



VO and AstroInformatics Activities During the Last Decade in China

Chenzhou Cui

Chinese Virtual Observatory (China-VO)

National Astronomical Observatory of China

China-VO

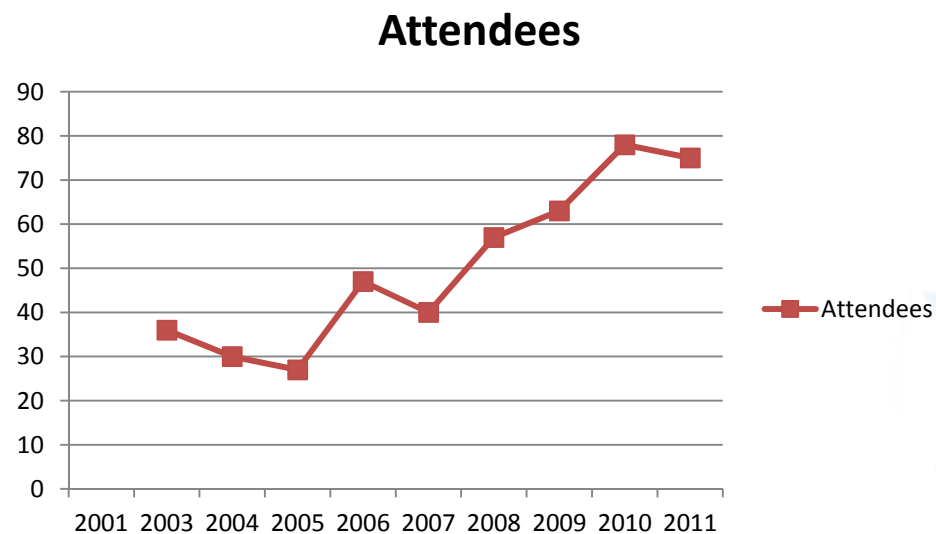
- Virtual Observatory (VO) is a data-intensively online astronomical research and education environment, taking advantages of advanced information technologies to achieve seamless, global access to astronomical information.
- Chinese Virtual Observatory (China-VO) is the national VO project in China initiated in 2002 by Chinese astronomical community leading by National Astronomical Observatories, Chinese Academy of Sciences.
- China-VO became a member of the IVOA with the recommendation of Dr. Jim Gray

R&D Focuses

- China-VO Platform
- Unified Access to On-line Astronomical Resources and Services
- VO-ready Projects and Facilities
- VO-based Astronomical Research Activities
- VO-based Public Education

Community: China-VO annual meeting

year	attendees
2001	
2003	36
2004	30
2005	27
2006	47
2007	40
2008	57
2009	63
2010	78
2011	75



China-VO

IVOA Events hosted by the China-VO

- IVOA Small Project Meeting, 26-28 November, 2003
- IVOA Interoperability Meeting, May, 2007



AstroInformatics 2012, Redmond, WA, Sep.
10-14, 2012

China-VO Team

Partners

- **NAOC (Beijing)**: Yongheng Zhao (PI), Chenzhou Cui (PM), Ganghua Lin, Yanxia Zhang, Boliang He, Changhua Li, Yue Chen, Yiming Teng, Zihuang Cao, Dongwei Fan, Jian Li, Haijun Tian, Zheng Li, ...
- **TianJin Univ. (Tianjin)**: Jizhou Sun, Ce Yu, Jian Xiao, Qing Zhao, Xu Liu, Ao Yuan, ...
- **CCNU (Wu Han)**: Xiaoping Zheng, Cuilan Qiao, Qin Wang, Jing Wang, ...
- **Kunming Univ. of Science and Tech**: Feng Wang, Kaifan Ji, Hui Deng, ...

Collaborators:

- **Computer Network Information Center, CAS (Beijing)**: Baoping Yan, Kai Nan, Jianhui Li, Ze Luo, Kevin Dong, Yongzheng Ma, Lianglin Hu
- **Purple Mountain Astro Obs (Nanjing)**: Ji Yang, Liang Liu, Dengrong Lu, Jixian Sun, ...
- **Shanghai Astro Obs (Shanghai)**: Yipeng Jing, Zhenghong Tang, Weipeng Lin, Xiao Chen, Shuhe Wang, Jianhai Zhao, Haiming Tang, ...
- **Yunnan Astro Obs**: Jinming Bai, Yufeng Fan, Chuanjun Wang, ...
- **Tsinghua Univ.**: Jianfeng Zhou, Zhihui Du

External collaborations:

- **JHU, MSR, Caltech, IUCAA, CDS, ICRAR (Australia), NAOJ (Japan)...**

Data Access Services



HOME NEWS DATA SEARCH VIRTUAL OBSERVATORY APPLICATION ABOUT Logout 简体中文 ENGLISH

OBJECT NAME RESOLVER

☒ Simbad ☐ NED ☒ ALL ☐ XML

Search Reset Help

LINKS

International Virtual Observatory Alliance
Chinese Virtual Observatory
National Astronomical Observatories, CAS
Centre de Données astronomiques de Strasbourg (CDS)
NASA/IPAC Extragalactic Database (NED)
NASA/IPAC Infrared Science Archive (IRSA)
NASA/ADS
arXiv.org (Astrophysics)

CSTAR 2008 Catalog



Target:

Sesame

Radius:

Search

China Virtual Observatory Services

Simple Cone Search Service
Table Access Service (TAP)

Chinese Astronomical Data

LAMOST Pilot Sky Survey Data
Chinese Small Telescope ARray (CSTAR) Photometric Catalog

Astronomical Catalog

The Sloan Digital Sky Survey (SDSS) Catalog
USNO CCD Astrograph Catalog (UCAC)
Tycho 2 Catalog

Data Mirrors

CDS VizieR Mirror **new**
SDSS SkyServer Mirrors in Beijing
CDS Astronomical Catalogues
USNO CCD Astrograph Catalog (UCAC)
The WISE All-Sky Data Release Source Catalog (WISE) **new**
The Two Micron All Sky Survey (2MASS)

Data Update News

More...

Latest News

China-VO and Astrominformatics 2011 (Jun 30, 2011)

More...



首页 新闻 数据 虚拟天文台 应用 帮助 中文 英文

OBJECT NAME RESOLVER

☒ Simbad ☐ NED ☒ ALL ☐ XML

Search Reset Help

友情链接

国际虚拟天文台联盟

中国虚拟天文台

中国科学院国家天文台

斯特拉斯堡天文数据中心

(CDS)

NASA/IPAC 红外星系数据库

(NED)

NASA/IPAC 红外天体物理学

档案 (IRSA)

NASA/ADS

arXiv.org (Astrophysics)

CSTAR 2008 Catalog

目标:

Sesame 半径: Search

中国虚拟天文台服务 虚拟天文台服务 (Simple Cone Search)

虚拟天文台服务 (TAP)

中国天文数据 LAMOST 巡天数据

中国之星小望远镜阵列天体测量数据 (CSTAR)

天文目录 Sloan 数字化巡天数据 (SDSS)

美国海军天文台 CCD 天体测量数据 (UCAC)

南天星表

数据镜像 SDSS SkyServer 北京镜像

CDS 星表

美国海军天文台 CCD 天体测量数据 (UCAC)

WISE 全天空巡天数据 (WISE) **new**

两微米全天空巡天数据 (2MASS)

数据更新消息

- WISE 全天空巡天数据 (2012-4-19)
- LAMOST 巡天数据正式发布 (2011-12-13)
- SDSS DR12 星表数据发布 (2011-3-23)
- SDSS DR7 星表数据发布 (2010-3-17)

更多...

