Virtuální observatoře

Nový revoluční nástroj pro výzkum

nebo jen jiná internetová technologie ?

Petr Škoda

Astronomický ústav AVČR Ondřejov

Astronomický festival, HaP Brno 12.9.2009

Astronomie 21. století

- Exponenciální nárůst objemu dat
  - Multiobject fibers, IFU
  - CCD mozaiky
  - Kontinuální expozice TDI
- Pozorování s velkými přístroji v servisním režimu (VLT, Subaru)
- Queue Scheduling (HET, SALT)
- Bez přítomnosti PI astronoma
- Komplikované zpracování dat = automatické pipeliny
- Robotické teleskopy (P60, Liverpool, TSU)

Teleskopy bez přítomnosti PI

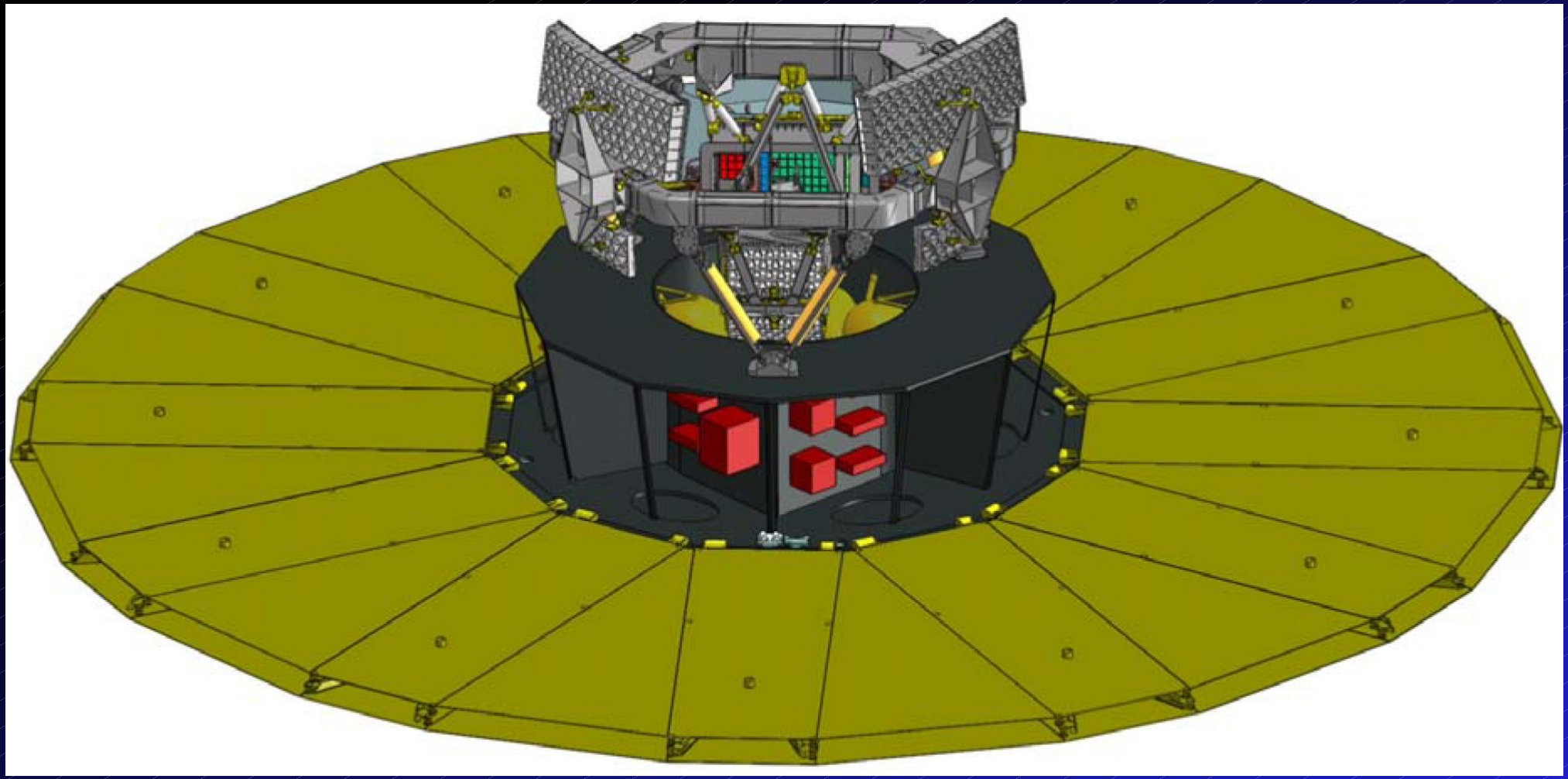
- Klasický model PI – observing run se mění
- Úspory nákladů, efektivita – scheduler (SPICA)
- Keck , WYIN, VLT .... remote observing, RT
- Quick-look preview a eavesdropping
- Komplikované posouzení co je výsledkem
- pipeliny na gridech – automaticky do databáze
- Výsledek PI vidí až z DB na WWW
- Teleskop je databáze s velmi dlouhým přístupem“

2dF (AAT)

Two degree field
2dF (AAT)

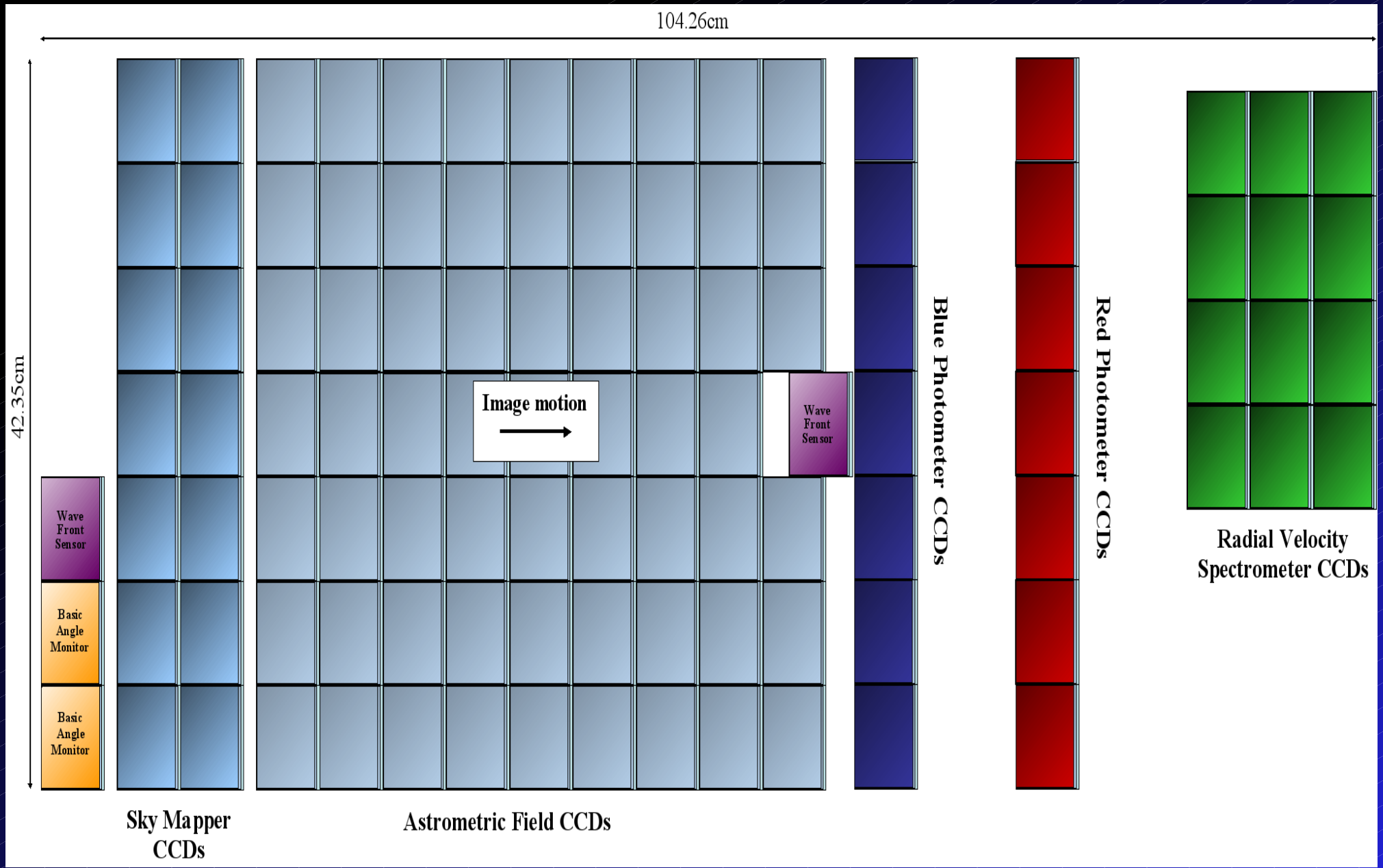
Robot
2 desky
400 vláken

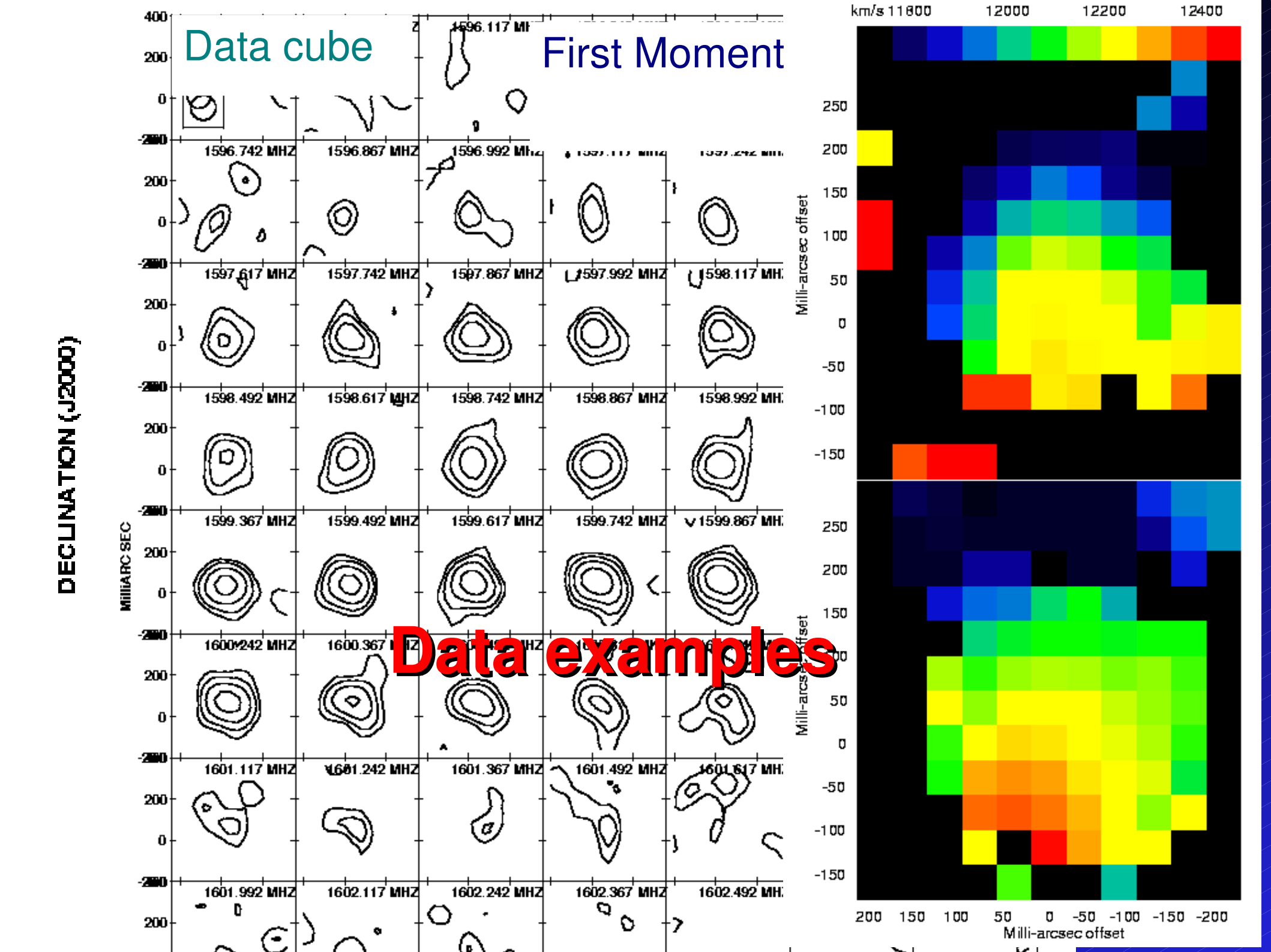
GAIA (2012)



GAIA CCDs

106 CCDs
938 Mpix
2800cm²

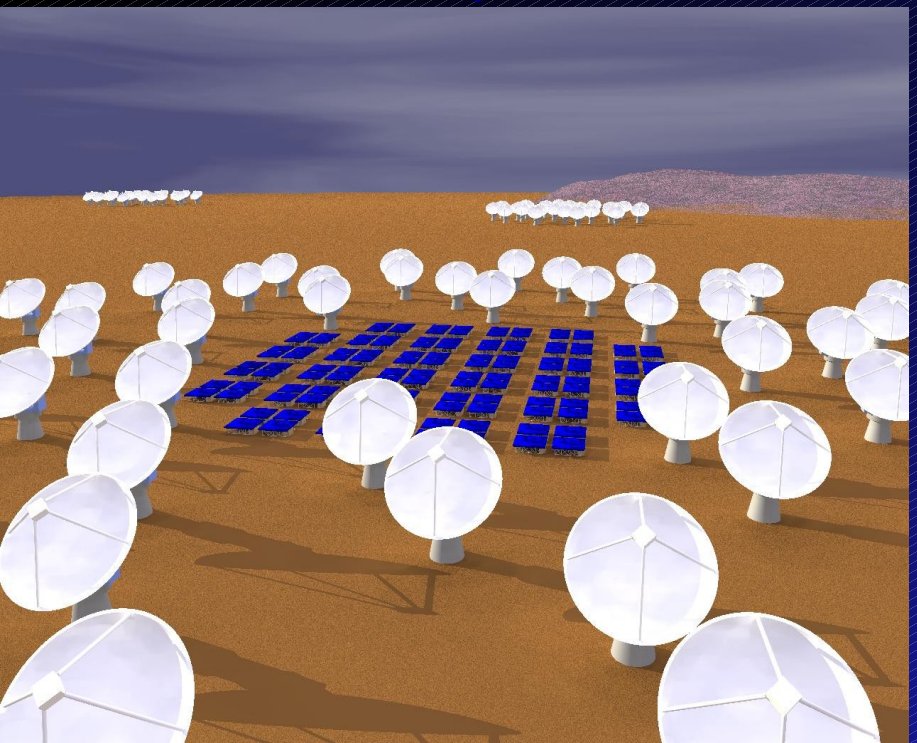



Data cube
First Moment
Data examples
DECLINATION (J2000)
MilliARC SEC
1596.117 MHZ
1596.742 MHZ
1596.867 MHZ
1596.992 MHZ
1597.617 MHZ
1597.742 MHZ
1597.867 MHZ
1597.992 MHZ
1598.117 MHZ
1598.492 MHZ
1598.617 MHZ
1598.742 MHZ
1598.867 MHZ
1598.992 MHZ
1599.367 MHZ
1599.492 MHZ
1599.617 MHZ
1599.742 MHZ
1599.867 MHZ
1600.242 MHZ
1600.367 MHZ
1601.117 MHZ
1601.242 MHZ
1601.367 MHZ
1601.492 MHZ
1601.617 MHZ
1601.992 MHZ
1602.117 MHZ
1602.242 MHZ
1602.367 MHZ
1602.492 MHZ
km/s 11800
12000
12200
12400
Milli-arcsec offset
Milli-arcsec offset

