4398046511104, 8796093022208x8796093022208, 17592180444416x17592180444416, 35184360888832x35184360888832, 70368721777664x70368721777664, 140737443555328x140737443555328, 281474887110656x281474887110656, 562949774221312x562949774221312, 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Remote observation of u-FUN



DOME

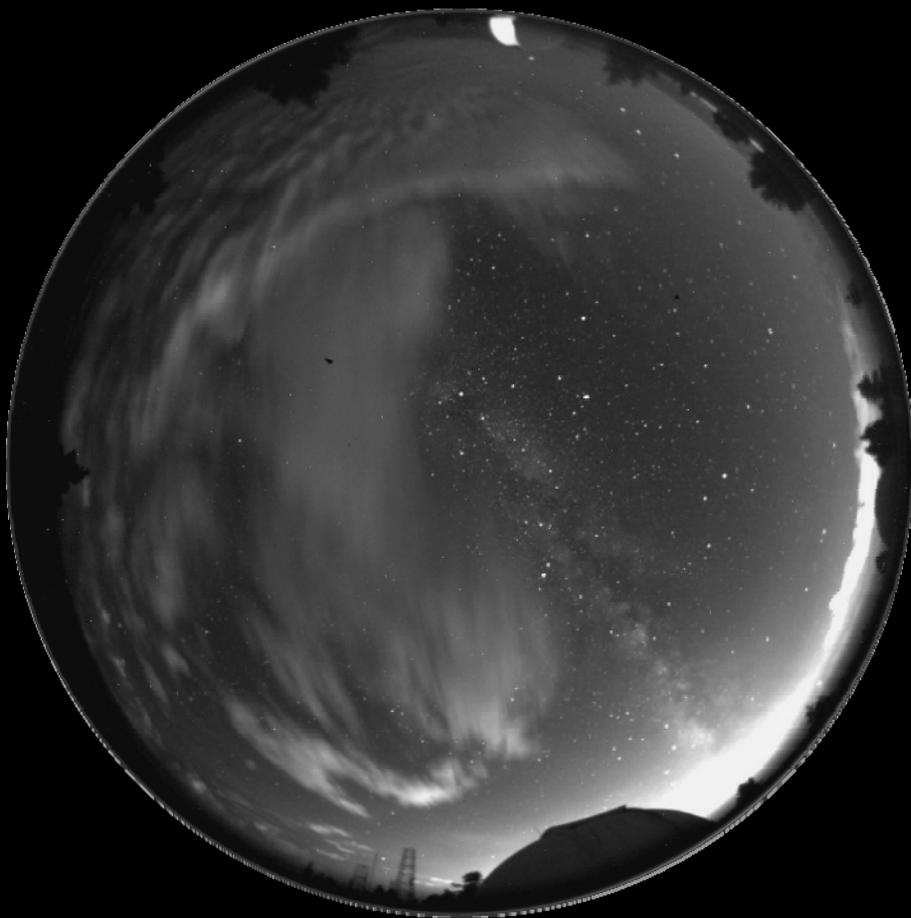
SPY

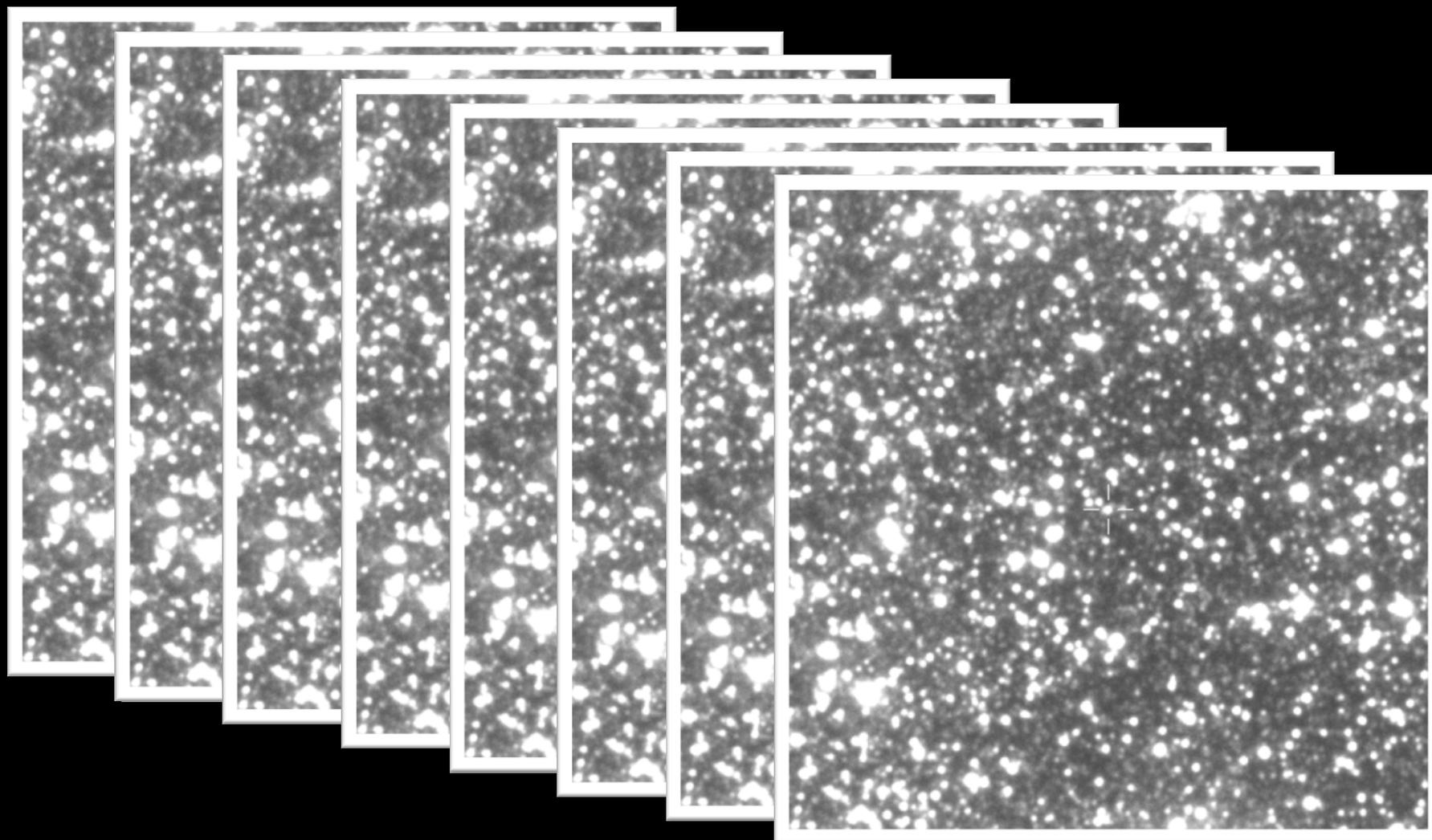


CH3

CH4







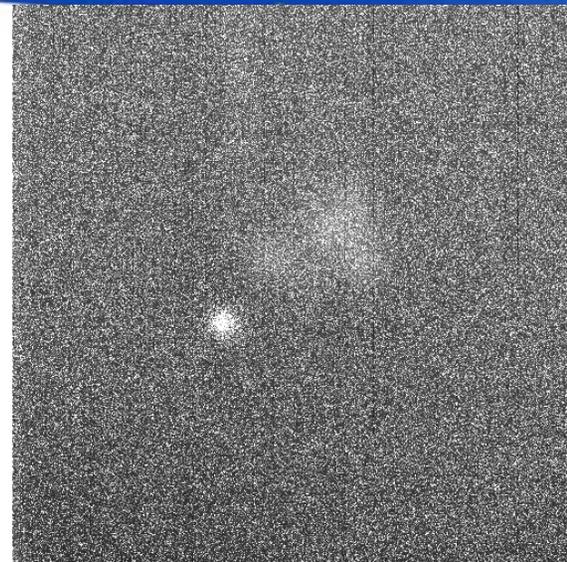
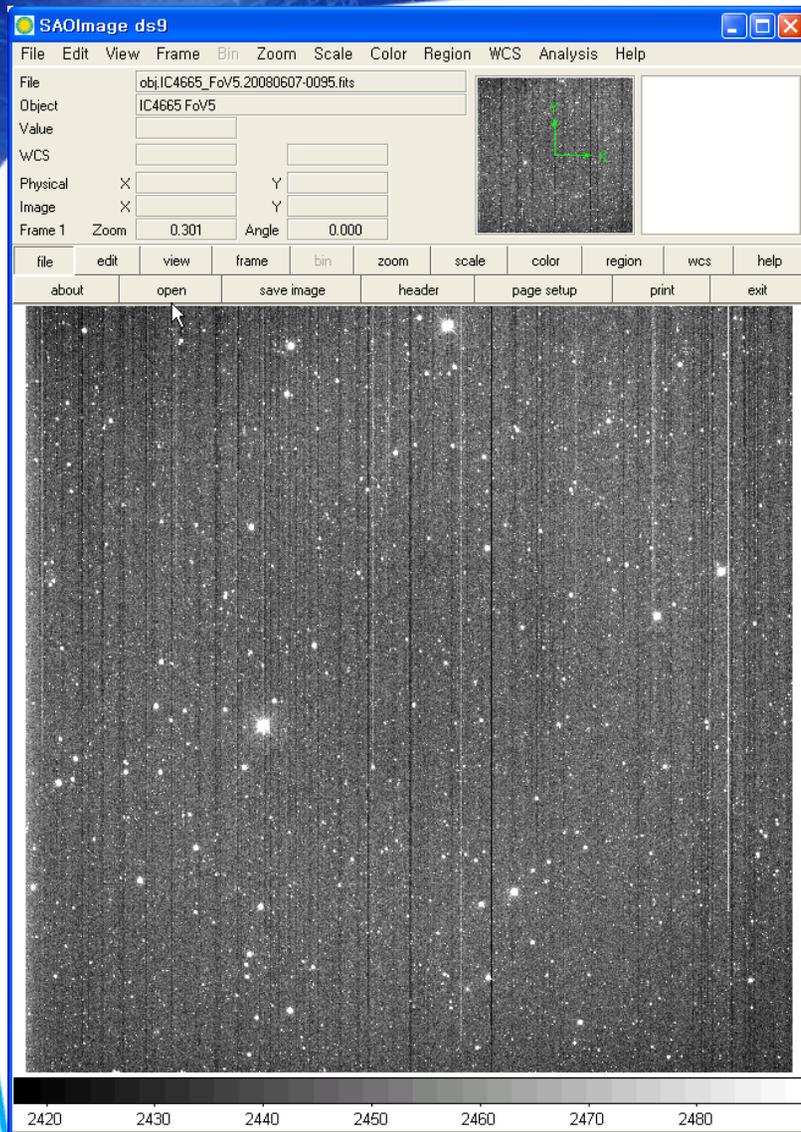
U-FUN observation