最新新闻

- 国内首个自主知识产权虚拟天文台用户天文台 (2012-3-21)
- 中国科学院国家天文台 暨清华大学天文台联合技术 革命天文台正式成立 (2012-1-4)
- 中国虚拟天文台暨天文台暨清华大学 2011 年学术年会在京 召开 (2011-11-13)
- 中国科学院国家天文台暨清华大学 2012 年 8 月在北 京召开 (2011-8-8)
- 2011 年 WISE 全天空巡天数据发布暨两微米全天空系 列星表发布 (2011-4-2)

更多...



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20A Datun Road, Chaoyang District, B
Tel:010-64872500 E-mail: archive(at)n

AstroInformatics 2012, Redmond, WA, Sep.
10-14, 2012



Copyright ©2005-2012, 中国科学院国家天文台 暨清华大学
地址: 北京市朝阳区大屯路 20A 号 中国科学院国家天文台
电话: 010-64872500 E-mail: archive@nao.cas.cn

Powered by China-VO

Data Resources at the CAsDC

From China

- LAMOST Pilot Data Release
- LAMOST Commission Data
- The South Galactic Cap U-band Sky Survey (SCUSS)
- CSTAR
- BATC
- LAMOST Sky Survey
- Xinjiang radio telescope (25m)
- Lijiang 2.4m telescope
- Bootes-4 robotic observatory
- Astronomical plates digitalization archive

International Mirrors

- CDS Vizier
- SDSS SkyServer
- 2MASS
- WISE
- Chandra (mirror site coming soon)
- UCAC
- USNO
- ADS

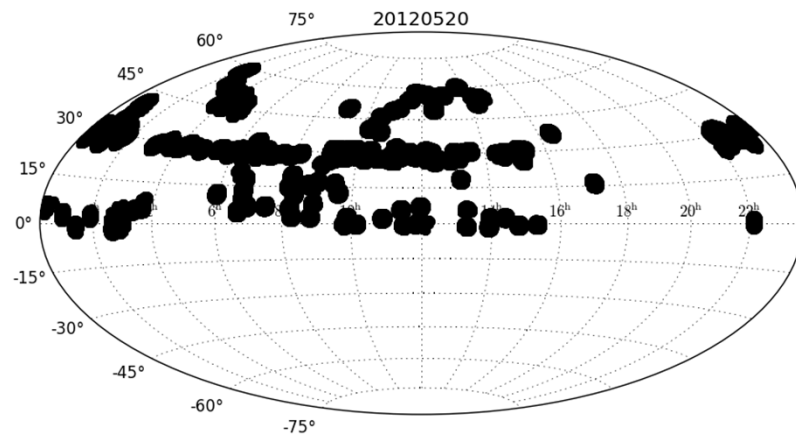


LAMOST Pilot Sky Survey

From 2011-10 to 2012-4

Plan: 302, Run: 309, archived: 478,699 (+ low SN <160,000)

Spectra Catalog 478,699



China V.O. 中国天文数据中心
Chinese Astronomical Data Center

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- NASAIADS
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Data Mirrors

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- The Two Micron All Sky Survey (2MASS)

Member of WORLD DATA SYSTEM

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Multiple Data Access Interfaces

Home SEARCH Plan My Data HELP

Plan	Plan Name	Center RA	Center Dec	Center mag	Run	Obs Date	Objects	光通 检查报告	光谱文件	View
1302	GAC_105N29_M1	105.02926	29.772125	7.18	1309	2011-12-27 16:47:07.0	560	ZIP	View	
1301	M31_025N30_B2	25.413486								
1300	M31_015N35_M1	15.994796								

LAMOST Pilot Data Access Service

Home SEARCH Plan My Data HELP

Output Preferences

Format: HTML Table Number: 50 Query Date: Only Catalog

☐ Basic Search ☒ Multi-Object Search

Upload file format: FITS
 ☐ FITS ☐ ASCII

Show/	Sort	Name	Low Limit (J2000)	Up Limit	Unit Data Type
☒	☐	specObjId			long
☒	☐	LAMOSTid			char
☒	☐	specid			char

中国天文数据中心
China Center for Astrophysics

HOME NEWS DATA SEARCH VIRTUAL OBSERVATORY APPLICATION ABOUT

THE SOUTH GALACTIC CAP U-BAND SPECT SURVEY DATA (SCUSD)

HOME / DATA / The South Galactic Cap U-band Sky Survey Data (S)

SOL Search

HOME SEARCH

SELECT 'RaHra','DecDm','Geo_sky','geo_posf_mag','geo_mag_e' as id is not null AND pos >= 80 where '<12h 0m 51.4s

[Home](#) [SEARCH](#) [PLAN](#) [MY DATA](#) [HELP](#)

LAMOST pilot data product: J025312.49+000716.1 :: 28204233892087043

SpectObjId	28204233892087043
Position	43.302047 0.121147
Spec ID	20110240590714131_v2.3.3
Plan ID	F500?
MagType	ugriz
Mag	18.6 18.45 17.87 17.77 17.67 99.0 99.0
SN (griz)	0.54 0.29 5.49 9.54
Class	Unknown
Sub-Class	
Unit ID	H2710
Sp ID	14
Fiber ID	131
z / z_err	7.3828E-4 / 5.916E-5
Version	v2.3.3

[Download FITS](#)

LAMOST J025312.49+000716.1

Pilot Data Access Service

[My Data](#) [Help](#)

[Query](#) [Tool](#) [View](#) [Interact](#) [Help](#)

+SDSS +Gaia +PRISM +WISE +UKID

[Signin](#) [Signup](#) [ENGLISH](#)

SDSS J210458.75-094024.8

STAR ra=316.24479887, dec=-9.67356519, ObjId = 1237666185621405774

Move mouse over a column name to get its units.