Atacama Large Milimeter Array
ALMA

64 antén 12m
Chajnator 5000m
Chille
2008-2012

SKA (2011-2018)



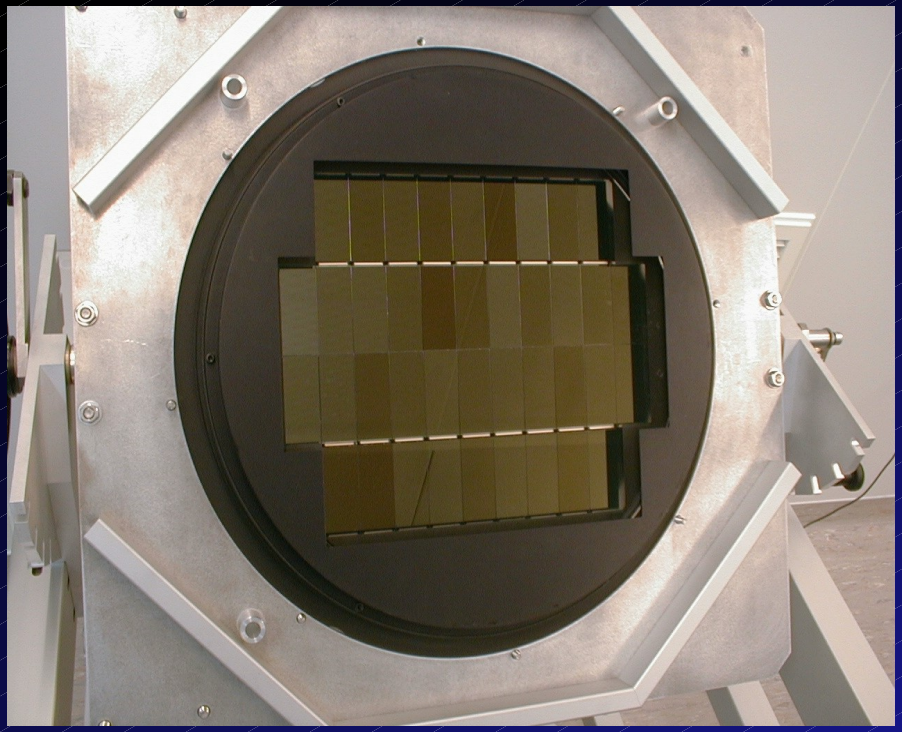
Inner core

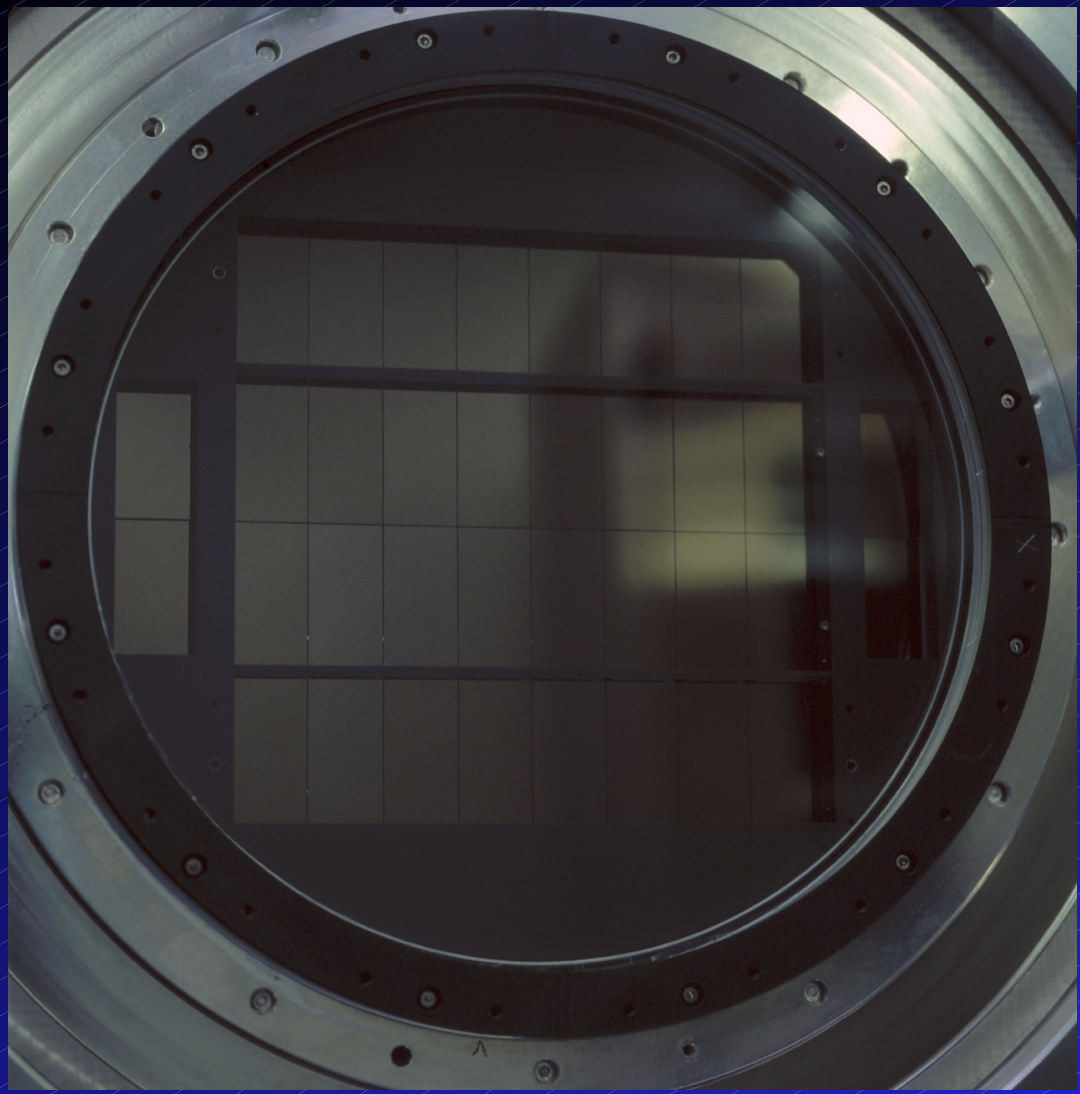
Station

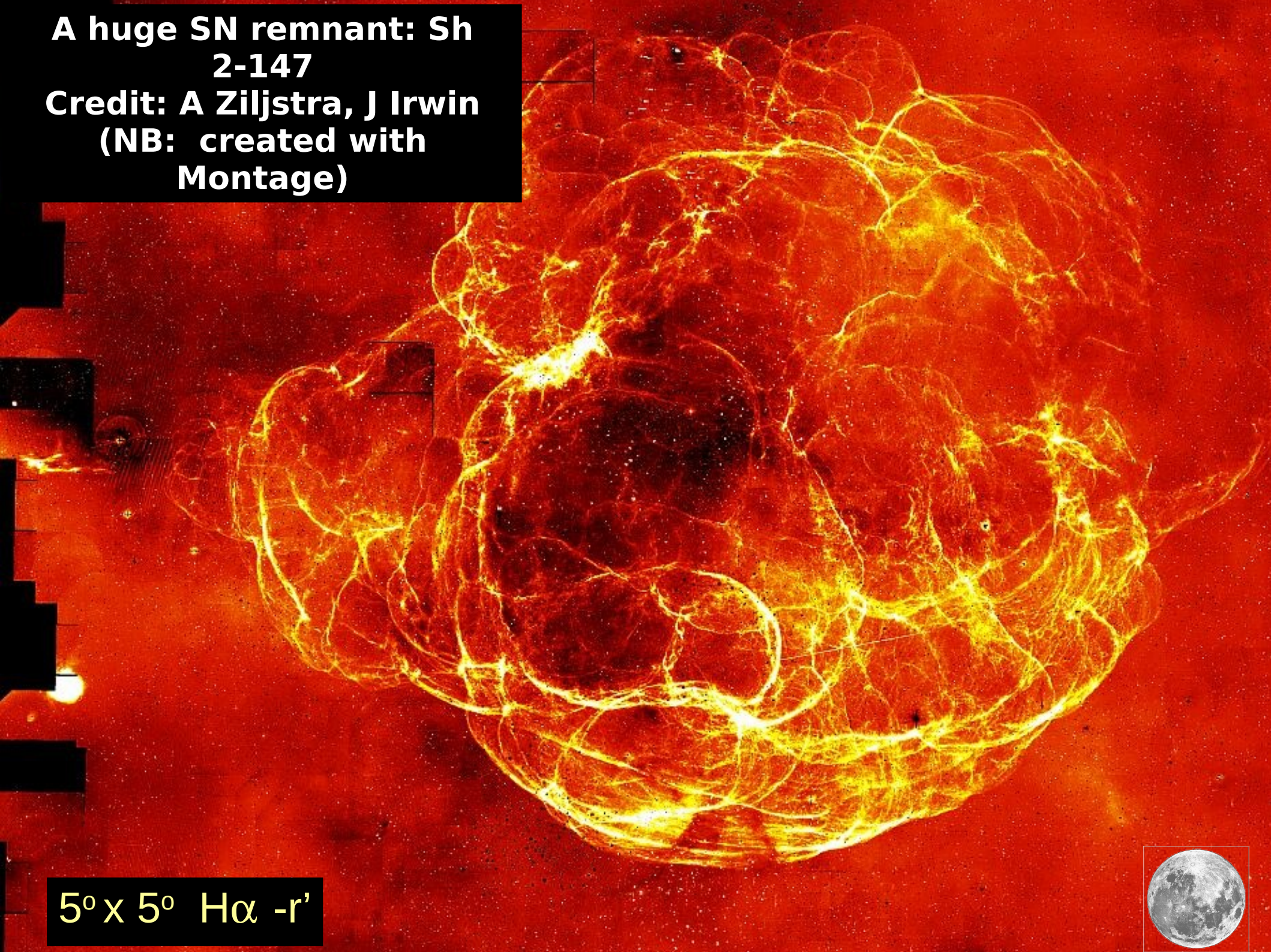
Wide-angle radio camera
+
radio “fish-eye lens”

OMEGACAM (CFHT)

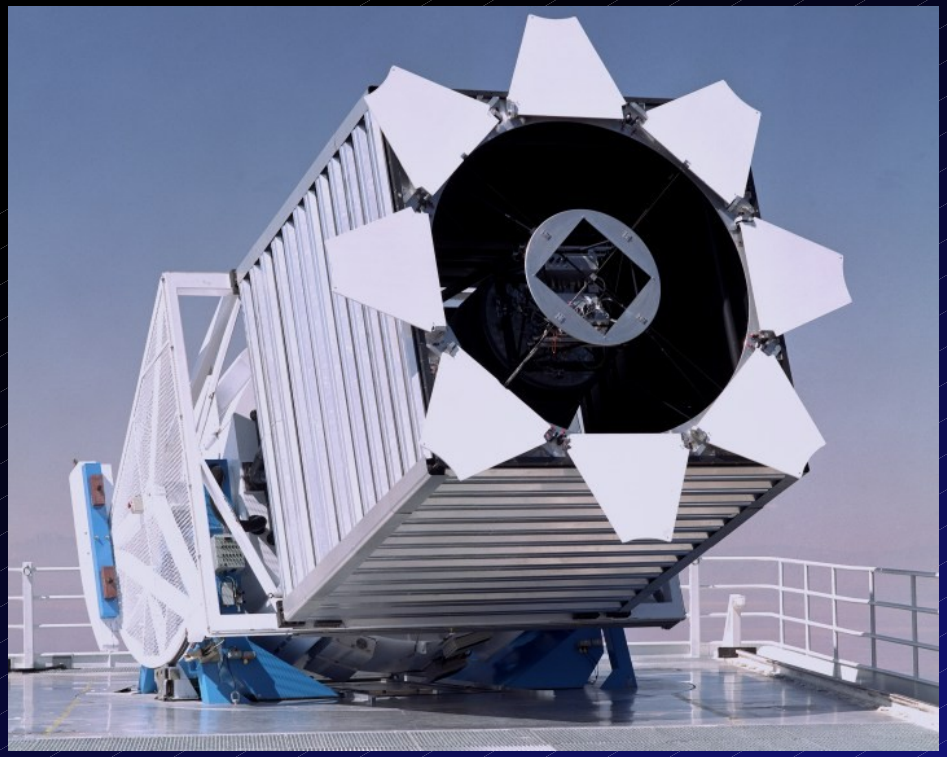
36 (40) CCD 4.6kx2k
770 MB na expozici
77 GB za noc
Montage - Terapix

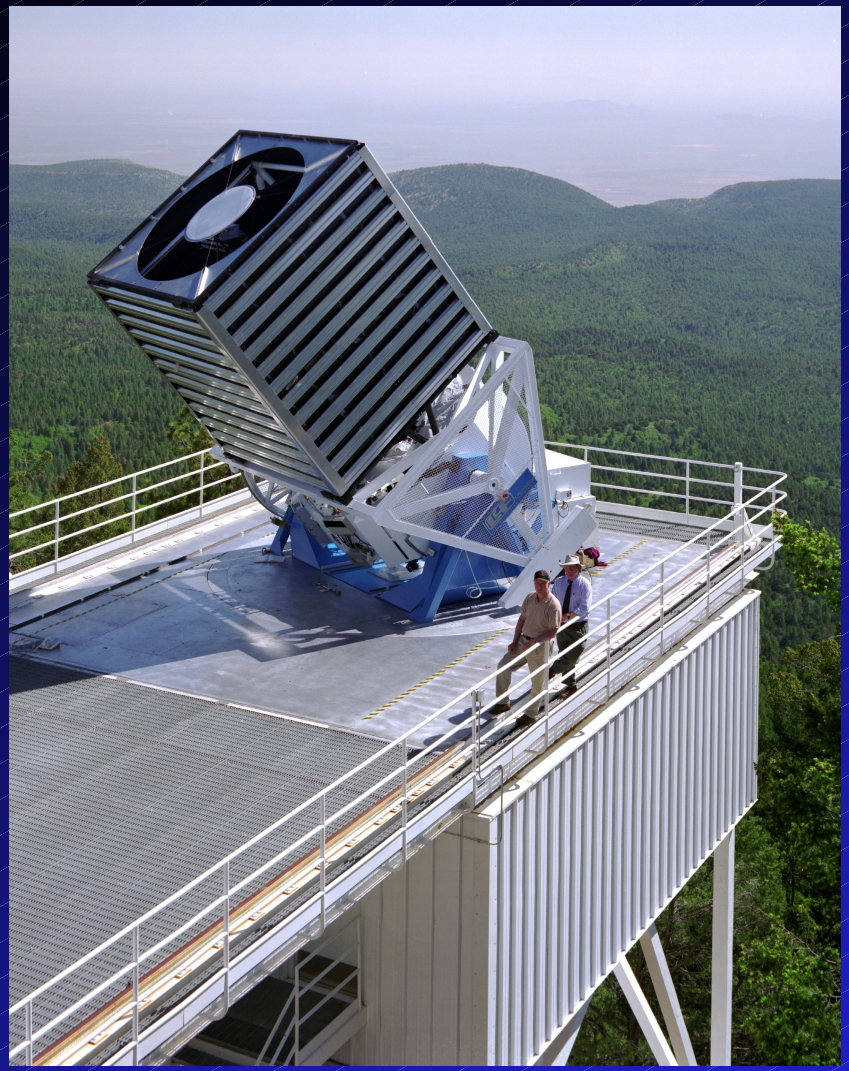





A huge SN remnant: Sh 2-147
Credit: A Ziljstra, J Irwin
(NB: created with Montage)
5° x 5° Hα -r'