- **Low speed internet connection**
 - 200KB/ sec
 - sub image : $512 \times 512 \times 2\text{bytes} = 0.5\text{MB}$
- **Exposure & readout time**
 - Flushing & Readout : 10 secs
 - Exposure : 150 - 300 secs
- **Daily data acquisition**
 - Bytes : 50MB in Max. / day
 - Approx. 5-10 minutes for downloading

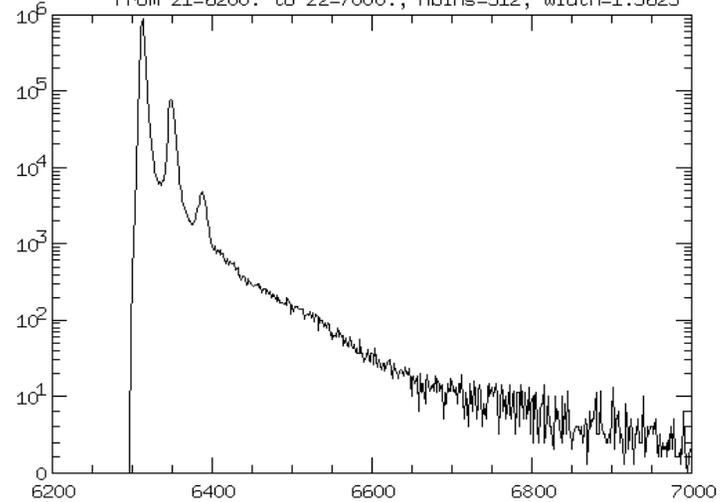


Upgrade

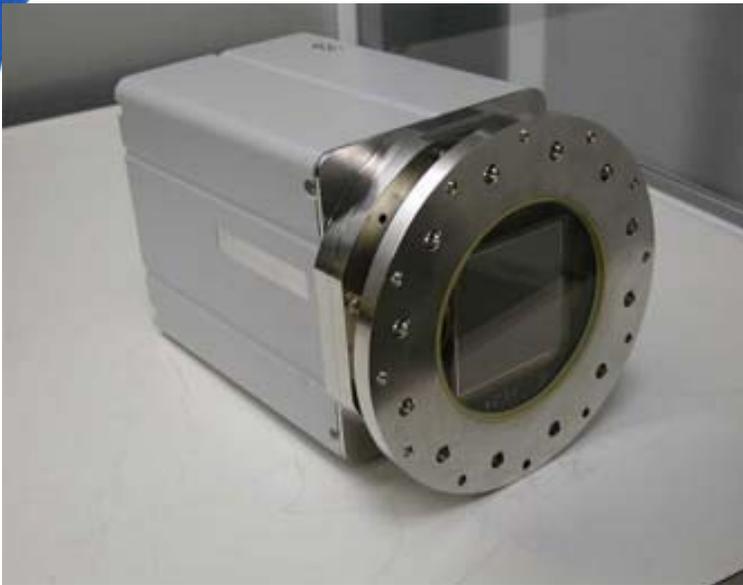
Aging of CCD camera



NDAO/IRAF V2.11.3EXPORT slkim@hanul Thu 14:37:42 22-Jul-2004
Histogram of Darkb.fits =
From z1=6200. to z2=7000., nbins=512, width=1.5625



New CCD camera



- Fairchild Imaging
- 4k x 4k x 15um Array
- Back-illuminated
- High sensitivity
- Fast readout rate
- Operation temperature -60C
- Full 16-bit resolution
- Readout noise ~ 10e-