mode	PRIMARY
flags	BINNED1 DEBLENDED_AS_PSF INTERP CHILD

	u	g	r	i
	19.24	17.56	16.89	16.63
err_u		err_g	err_r	err_i

Home	SEARCH	Plan	My Data	HELP
------	--------	------	---------	------

My Data

 Refresh

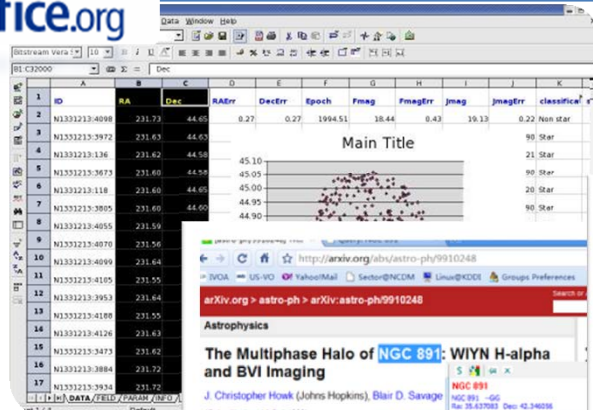
	Job Id	Start Time	End Time	Download
1	1337621649	2012-05-22 01:34:09.0	2012-05-22 01:34:09.0	
2	1337621591	2012-05-22 01:33:11.0	2012-05-22 01:33:11.0	
3	1337619112	2012-05-22 00:51:52.0	2012-05-22 00:51:52.0	
4	1337617510	2012-05-22 00:25:10.0	2012-05-22 00:25:10.0	
5	1337617496	2012-05-22 00:24:56.0	2012-05-22 00:24:56.0	
6	1337617484	2012-05-22 00:24:44.0	2012-05-22 00:24:44.0	
7	1337617459	2012-05-22 00:24:19.0	2012-05-22 00:24:20.0	
8	1337617444	2012-05-22 00:24:04.0	2012-05-22 00:24:04.0	
9	1337211110	2012-05-17 07:31:50.0	2012-05-17 07:31:50.0	Catalog VOTable
10	1337211046	2012-05-17 07:30:46.0	2012-05-17 07:30:46.0	Catalog VOTable
11	1337210943	2012-05-17 07:29:03.0	2012-05-17 07:29:04.0	Catalog VOTable
12	1337210906	2012-05-17 07:28:26.0	2012-05-17 07:28:26.0	
13	1337210550	2012-05-17 07:22:30.0	2012-05-17 07:22:31.0	Catalog VOTable
14	1337210241	2012-05-17 07:17:21.0	2012-05-17 07:17:22.0	

	angle
k	phQual
15.17	AAB

Development Achievement



VOFilter

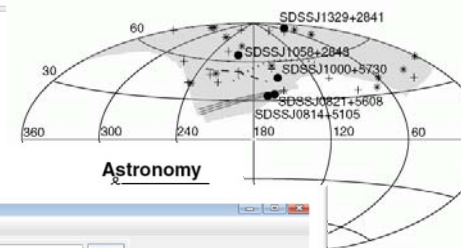
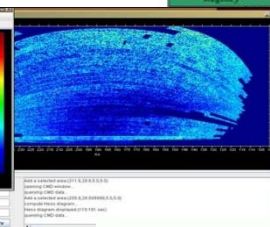
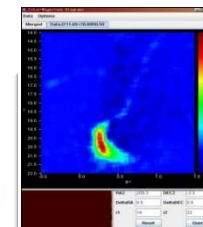


A&A 477, 139–145 (2008)
DOI: 10.1051/0004-6361:20078392
© ESO 2007

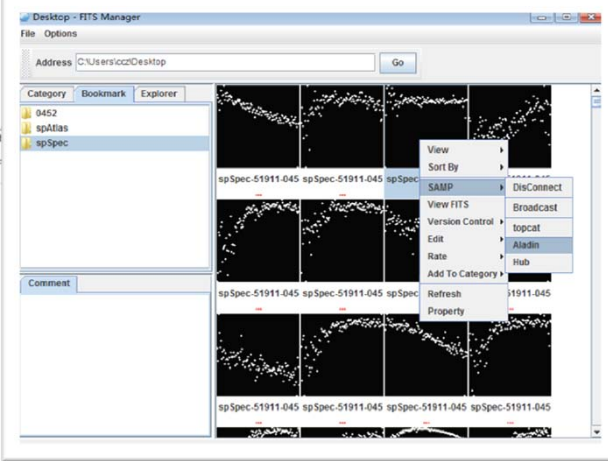


FitHAS

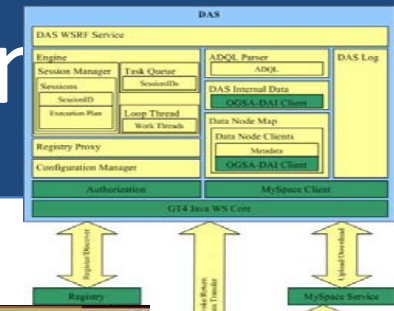
SkyMouse



Astronomy

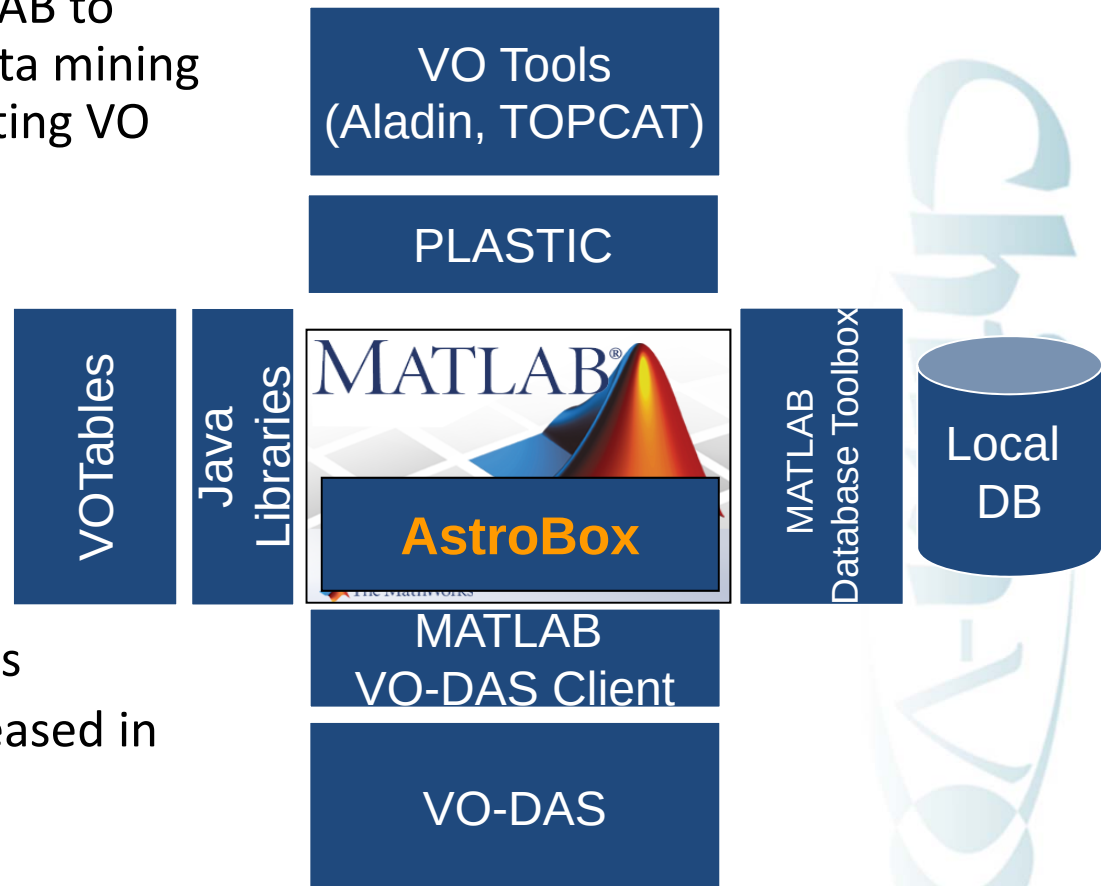


FITS Manager



AstroBox

- A plug-in package for MATLAB to provide an astronomical data mining application service, supporting VO protocols and tools.
- A high-level data analysis environment supporting:
 - PLASTIC
 - VOTable
 - Local DB
 - VO-DAS client
 - Astronomical algorithms
- The first version will be released in the year



First Science Paper from China-VO

- Candidate Milky Way satellites in the Galactic halo (Liu et al., 2008, A&A)
- SDSS DR5 photometric data were searched for new Milky Way companions or substructures in the Galactic halo.
- Data analysis procedures were based on the VO-DAS.
- Five candidates are identified as over-dense faint stellar sources that have color-magnitude diagrams similar to those of known globular clusters, or dwarf spherical galaxies.