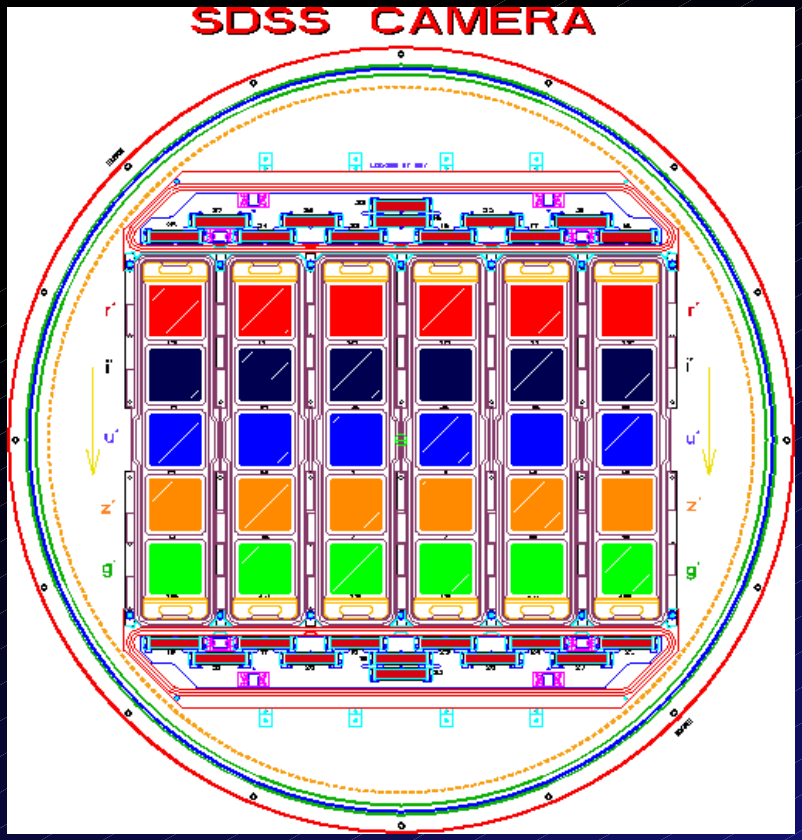
SDSS 2.5m teleskop



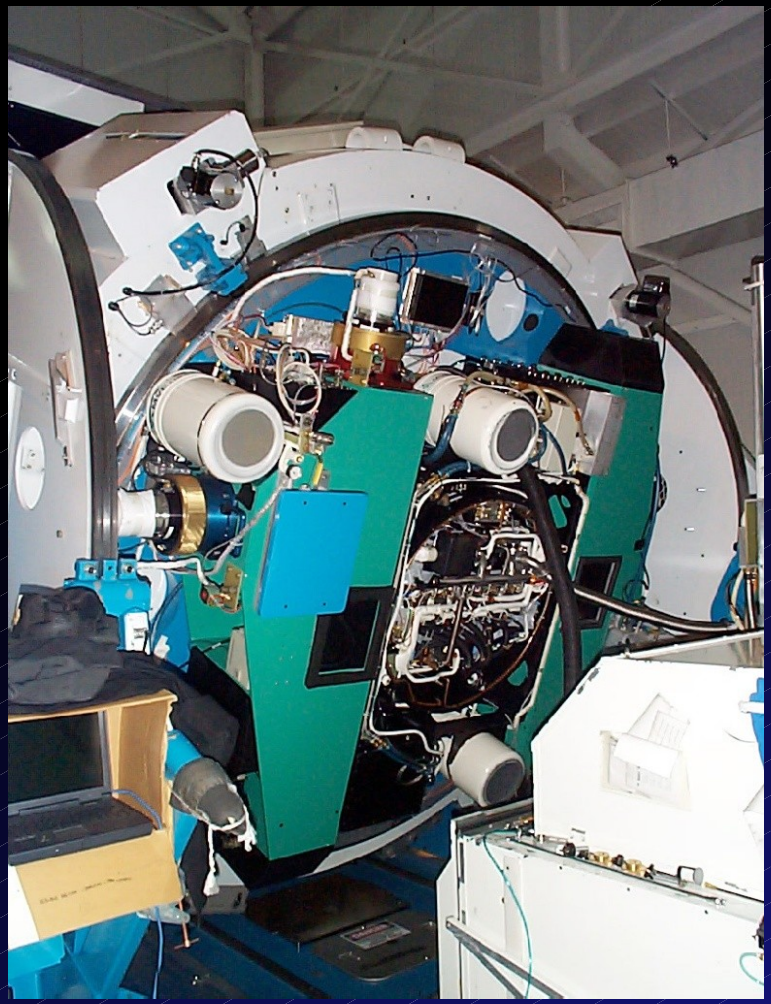


SDSS CCD

30x CCD 2kx2k



SDSS spektrograf



2 spektrografy 3800-9200 A
640 vláken
beamsplitter – červený a modrý
desky až 6-9 za noc (5000 objektů)

SDSS DR5 Archiv

- Obrázky
  - 8000 deg sq
  - 215 milionů objektů
  - 9 TB obrázků
  - 1.8 TB katalog
  - u g r i z
    - 3551Å 4686Å 6165Å 7481Å 8931Å
    - 22.0 22.2 22.2 21.3 20.5mag

SDSS DR5 Archiv

- Spektra (60GB 2D -170GB z,měření)
  - 5740 sq. deg.
  - 3800-9200 A resolution 1800, SNR>4 g=20.2
  - 1,048,960 spectra, classified into
  - 674,749 Galaxies
  - 79,394 Quasars (redshift <2.3)
  - 11,217 Quasars (redshift >2.3)
  - 154,925 Stars
  - 60,808 M stars and later
  - 12,312 Unknown class

Specializované – Mikročočky

- MOA
  - NZ, Mt John Observatory, 4 CCD 2kx2k
- OGLE
- MACHO
- WASP (Sutherland, La Palma) – 8 kamer 2x2k
- KIDS
- Zpracování on-line statisíce objektů
- Mikročočky jen zlomek potenciálu – proměnné hvězdy a pod.

VISTA

4m telescope

0.6 sq.deg. IR camera

16 2kx2k detectors

0.35” pixels

VST

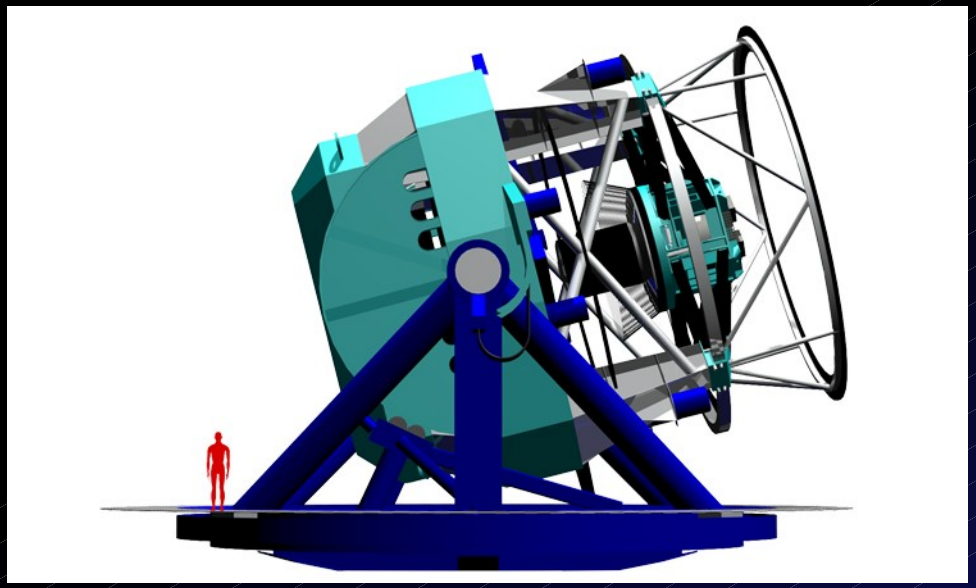
2.6m telescope

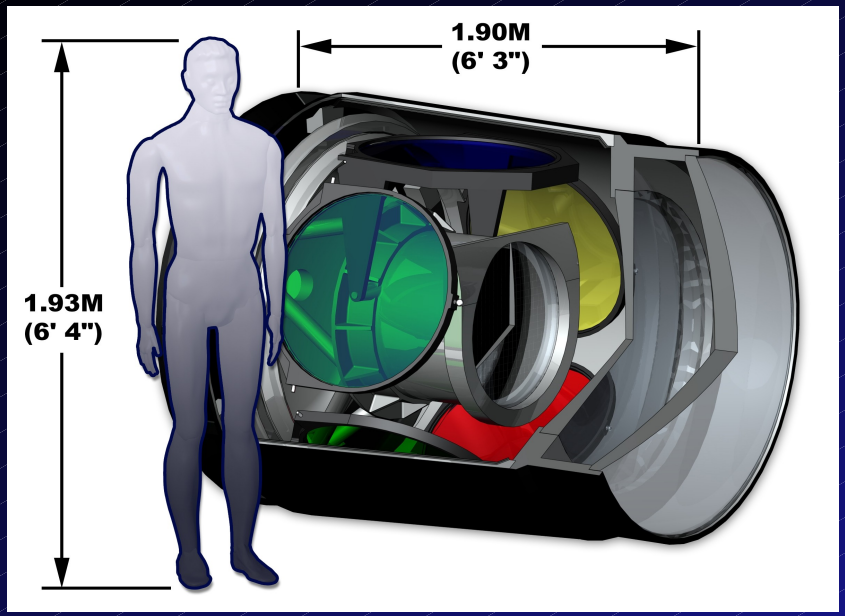
1 sq.deg. optical camera (OmegaCAM)

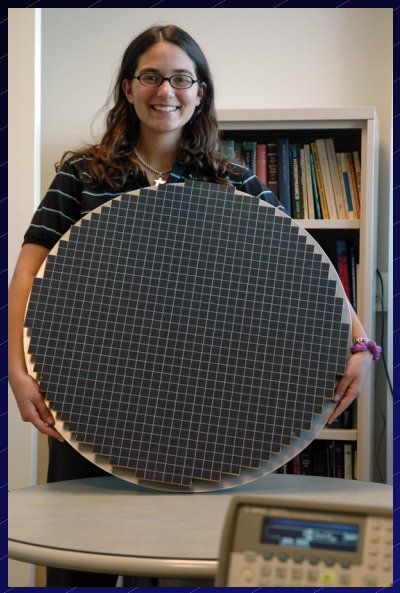
32 2kx4k detectors

0.21” pixels

LSST (8.4m)



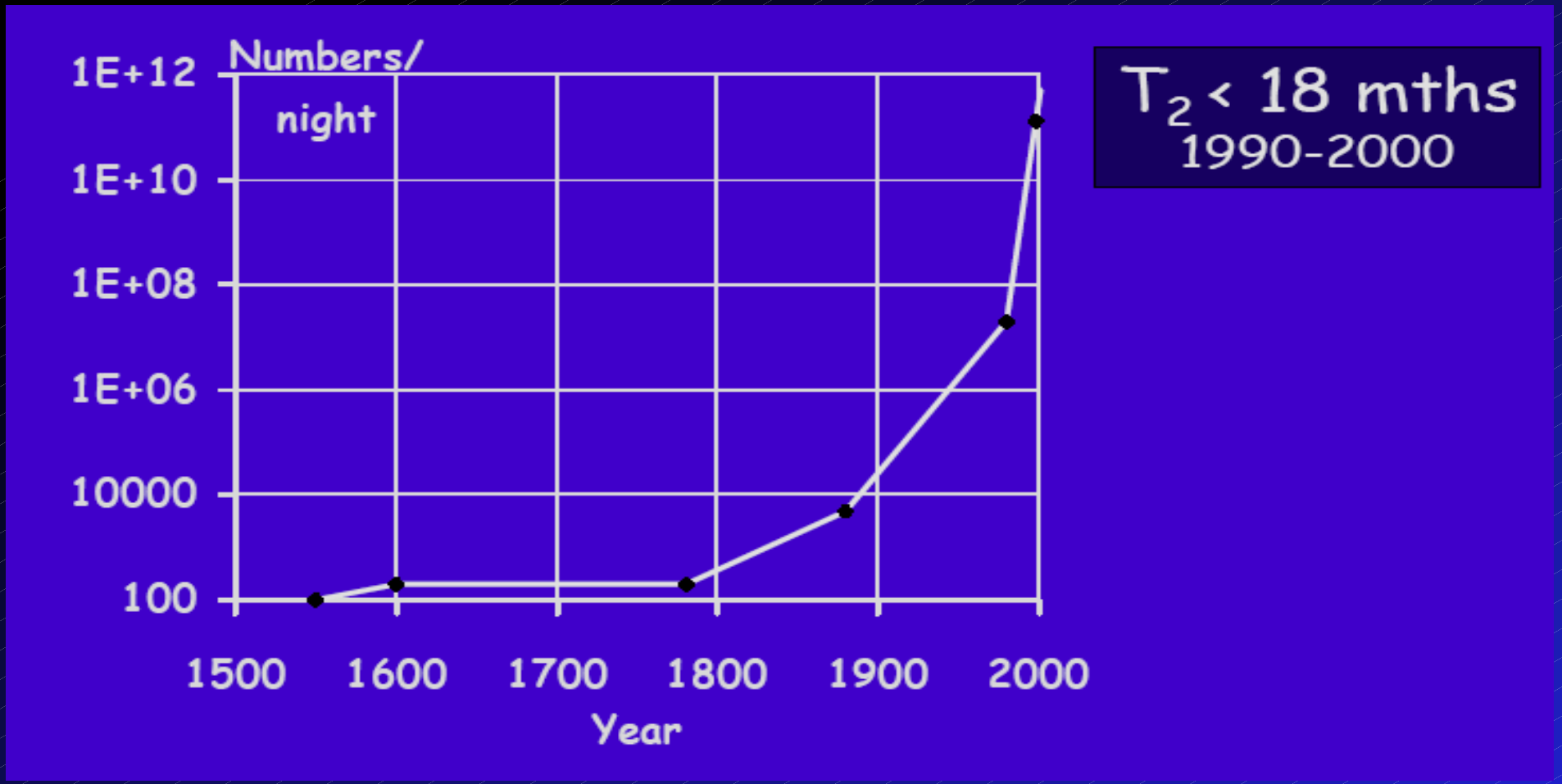




200 CCD 4kx4k,
32 kanálů (6400)
3.2 Gpix za 2 sec
64cm průměr
3.5 deg FOV
30 TB/noc
2 TFLOPS
detekce změn do 60sec

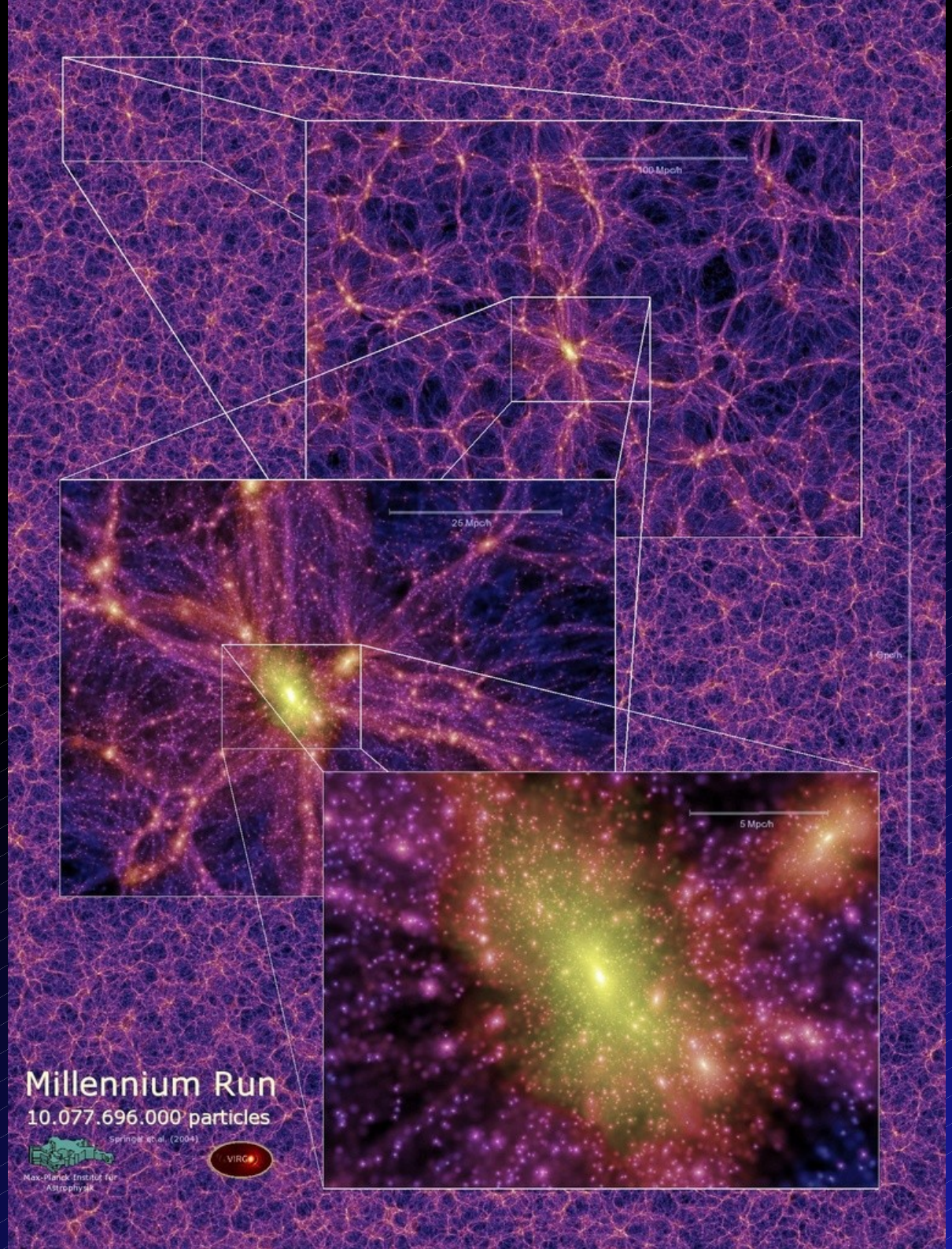
Lavina dat

- Moorův zákon chipy – zdvojení 1.5 roku (1000/10 let)
- Data v astronomii – zdvojení < 1 rok !



Teorie – složité modely

- 3D simulace
- Plná MHD
- Velké simulace – data v TB, velké databáze na vstupu (linelisty, sítě modelů)
- Turbulence ISM …
- N-částicové modely (celé galaxie, populace)
- Velkorozměrová struktura
- AI metody, NS, GA
- Vizualizace TB dat pomocí VR



Millenium Run

- 10^10 particles
- Several Gpc to
- 10 kpc
- Cube 2 billion ly
- One month MPSSC
- 25 TB
- Evolution of 20 mil galaxies
- Evolution merger tree

Počátky VO

- idea VO konec 2000
- propojení archivů
- jednotné rozhraní, datový formát pro přenos
- mnoho dat – distribuované zpracování
- GRID - fyzika elementárních částic
- multispektrální výzkum: radio---gama
- Výstupy simulací v NCSA
- Data pro SDSS – hlavní výzkum

Virtual Observatory : Key Definitions

- "*The Virtual Observatory will be a system that allows astronomers to interrogate multiple data centers in a seamless and transparent way, which provides new powerful analysis and visualization tools within that system, and which gives data centers a standard framework for publishing and delivering services using their data*".
- Standardization of data and metadata, and of data exchange methods.
- Registry, listing available services and what can be done with them.

R.J.Hanisch, P.J.Quinn, in "IVOA – Guidelines for participation"

Principy VO

- Jednotný formát dat – VOTable, UCD
- Interoperabilita - SAMP (PLASTIC)
- Web services (WS)
- VOregistry (jako DNS)
- VOSpace (síťový home disk)
- protokoly (CGI services)
  - ConeSearch (hledání v kruhu na obloze)
  - SIAP (Simple Image Access Protocol)
  - SSAP(Simple Spectral Access Protocol)
  - SLAP(Simple Line Access Protocol)
  - TAP (Table access, general, asynch)

Display Data In VOTable Format.

VOTable :

```
<?xml version="1.0"?>
<!DOCTYPE VOTABLE SYSTEM "http://us-vo.org/xml/VOTable.dtd">
<VOTABLE >
 <DESCRIPTION>
 VizieR Astronomical Server: urania.iucaa.ernet.in                2002-10-04T05:20:16
 Explanations and Statistics of UCDs:                                    See LINK below
 In case of problem, please report to:          question@simbad.u-strasbg.fr
 </DESCRIPTION>
 <DEFINITIONS>
  <COOSYS ID="J2000"  equinox="J2000"  system="EQ_FK5"/>
 </DEFINITIONS>
 <INFO ID="Ref"  name="-ref"  value="VOTx11451"/>
 <RESOURCE  name="V/105"  ID="yCat_5105" >
  <DESCRIPTION>SKY2000 Catalog, Version 3 (Myers+ 2000)
  </DESCRIPTION>
  <TABLE ID="V_105_sky2v3r1"  name="V/105/sky2v3r1" >
   <DESCRIPTION>The Sky2000 Version 2 Catalogue
   </DESCRIPTION>
   <FIELD datatype="int"  width="6"  name="HD"  ucd="ID_ALTERNATIVE" >
    <DESCRIPTION>?Henry Draper &lt;III/135&gt; number
    </DESCRIPTION>
   </FIELD>
   <FIELD unit="h:m:s"  datatype="char"  ref="J2000"  name="RAJ2000"  ucd="POS_EQ_RA_MAIN"  arraysize="13" >
    <DESCRIPTION>Right ascension (J2000) hours
    </DESCRIPTION>
   </FIELD>
   <FIELD unit="d:m:s"  datatype="char"  ref="J2000"  name="DEJ2000"  ucd="POS_EQ_DEC_MAIN"  arraysize="13" >
    <DESCRIPTION>Declination degrees (J2000)
    </DESCRIPTION>
```

☑ Display Data Of Selected Points

Close | Save As File

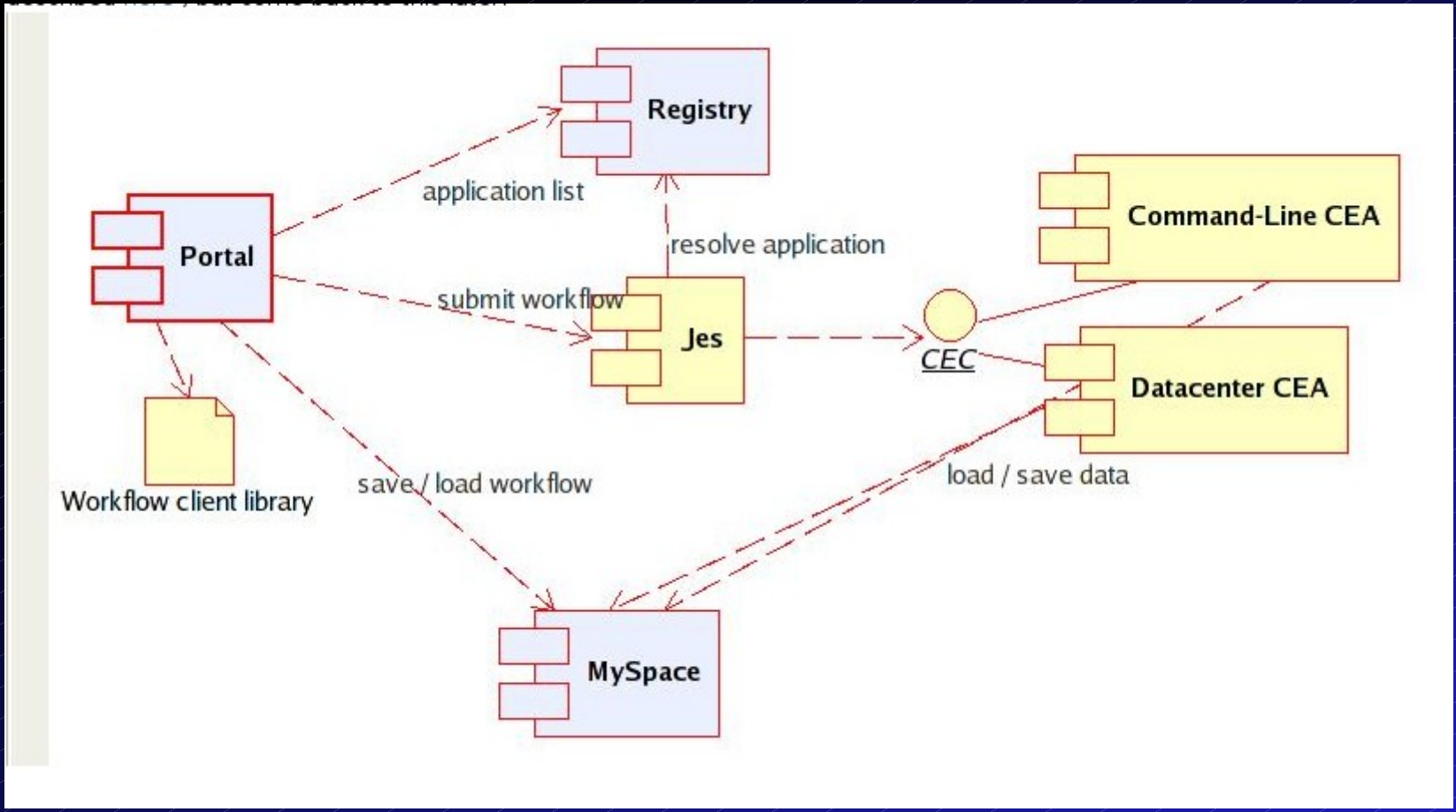
Ontologie

- Důležitá role humanitních oborů
- METADATA
- Domény = sady pravidel, objektů
- Jazyk - karta (eso, videokarta)
- W3C standardy – OWL, RDF
- Semantický Web
- Strojoví agenti pomáhají člověku něco (hledat)
- VOEvent – co to bouchlo?, čím pozorovat
- UCD, utypes

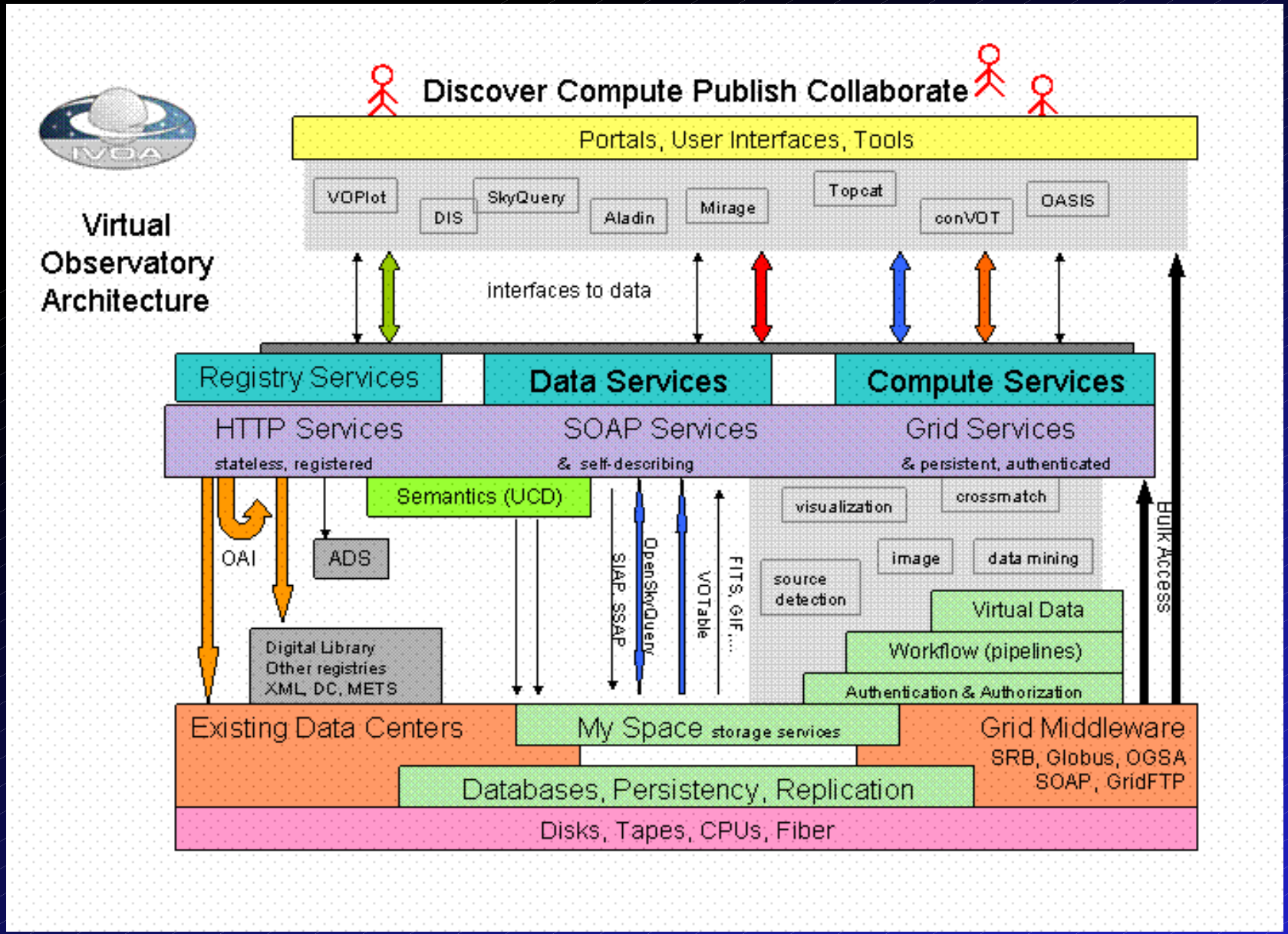
Technologie VO (SDSS)

- SDSS = SkyServer
- Skynode, SkyPortal (distribuované query mezi SkyNody)
- OpenSkyQuery
- ADQL
- XMATCH, REGION
- VOSpace – cache(WS, database,http put get)
- přenos dat nelze, pomalý - zpracování na místě
- VOEvent (alerty)

Workflows - Astrogrid



Architektura VO



Simple Spectra Access Protocol Spectral Data Model

Simple Spectral Access Protocol V1.04

International Virtual Observatory Alliance

Simple Spectral Access Protocol

Version 1.04

IVOA Recommendation Feb 01, 2008

This version:
http://www.ivoa.net/Documents/REC/DAL/SSA-20080201.html
Latest version:
http://www.ivoa.net/Documents/latest/SSA.html
Previous version(s):
Version 1.03, December 2007
Version 1.02, September 2007
Version 1.01, June 2007
Version 1.00, May 2007
Version 0.97, November 2006
Version 0.96, September 2006
Version 0.95 May 2006
Version 0.91 October 2005
Version 0.90 May 2005
Editors:
D.Tody, M. Dolensky
Authors:
D.Tody, M. Dolensky, J. McDowell, F. Bonnarel, T.Budavari, I.Busko, A. Micol, P.Osuna, J.Salgado, P.Skoda, R.Thompson, F.Valdes, and the data access layer working group.