A&A 477, 139–145 (2008)
DOI: 10.1051/0004-6361:20078392
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Candidate Milky Way satellites in the Galactic halo

C. Liu^{1,2}, J. Hu¹, H. Newberg³, and Y. Zhao¹

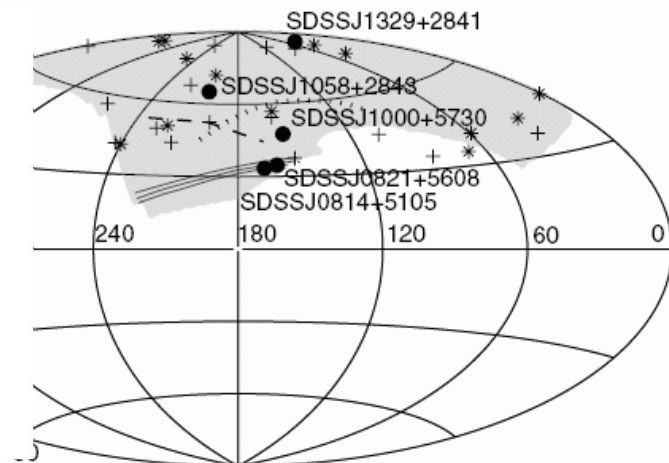
¹ National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012, PR China
e-mail: chaoliu@lamost.org

² Graduate University of Chinese Academy of Sciences, Beijing 100049, PR China

³ Department of Physics, Applied Physics, and Astronomy, Rensselaer Polytechnic Institute, Troy, NY 12180, USA

Received 1 August 2007 / Accepted 28 September 2007

**Astronomy
&
Astrophysics**



Astrophysical Integrated Research Environment (AIRE)

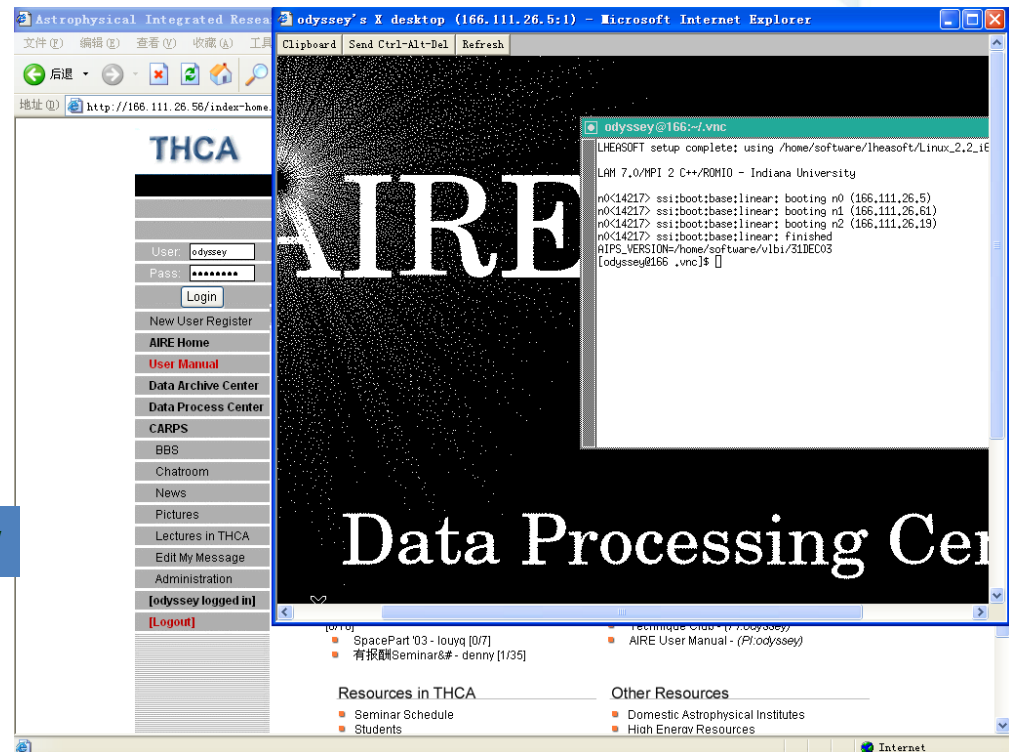
- Provide a web-based collaborative research environment

Radio : Interferometry ..., AIPS, AIPS++, Difmap...

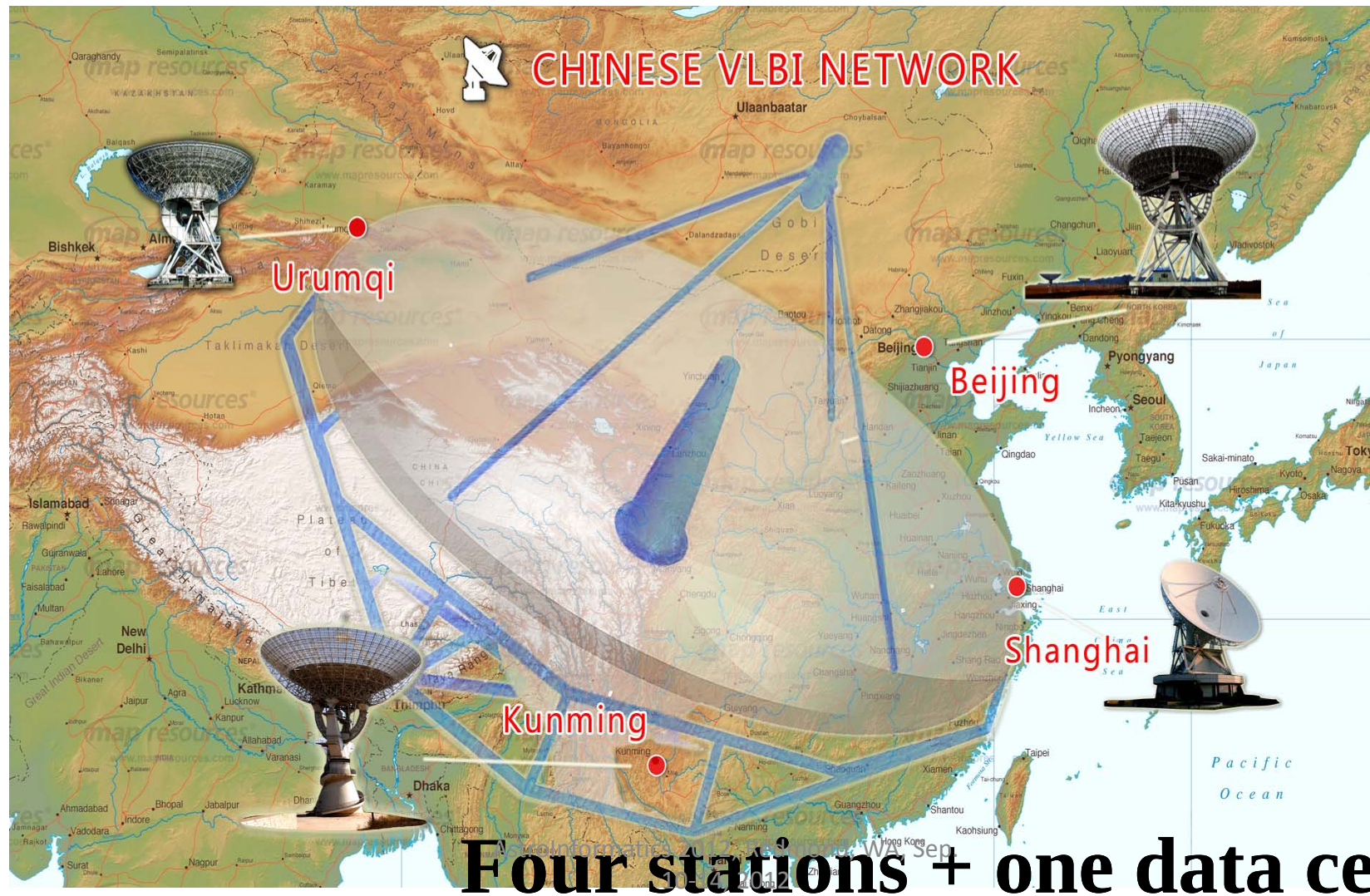
Optical : Photometry ... , IRAF, MIDAS ...