International Virtual Observatory Alliance

IVOA Spectral Data Model

Version 1.03

IVOA Recommendation 2007-10-29

This version (Recommendation Rev 1)
http://www.ivoa.net/Documents/REC/DM/SpectrumDM-20071029.pdf
Latest version:
http://www.ivoa.net/Documents/latest/SpectrumDM.html
Previous versions:
http://www.ivoa.net/Documents/PR/DM/SpectrumDM-20070913.html

Editors:
Jonathan McDowell, Doug Tody
Contributors:
Jonathan McDowell, Doug Tody, Tamas Budavari, Markus Dolensky, Inga Kamp, Kelly McCusker, Pavlos Protopapas, Arnold Rots, Randy Thompson, Frank Valdes, Petr Skoda, and the IVOA Data Access Layer and Data Model Working Groups.

SSAP Parameters

4.1.1 Mandatory Query Parameters

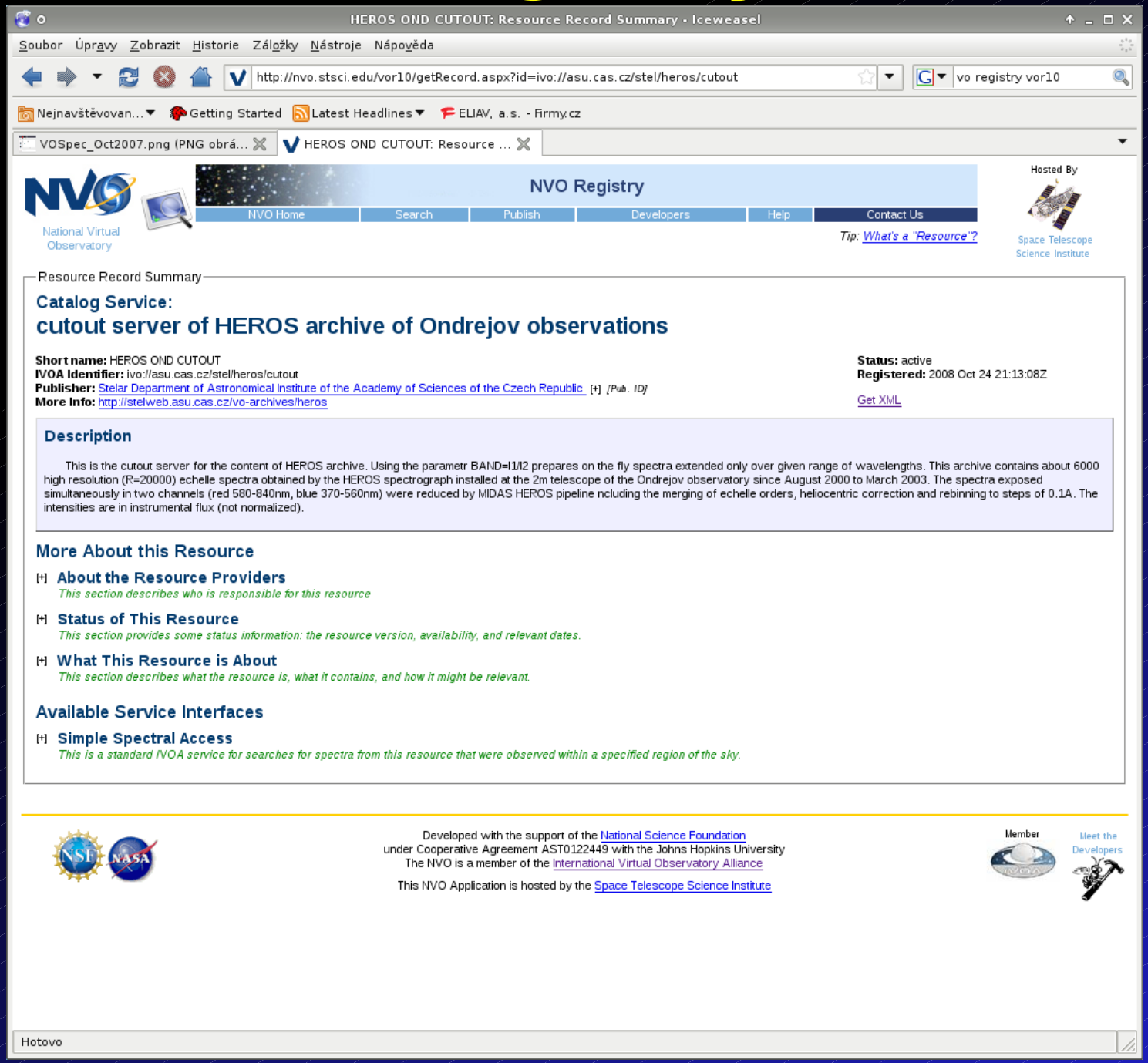
The following parameters **must** be implemented by a compliant service:

Parameter	*Sample value*	*Physical unit*	*Datatype*
POS	52,-27.8	degrees; defaults to ICRS	string
SIZE	0.05	degrees	double
BAND	2.7E-7/0.13	meters	string
TIME	1998-05-21/1999	ISO 8601 UTC	string
FORMAT	votable	-	string

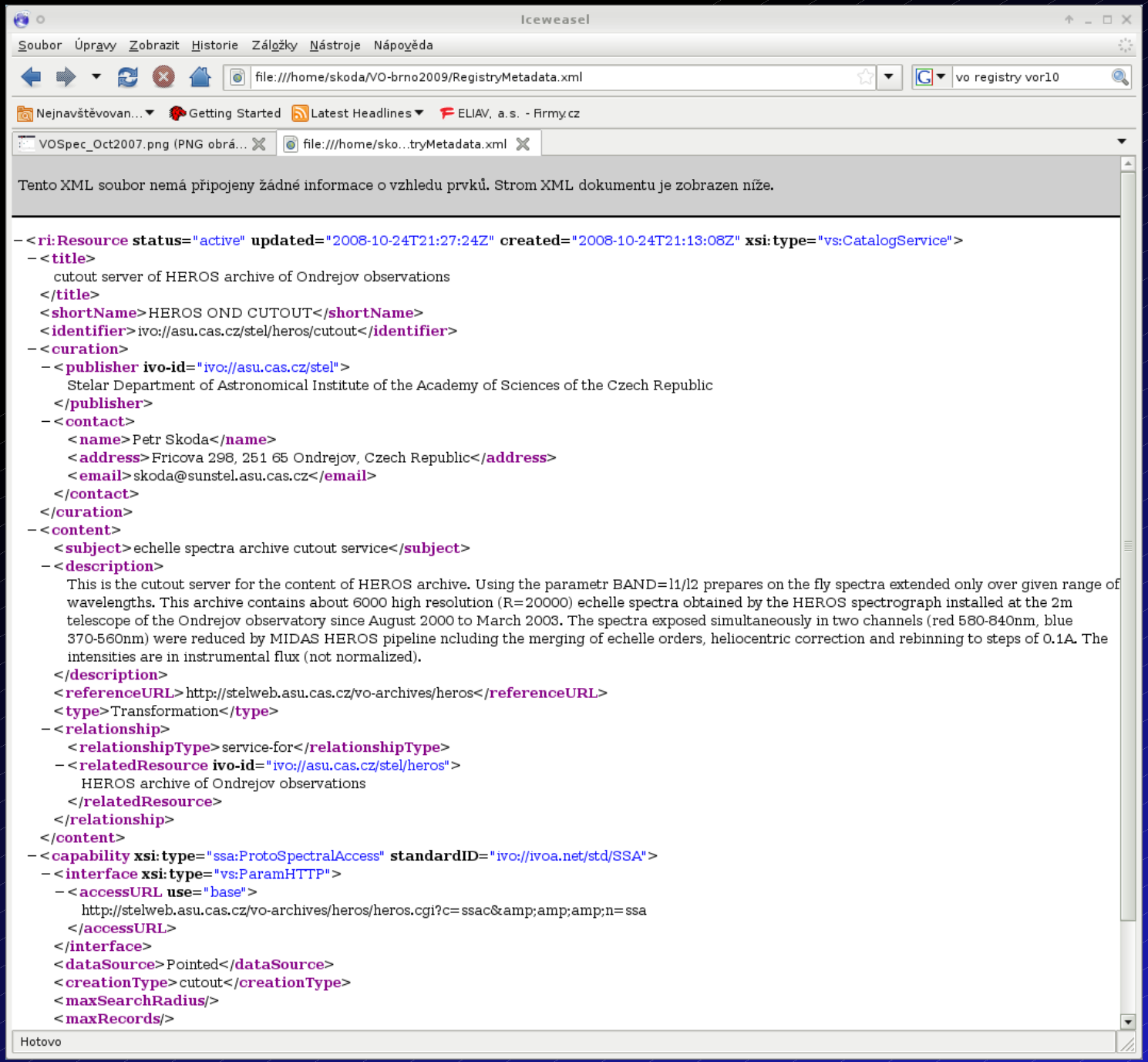
4.1.2 Recommended and Optional Query Parameters

Parameter	Sample value	Unit	Req	Datatype
APERTURE	0.00028 (=1°)	degrees	OPT	double
SPECRP	2000	λ/dλ	REC	double
SPATRES	0.05	degrees	REC	double
TIMERES	31536000 (=1yr)	seconds	OPT	double
SNR	5.0	dimensionless	OPT	double
REDSHIFT	1.3/3.0	dimensionless	OPT	string
VARAMPL	0.77	dimensionless	OPT	string
TARGETNAME	mars		OPT	string
TARGETCLASS	star		OPT	string
FLUXCALIB	relative		OPT	string
WAVECALIB	absolute		OPT	string
PUBDID	ADS/col#R5983		REC	string
CREATORDID	ivo://auth/col#R1234		REC	string
COLLECTION	SDSS-DR5		REC	string
TOP	20	dimensionless	REC	int
MAXREC	5000		REC	string
MTIME	2005-01-01/2006-01-01	ISO 8601	REC	string
COMPRESS	true		REC	boolean
RUNID			REC	string

VO Registry - web



VO Registry – XML




```
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  −<title>
      cutout server of HEROS archive of Ondrejov observations
    </title>
    <shortName>HEROS OND CUTOUT</shortName>
    <identifier>ivo://asu.cas.cz/stel/heros/cutout</identifier>
  −<curation>
    −<publisher ivo-id="ivo://asu.cas.cz/stel">
        Stelar Department of Astronomical Institute of the Academy of Sciences of the Czech Republic
      </publisher>
    −<contact>
        <name>Petr Skoda</name>
        <address>Fricova 298, 251 65 Ondrejov, Czech Republic</address>
        <email>skoda@sunstel.asu.cas.cz</email>
      </contact>
    </curation>
  −<content>
      <subject>echelle spectra archive cutout service</subject>
    −<description>
        This is the cutout server for the content of HEROS archive. Using the parametr BAND=l1/l2 prepares on the fly spectra extended only over given range of
        wavelengths. This archive contains about 6000 high resolution (R=20000) echelle spectra obtained by the HEROS spectrograph installed at the 2m
        telescope of the Ondrejov observatory since August 2000 to March 2003. The spectra exposed simultaneously in two channels (red 580-840nm, blue
        370-560nm) were reduced by MIDAS HEROS pipeline ncluding the merging of echelle orders, heliocentric correction and rebinning to steps of 0.1A. The
        intensities are in instrumental flux (not normalized).
      </description>
      <referenceURL>http://stelweb.asu.cas.cz/vo-archives/heros</referenceURL>
      <type>Transformation</type>
    −<relationship>
        <relationshipType>service-for</relationshipType>
      −<relatedResource ivo-id="ivo://asu.cas.cz/stel/heros">
          HEROS archive of Ondrejov observations
        </relatedResource>
      </relationship>
    </content>
  −<capability xsi:type="ssa:ProtoSpectralAccess" standardID="ivo://ivoa.net/std/SSA">
    −<interface xsi:type="vs:ParamHTTP">
      −<accessURL use="base">
          http://stelweb.asu.cas.cz/vo-archives/heros/heros.cgi?c=ssac&amp;amp;amp;n=ssa
        </accessURL>
      </interface>
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      <maxRecords/>
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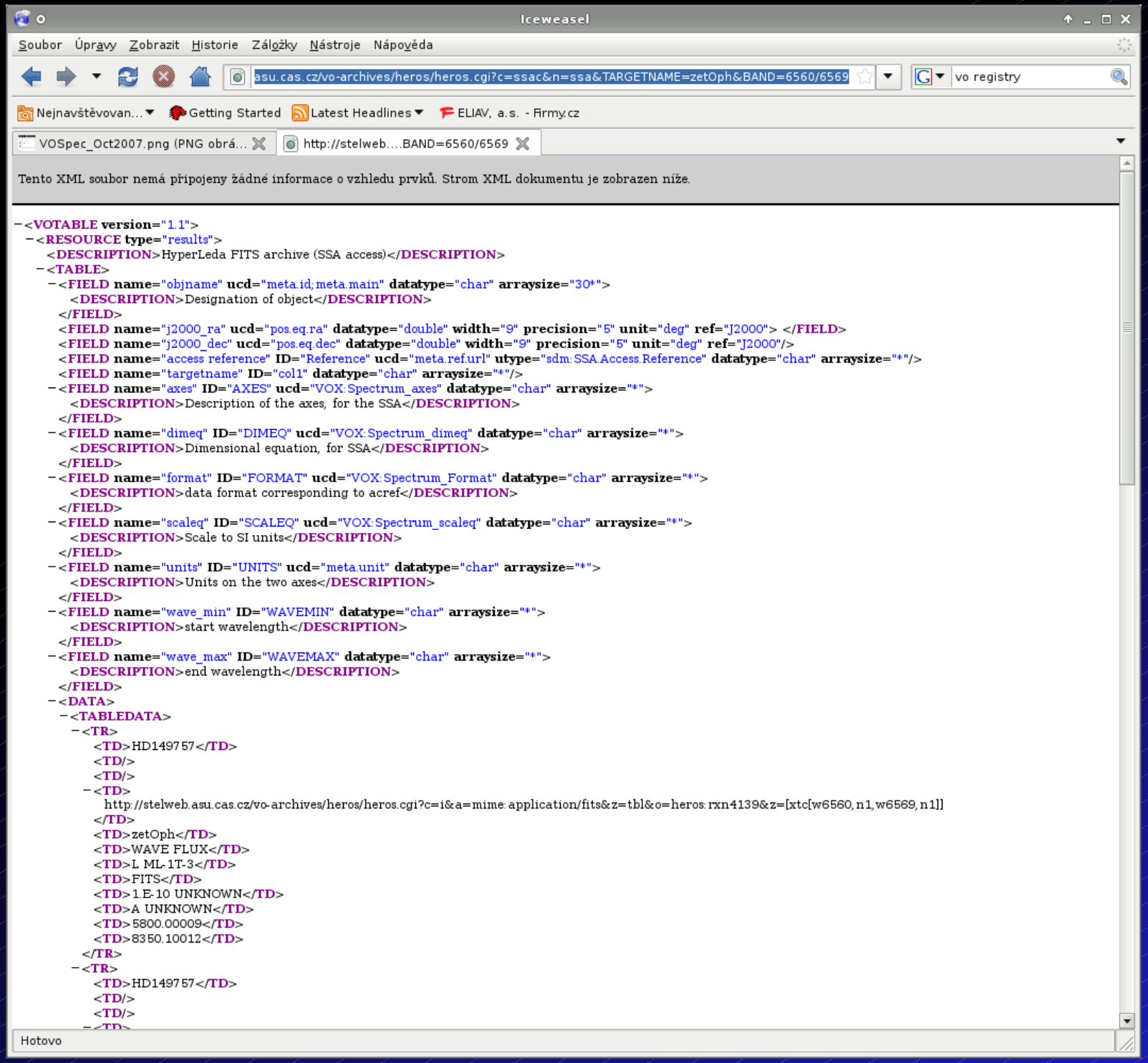

Service URL
Query Params

Response:

VOTable
with
embedded
accessRef

accessRef

VO-enabled tools

- Aladin
- VOPlot
- TOPCAT
- VOSpec
- SpecView
- SPLAT
- ViSiVio
- VOSED
- Sextractor – WESIX (Web Enabled Source Identification with Cross Matching)
- AstroWeka

ESO Archive Query Form