X-ray : Coded-mask ..., HEADAS

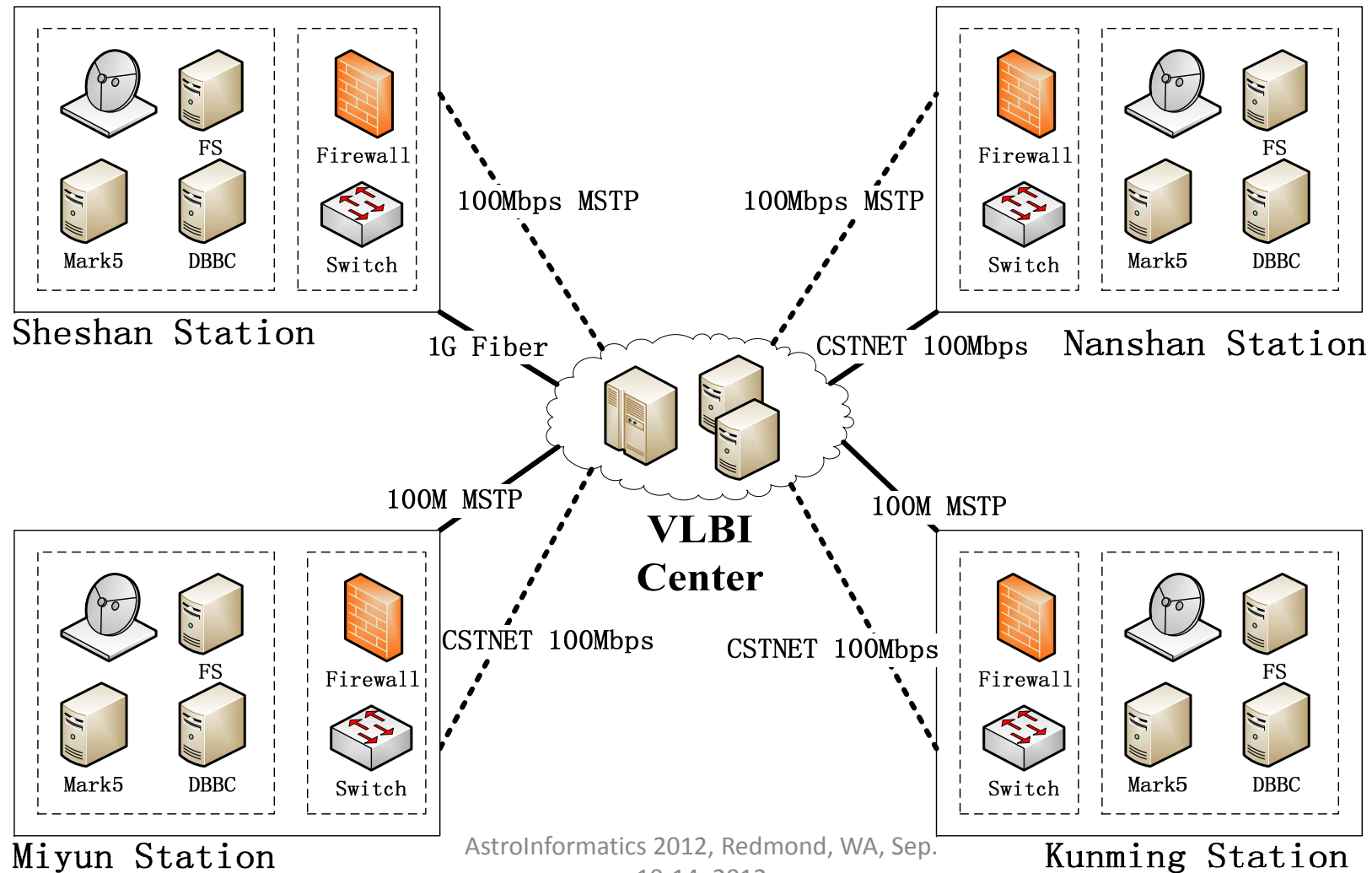
Contributed by Tsinghua University



Chinese e-VLBI Network Infrastructure

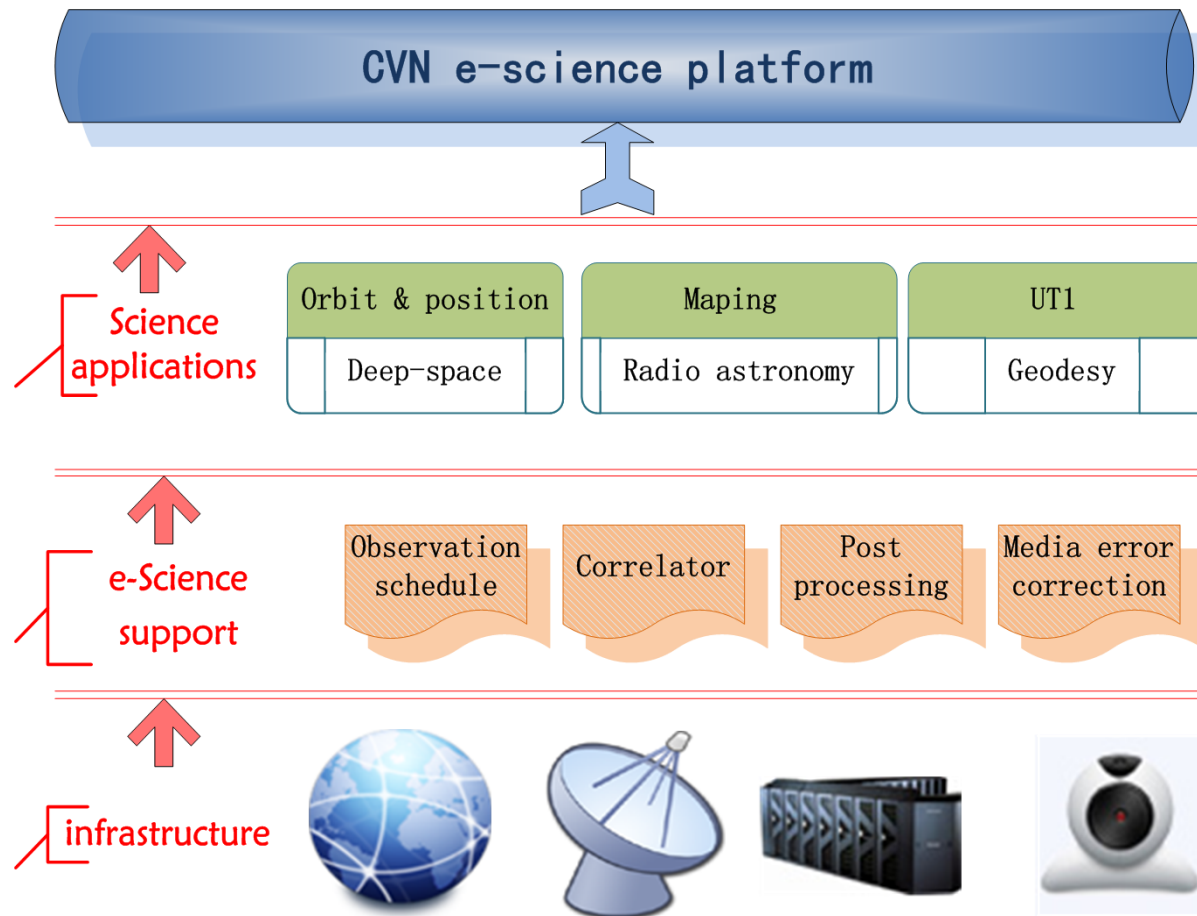


e-VLBI network of CVN



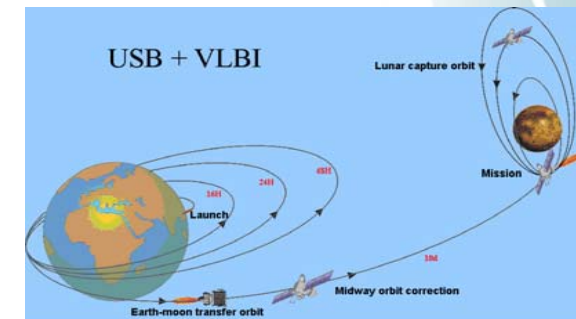
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10-14, 2012

e-CVN: multi-purpose e-science oriented network



➤ Applications:

**deep space mission,
radio astronomy,
geodesy**



➤ Two data processing platforms at the data center

e-CVN in the future



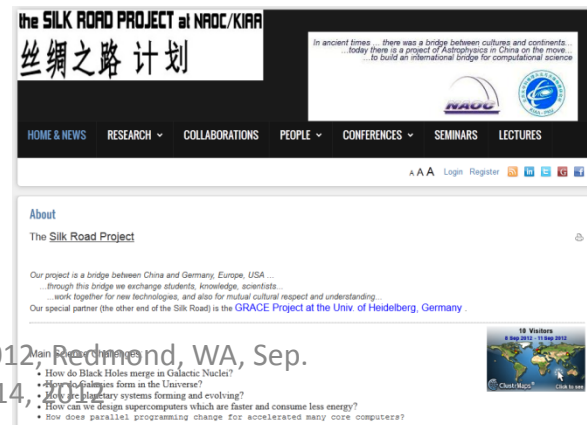
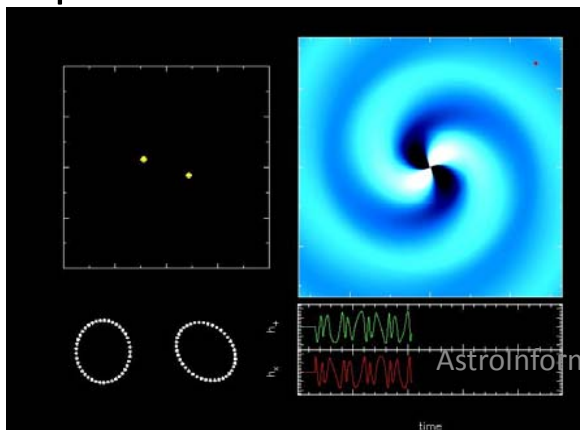
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500m FAST 2017

65m 2012-2016

GPU cluster project at NAOC

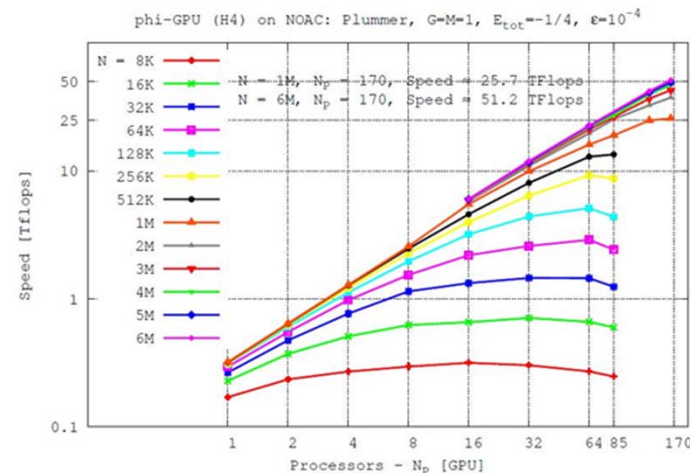
- Laohu GPU cluster is used by students and staff from NAOC and other Chinese and international collaborations. We are also running an international computational science center (ICCS, <http://iccs.lbl.gov>) together with Berkeley and Univ. of Heidelberg, Germany (Prof. Rainer Spurzem).