New

ESO Archive Overview | Form INFO | FAQ | Archive Facility HOME | ESO HOME

The checkboxes on the right of the parameters d

SEARCH | ShowAll | ShowNone | Reset

Target | Resolved
RA | DEC
Search Box 00 10 00 | Input RA
Output | Sexagesimal (h, deg)

M	More	Target Ra, Dec	Program ID	Ins
-		05:22:04.40 -67:58:56.4	074.D-0696(A)	EM
-		05:22:04.40 -67:58:56.4	074.D-0696(A)	EM
-		05:22:04.40 -67:58:56.4	074.D-0696(A)	EM
		05:22:14.41 -67:58:48.0	68.C-0019(A)	WF
		05:22:14.82 -67:58:43.0	68.C-0019(A)	WF
		05:22:14.91 -67:58:42.1	68.C-0019(A)	WF
		05:22:15.02 -67:58:55.7	68.C-0019(A)	WF
		05:22:15.07 -67:58:41.4	68.C-0019(A)	WF
		05:22:27.29 -67:58:07.0	68.C-0238(A)	FO

Request Marked Datasets | Reset

A total of 68 were found matching the provided criteria

Download result table from: export18381

Sky Map: the Aladin@CDS Java applet
interchange of data between ESO and Al
Further **help**.
You may also **convert** the VOTable and

Use tabular output even if only one row is retur
Use full-screen output even if more than one ro
Format results in plain text only (without HTML

Sort by: Nothing (Faster)

Aladin v3.0 multiview

Load... | Save... | Tools... | Print... | Help... | Undetach

Position J2000 05:21:59.98 -67:59:29.9 | Pixel full | unknown

selec | dist | draw | tag | text | filter | rgb | blink | rainb | cont | zoom | mglss | hist | prop | del

Simbad
ESO Archive
Instrume
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MAMA.A.ES

multiview | Zoom 2/3x | out

05:22:04.40	-67:58:56.4	EMMI.2004-11-21T07:12:45.503	074.D-0696(A)	EMMI/2.15	10
05:22:04.40	-67:58:56.4	EMMI.2004-11-21T07:15:16.650	074.D-0696(A)	EMMI/2.15	10
05:22:15.02	-67:58:55.7	WFI.2001-12-08T06:08:34.132	68.C-0019(A)	WFI	20
05:22:20.41	-67:59:12.1	WFI.2001-12-08T07:58:52.819	68.C-0019(A)	WFI	20
05:22:21.12	-67:59:05.9	WFI.2001-12-07T03:16:29.145	68.C-0019(A)	WFI	20

(c)1999-2005 ULP/CNRS - Centre de Données astronomiques de Strasbourg | 5 planes, 1 view, 35Mb

Complex queries by:
- Coordinates, target name
- Input lists
- Scheduling information
- Proposal information
- Instrument, obs category

O SAF is
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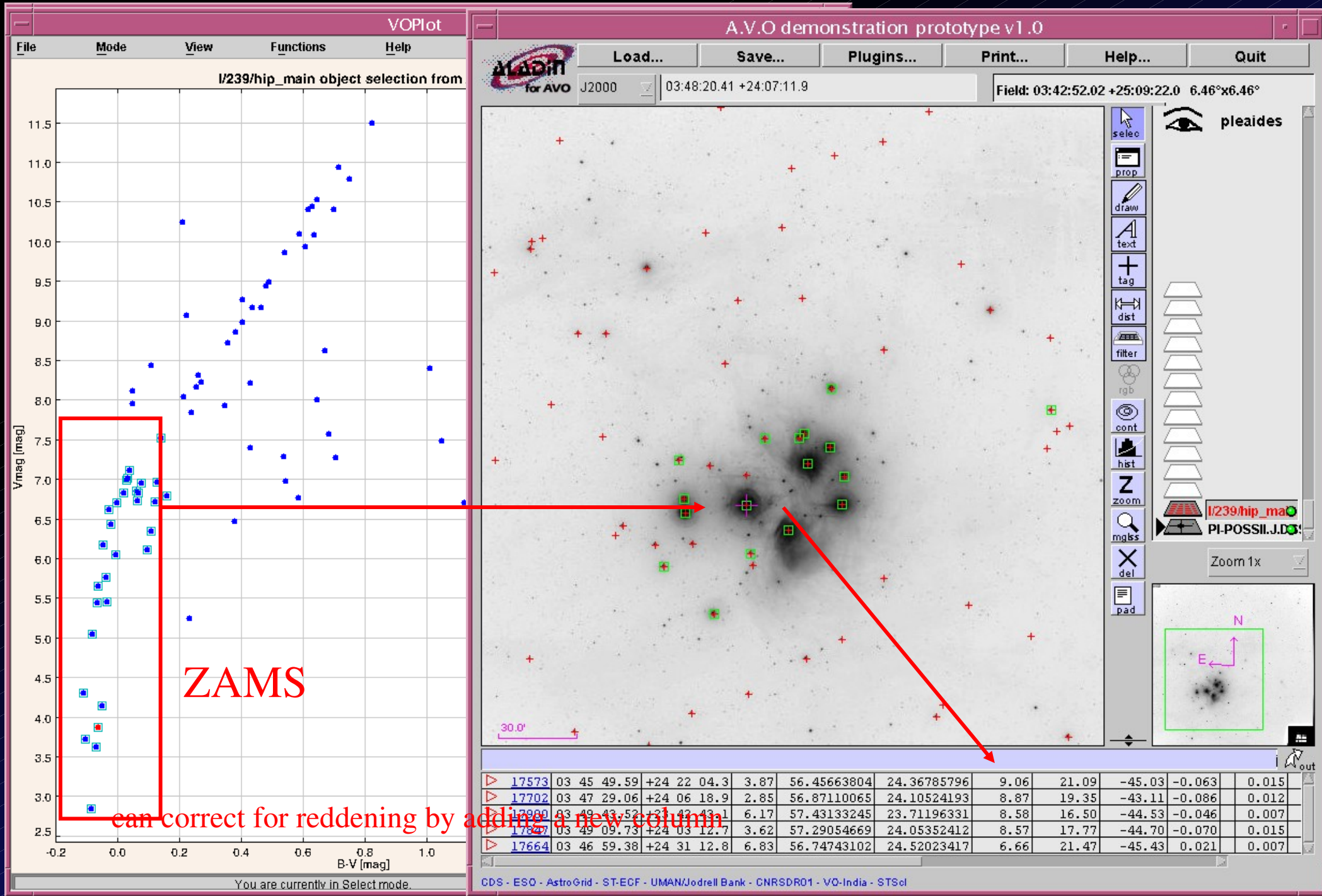
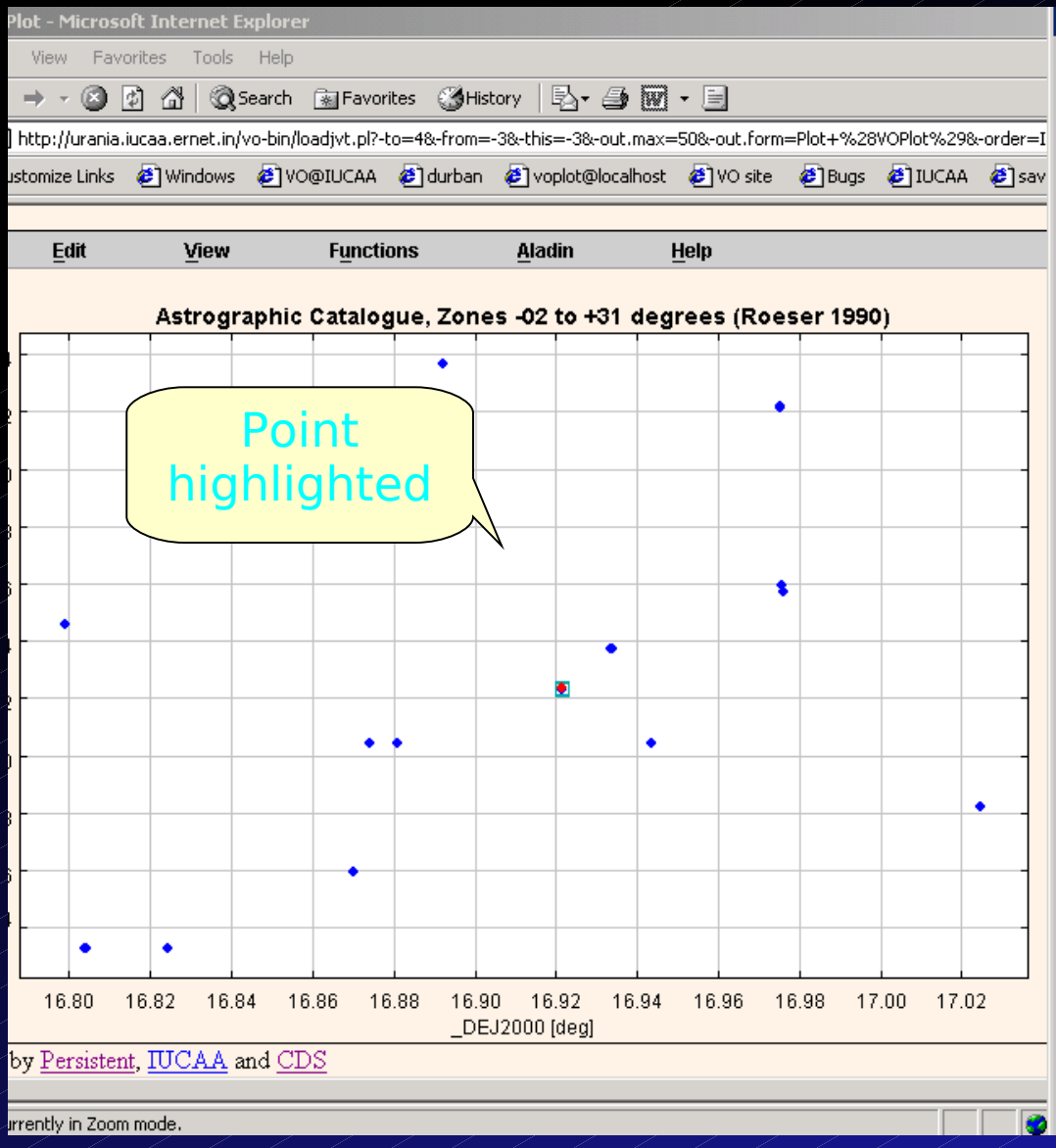
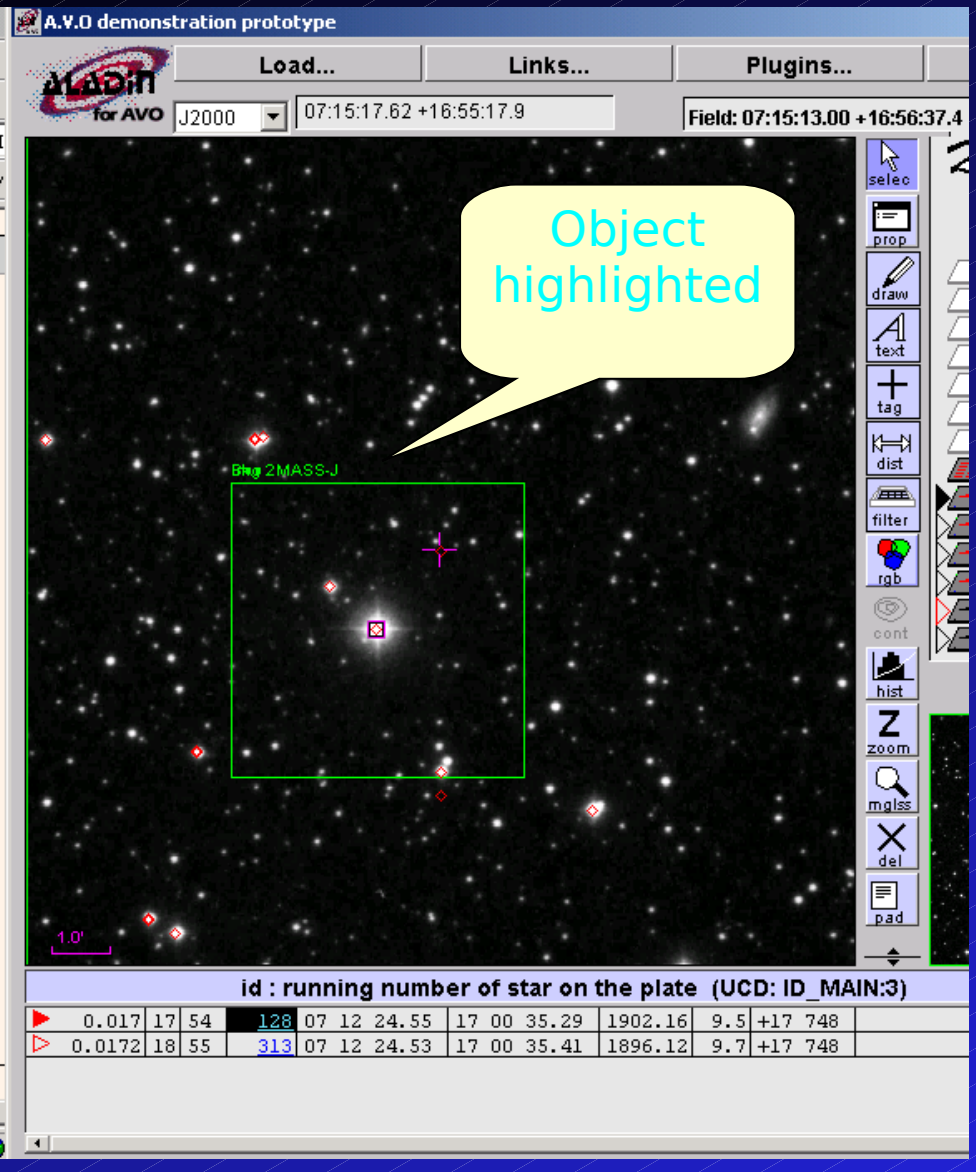
Colour-magnitude diagram



can correct for reddening by adding a new column

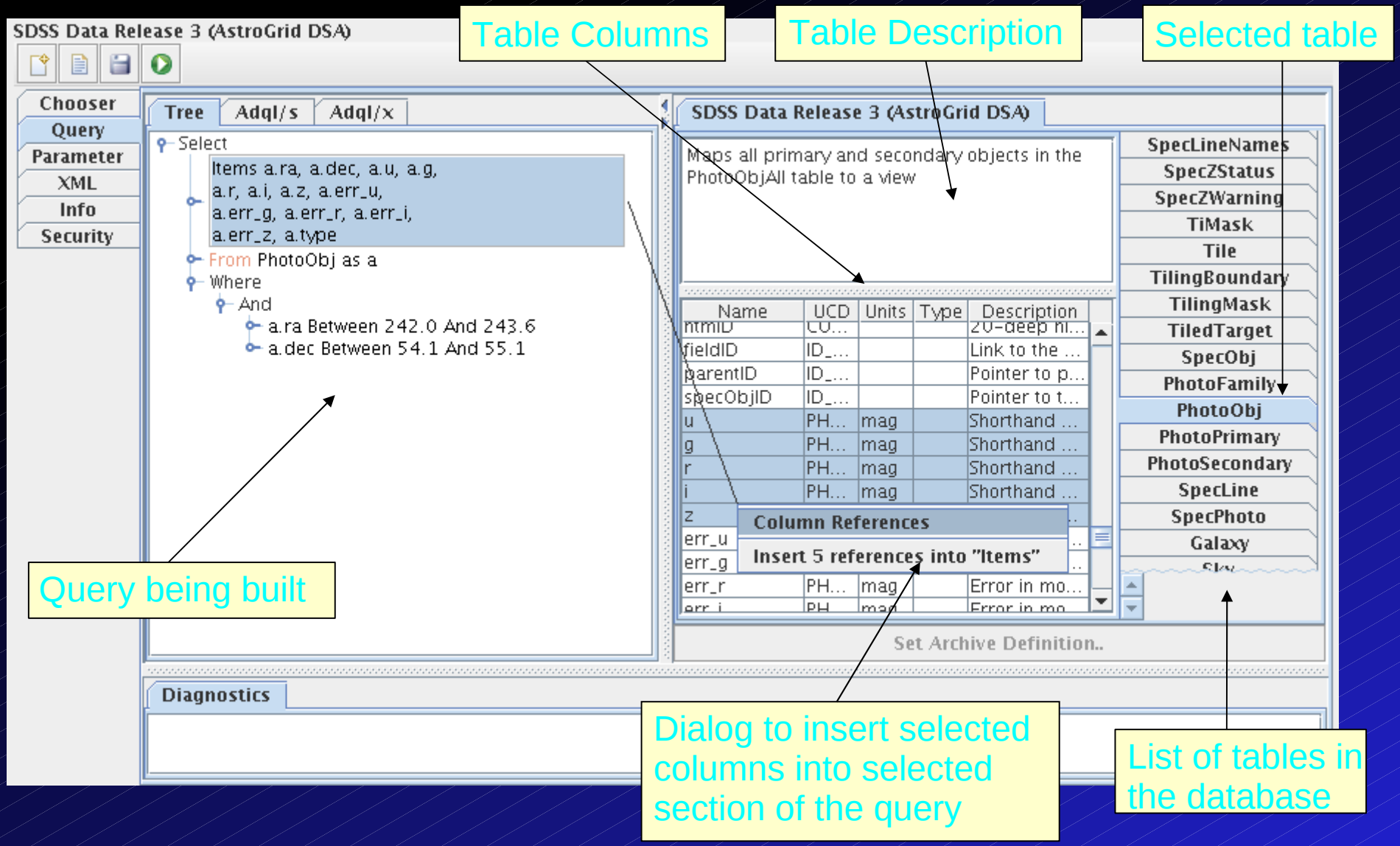
VOPlot-Aladin interoperability



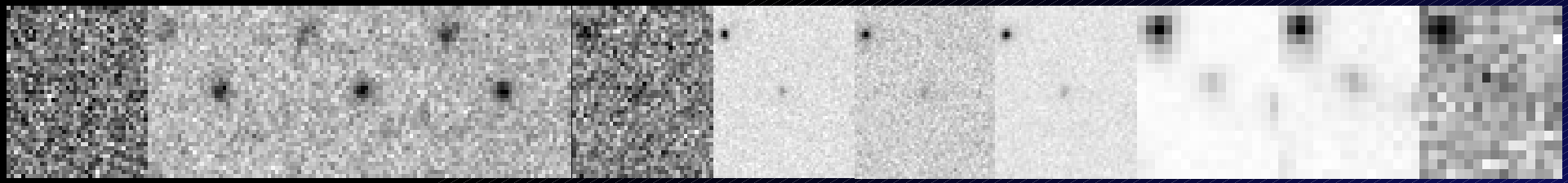


Building a query

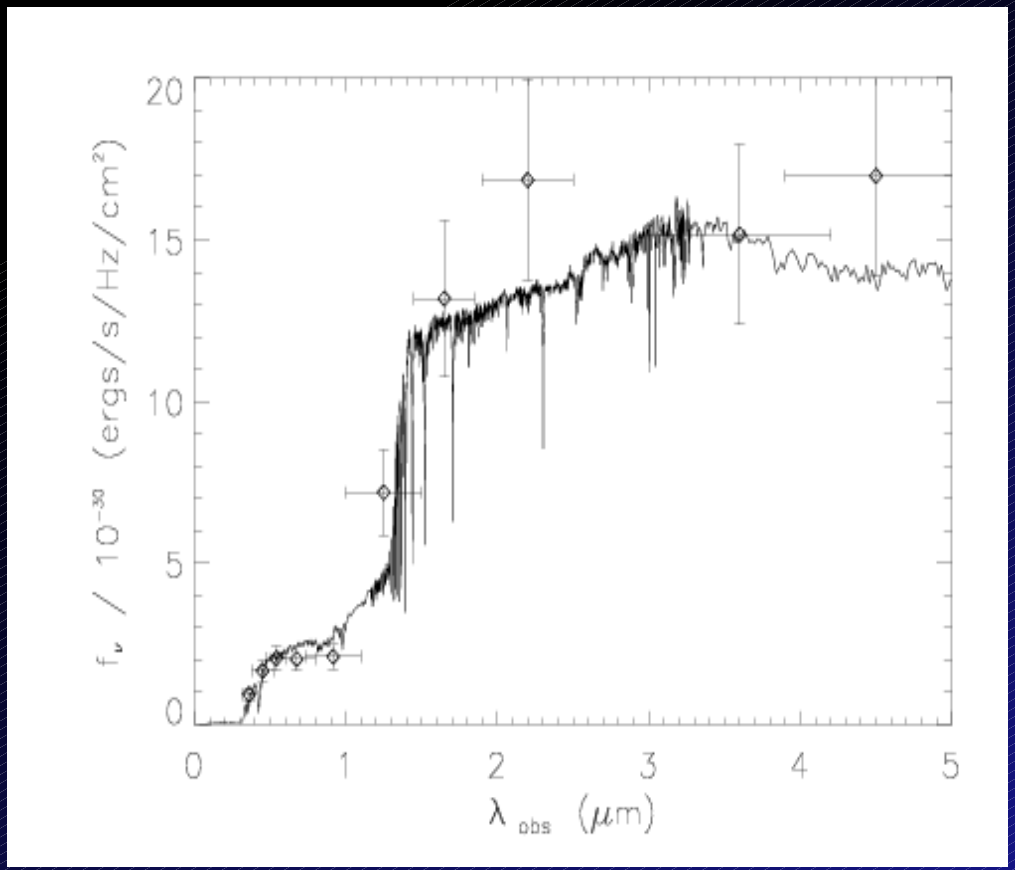
AstroGrid Query Builder