- Some important results obtained with the NAOC supercomputer have been for example to show that binary black holes after galaxy mergers can coalesce fast and to prove that recoiling black holes after a binary black hole coalescence will generate X-ray flares from stellar tidal disruptions.



Astrophysics 2012, Redmond, WA, Sep.

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Laohu GPU cluster at NAOC



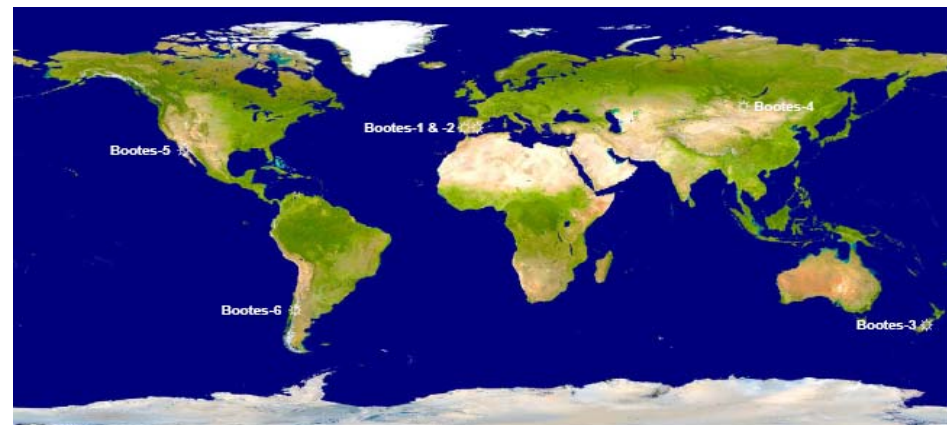
- Left: NAOC GPU Cluster; The cluster is running with 85 nodes, each with two NVIDIA Tesla C1070 GPUs.
- Right: Sustained Speed in Teraflop/s of astrophysical N-body Simulation for different particle numbers, as a function of number of GPU multiprocessors used. Near ideal speed-up is reached for large N , approaching the diagonal.

The BOOTES Project: A world wide network of robotic telescopes

Boo-2 & 3 integrated in:

- Identical telescopes spaced around the Earth
- Identical filter sets: g'r'i'ZY
- Identical CCD cameras
- Impact on several scientific fields and public outreach

*Global Robotic Telescopes Intelligent Array For
Citizen Science*



Bootes-4, history review

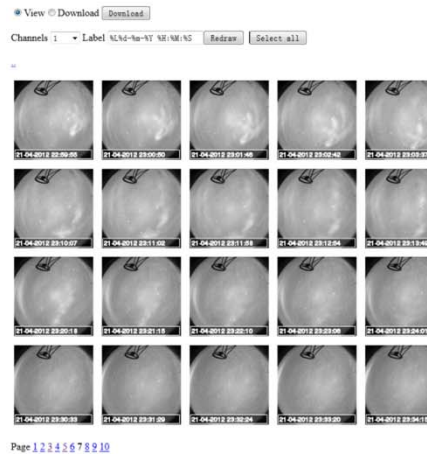


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10-14, 2012

Good Infrastructure

Rich information is available:

- Remote control
- Autonomous observation
- Status monitor
- Data access



Live View | Setup | Help

View Download Single FITS file Download

Channels 1 Lab

All images Night images alt-az plot Night images alt

Date part Number of observations Number of images Number of good images Time on sky

rts2-mon@bootes4a

File Edit View Options Transfer Script Tools Help

Enter host <Alt+R>

rts2-mon@bootes4a

System States Debug Help bootes4a

```
bad weather | standby night | BAD WEATHER
infotime x 2012-08-29T20:59:14.445 CST (-31.944s)
centr
CLOUD longitude +100 01 52.32
DOVE latitude +26 41 43.80
DWEAT W morning_off false
GRBD W morning_standby false
MOODD W required_devices WEATHER CLOUD
SEL failed_devices WEATHER CLOUD DOVE
TO weather_reason DOVE: some centrald are not connected
UPS_B next_state_change 2012-08-30T06:15:26.000 CST ( 9:15:39.610)
WEATH next_state 4 dawn
statu W night_horizon -10 00 00.00
W day_horizon +00 00 00.00
W evening_time 300
W morning_time 180
night_start 2012-08-30T20:23:43.000 CST (23:56.610)
night_stop 2012-08-30T06:15:26.000 CST ( 9:15:39.610)
U: "time of last update"
```

bad weather | standby night 13 | F9 menu F10 exit | 2 2ILST 18:12:26|2012-08-29 12:59:46

Ready ssh2: AES-256-CTR 20, 8 30 Rows, 97 Cols VT100 CAP NUM

10-14, 2012

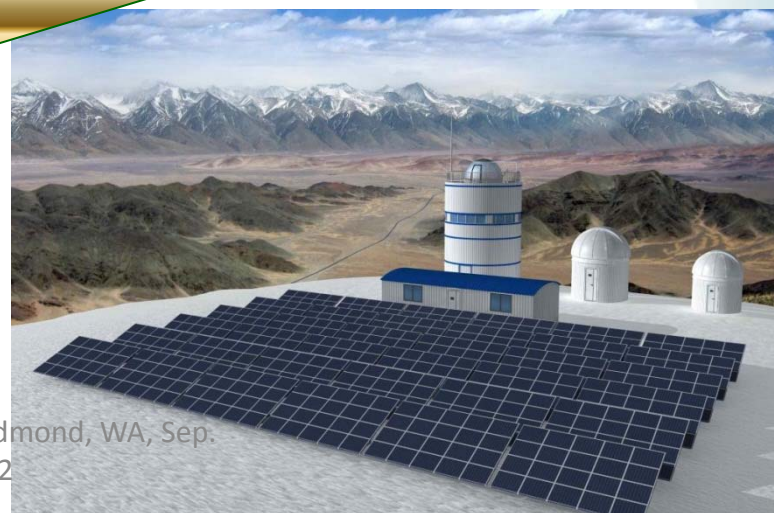
Time Domain Astronomy and Robotic Autonomous Observatory

RAO requirements in China

- Antarctic Observatory
- Tibet Observatory
- Argentina Observatory (San Juan Univ.)
- Lunar-based astronomy
- International projects: SONG, SVOM, ...
- School education
- Amateur observation
-



Huge Market in China



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China-RAON

- A project just initiated, no funding support yet.
- Not a specific RAO project, but a technical support plan.
- A team to provide solutions and technical support to Chinese astronomical community.
 - A new service from Chinese Virtual Observatory (China-VO)
- Serve professional and non-professional RAO projects used for research and education.
- We need RAO solutions
 - Software systems (RTS2, Linux/Windows)
 - Compliant hardware systems and components
- International collaboration



VO-driven Bootes-4

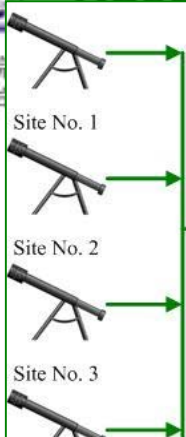
- GCN triggered ->VOEvent triggered
- Full automatic photometric pipeline
- Full automatic archiving
- VO-compliant data access
- Automated Event Classification



Total Solar Eclipse Live Broadcast in IYA2009



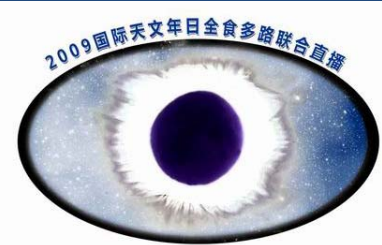
中国科学院
国家天文台



支持媒体

搜 狐

ASTRONOMIA.PL



Huge Audience

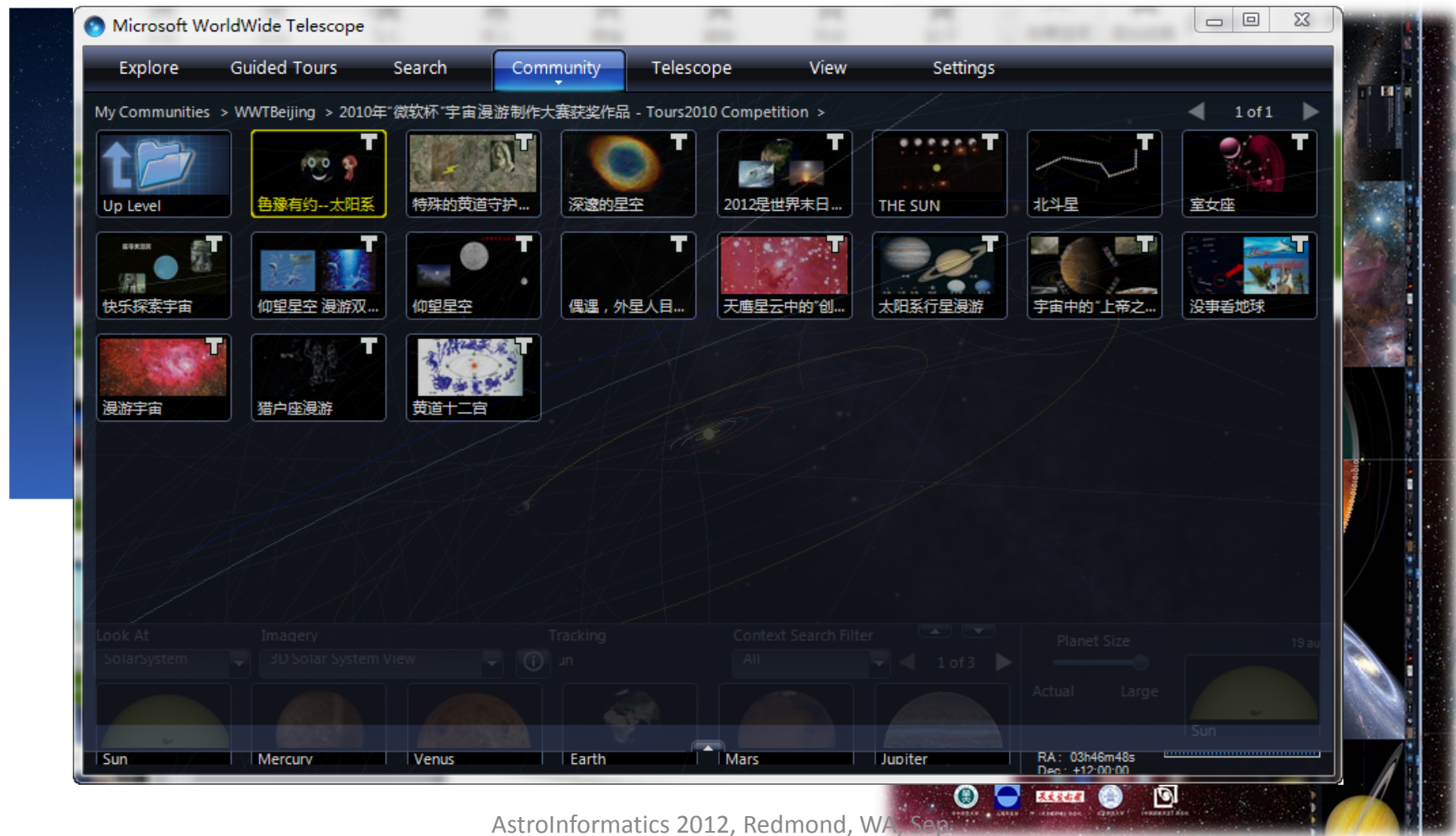
- 30 signed clients
- Network portal: 17
- TV station: 10
- Mobile portal: 1
- IPv6 portal: 2
- Website click: > 230M
- ~500 volunteers involved

AstroInformatics 2012, Redmond, WA, Sep.

Read www.astronomy2009.org
10-14, 2012

The screenshot shows the homepage of the International Year of Astronomy 2009 website. It features a large banner for the 'Worldwide broadcast for July's solar eclipse' with a date of 'JULY 22, 2009'. Below the banner, there are sections for 'National Nodes: 142' (with a world map), 'IYA2009/History', 'IYA2009 Updates', and 'Press Releases'. A sidebar on the right lists statistics: National Nodes: 142, Organisational Nodes: 37, Organisational Associates: 30, National Websites: 104, Cornerstone Projects: 12, Special Task Groups: 11, Special Projects: 10, Official Products: 8, and Media Partners: 21. At the bottom, there are logos for global sponsors including ThalesAlenia Space and CELESTRON.

WWT Guided Tour Design Contest



AstroInformatics 2012, Redmond, WA, Sep.
10-14, 2012

Award Ceremony (2010.11.9)



@ Beijing Planetarium



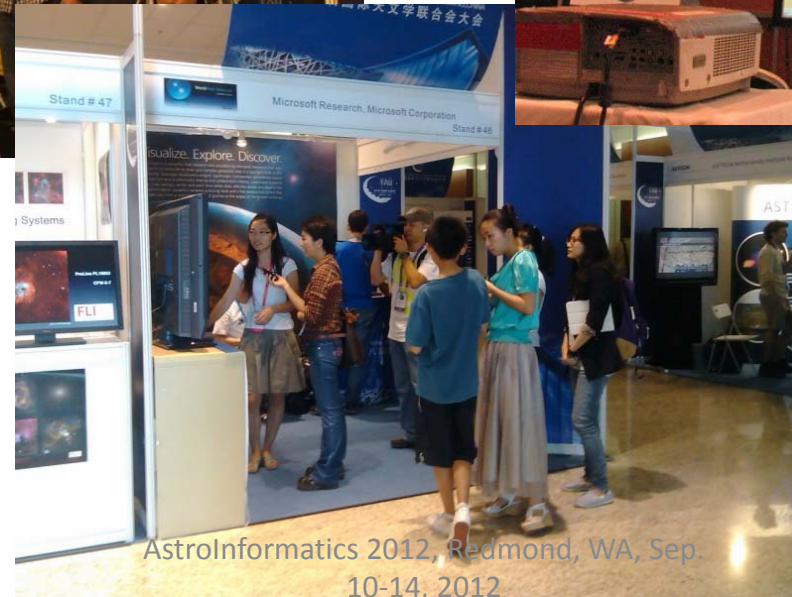
AstroInformatics 2012, Redmond, WA, Sep.
10-14, 2012

WWT Lectures and classes



AstroInformatics 2012, Redmond, WA, Sep.
10-14, 2012

WWT Booth at the 28th IAU GA



AstroInformatics 2012, Redmond, WA, Sep.
10-14, 2012

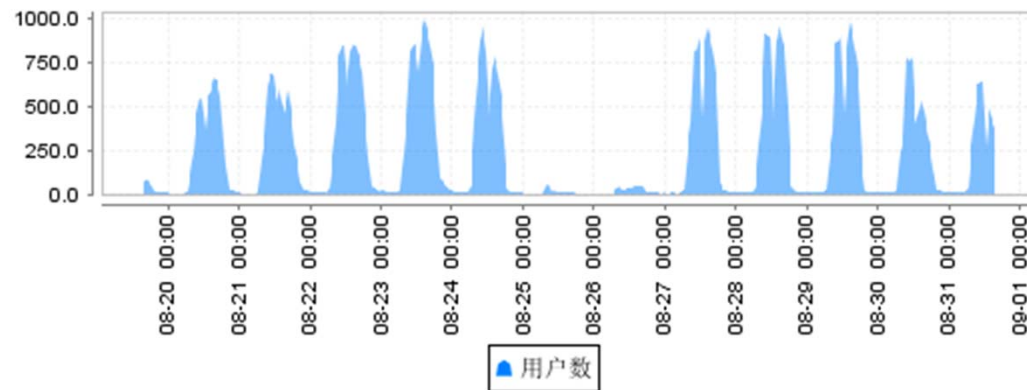
WWT Teacher Training

- WWT teacher training 2010, Aug. 1-3, 2010
- WWT teacher training 2011, Jul. 22-26, 2011
- WWT teacher training in Haidian, Aug. 25-26, 2011
- WWT teacher training in Xinjiang, Apr. 25-26, 2012
- WWT teacher training 2012, Jul. 18-20, 2012



Astroinformatics 2012, Redmond, WA, Sep.
10-14, 2012

Wifi Service at the 28th IAU GA



峰值接收速率(Mbps)

平均接收速率(Mbps)



Thank You