SED from photometry

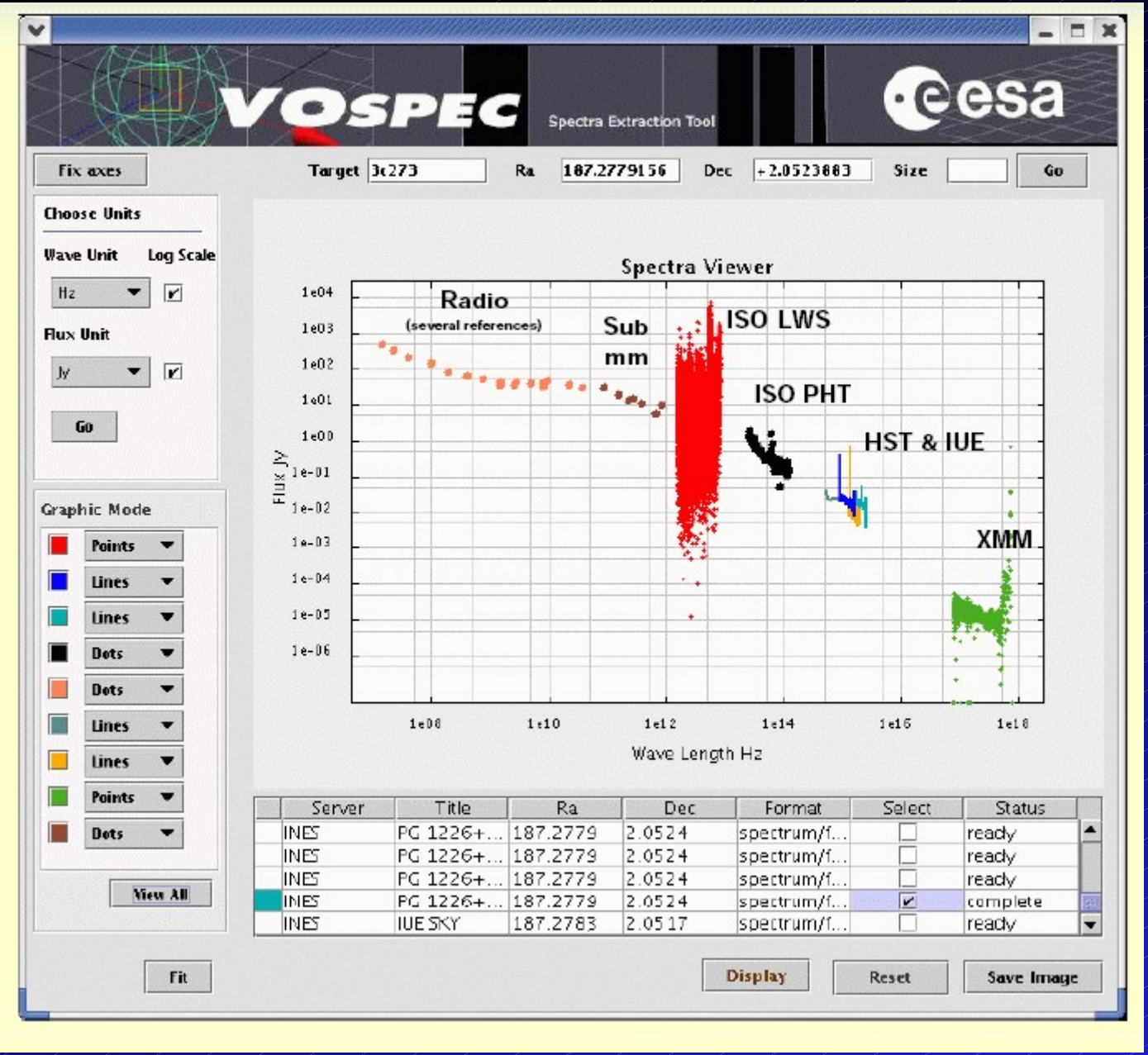


U B V R I J H Ks 3.6μm 4.5 μm 5.8 μm

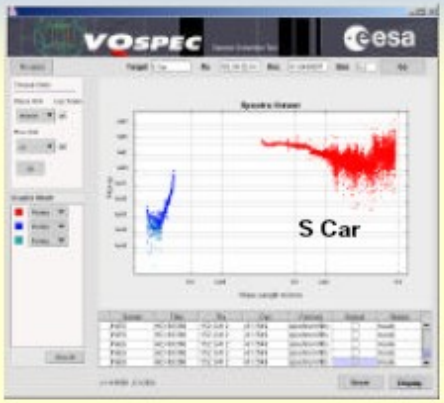


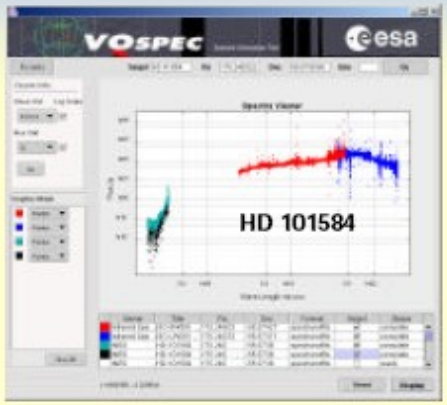
zphot = 2.52
Age = 500 Myr
Stellar mass = 9.9e10^9 M_{sun}
Reduced chi-sq = 1.04
SFR current = 0.79 M_{sun} yr^{-1}

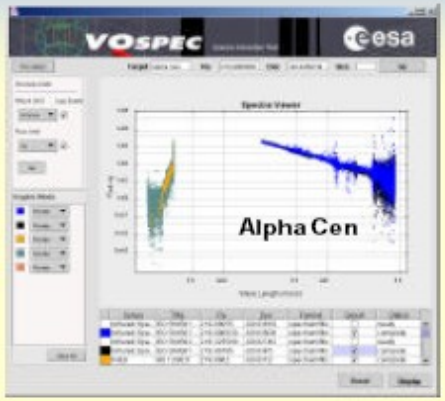
VOspec

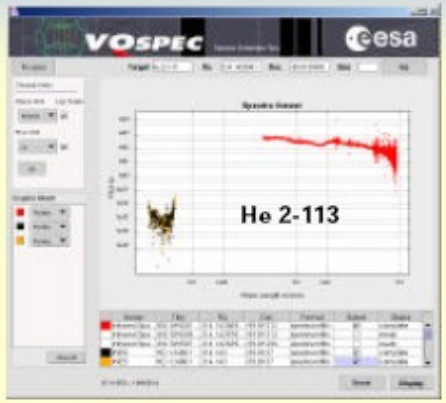

VOSPEC
Spectra Extraction Tool
esa
Fix axes
Target 3c273
Ra 187.2779156
Dec +2.0523883
Size
Go
Choose Units
Wave Unit
Log Scale
Hz
Flux Unit
Jy
Go
Graphic Mode
Points
Lines
Lines
Dots
Dots
Lines
Lines
Points
Dots
View All
Spectra Viewer
Radio
(several references)
Sub
mm
ISO LWS
ISO PHT
HST & IUE
XMM
Flux Jy
1e04
1e03
1e02
1e01
1e00
1e-01
1e-02
1e-03
1e-04
1e-05
1e-06
1e08
1e10
1e12
1e14
1e16
1e18
Wave Length Hz
Server
Title
Ra
Dec
Format
Select
Status
INES PG 1226+... 187.2779 2.0524 spectrum/f... ready
INES PG 1226+... 187.2779 2.0524 spectrum/f... ready
INES PG 1226+... 187.2779 2.0524 spectrum/f... ready
INES PG 1226+... 187.2779 2.0524 spectrum/f... complete
INES IUE SKY 187.2783 2.0517 spectrum/f... ready
Fit
Display
Reset
Save Image

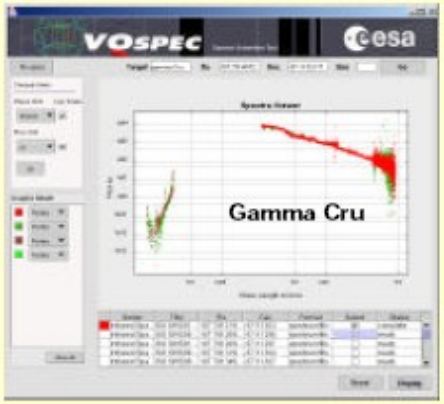
VOSpec working example: Sampling AGBs

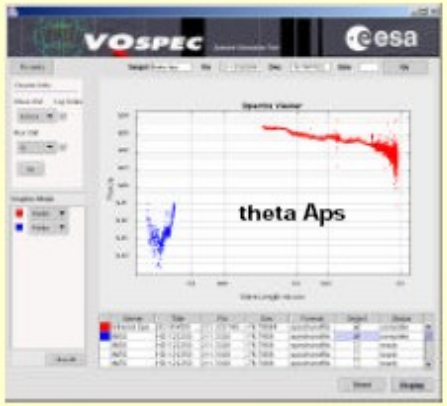


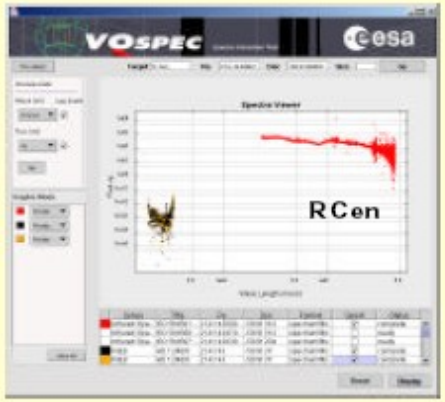


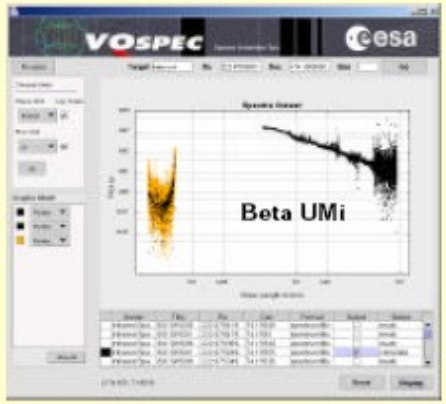


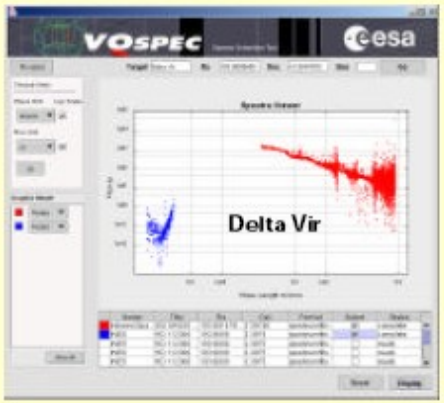


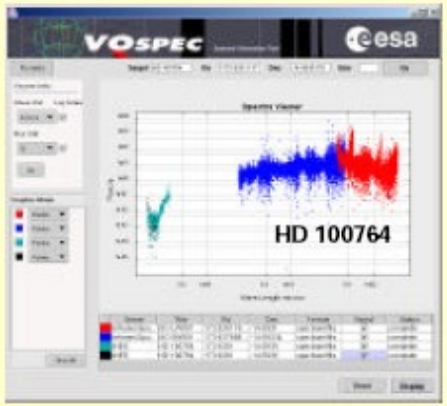


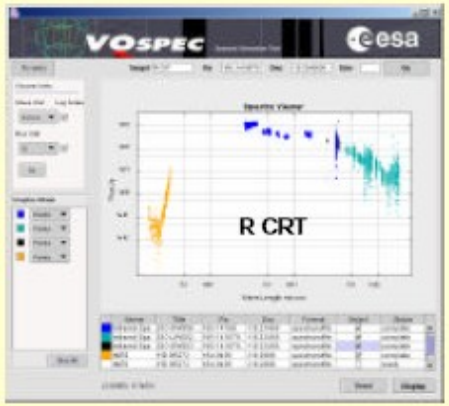


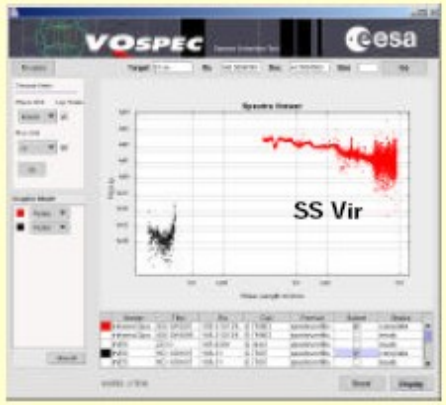






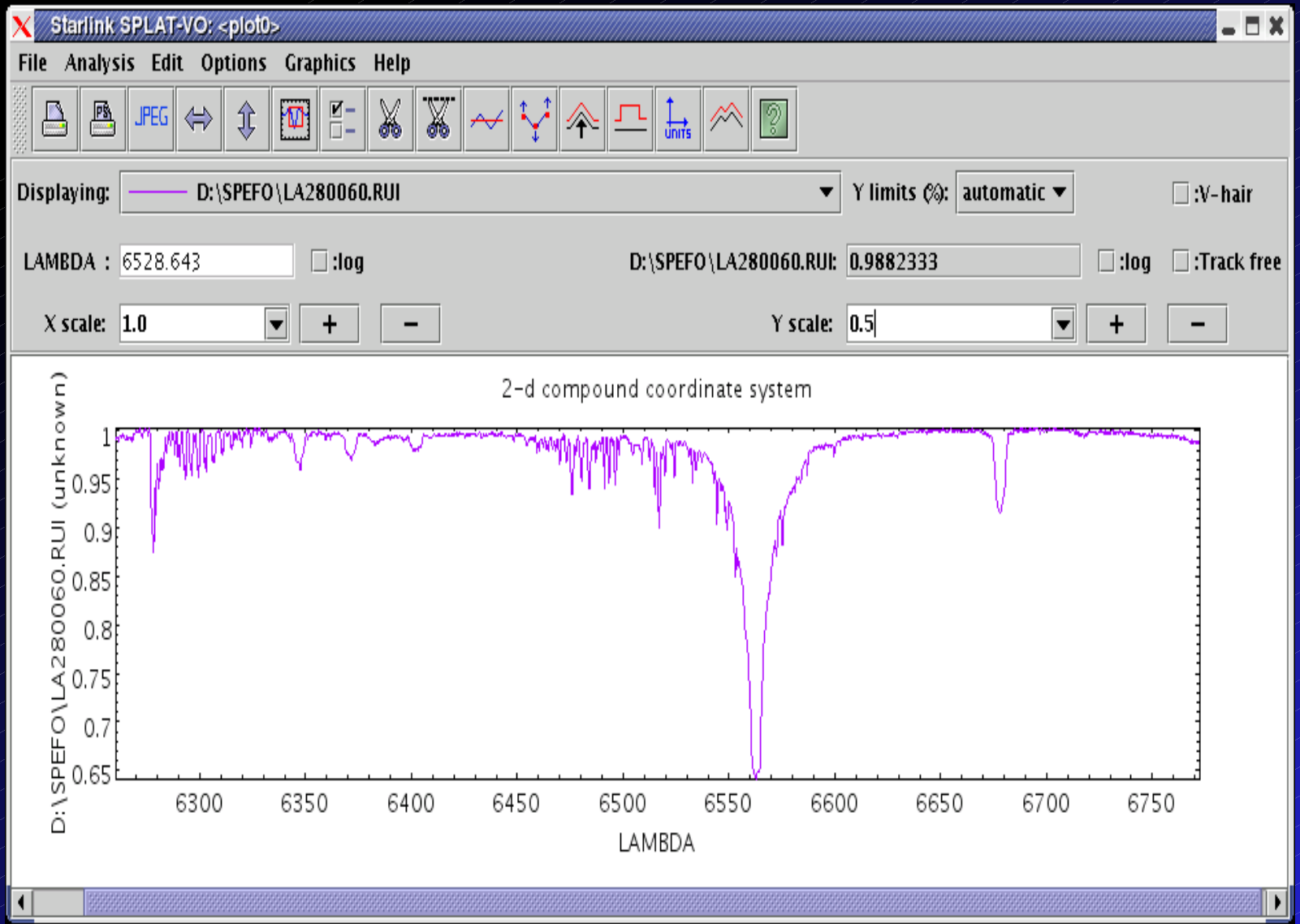






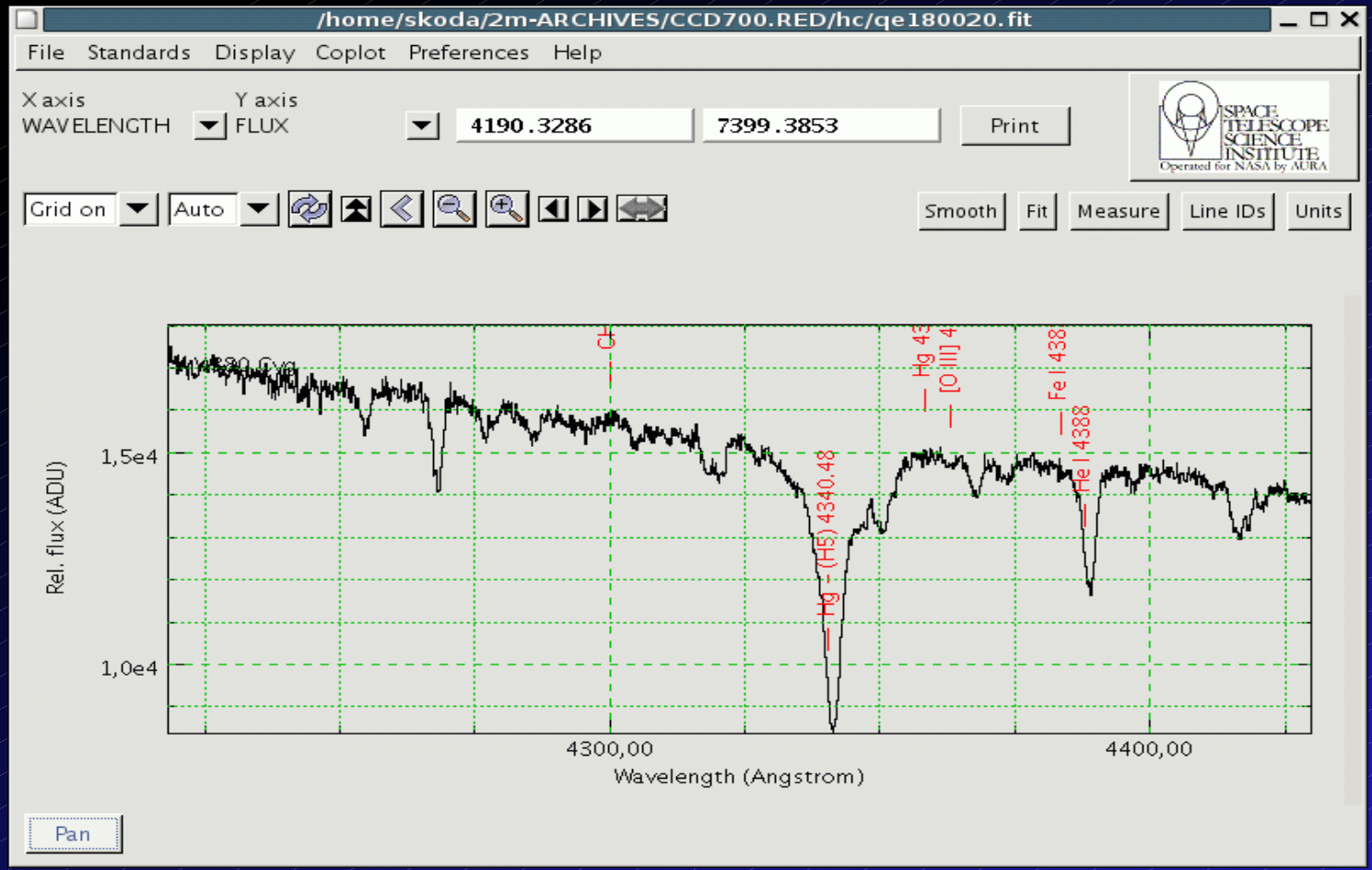
SPLAT-VO

- VO Client for analysis (SSA and local files)
  1D FITS IRAF WCS (CRVAL1, CDELT1)



SpecView 2.14.1

- VO Client for analysis (SSA and local files)
  1D FITS IRAF WCS (CRVAL1, CDELT1)



Spectrum Services for the VO - Microsoft Internet Explorer

Back Search Favorites File Edit View Favorites Tools

Address http://voservices.net/spectrum/search_list.aspx?search=cone&view=graph&page=o Go

NVO

National Virtual Observatory

Spectrum Services

home | docs | search | MySpectrum | collections | webservices | user

not logged in
login | register

Search Results

Found 12 objects. Displaying from 1 to 3

List mode Image mode

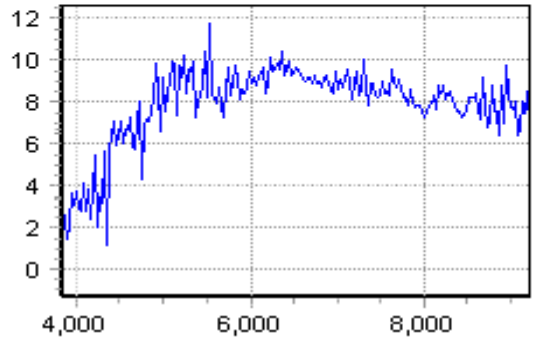
First Prev Next Last

1 . SDSS J115944.85+000000.00

ivo://jhu/sdss/dr4#80443408212033536 |
ivo://sdss/dr4/spec#80443408212033536 details

class: Galaxy , Z = 0.1009

ra = 179.936874 , dec = 0.941241

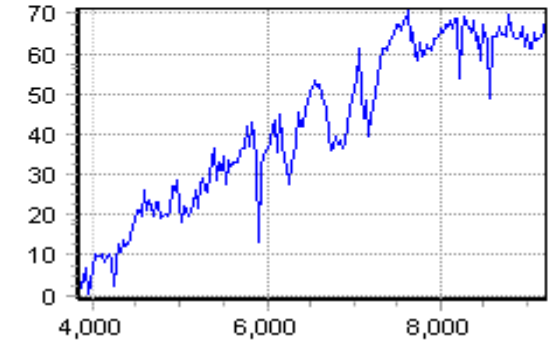


2 . SDSS J120008.29+016000.00

ivo://jhu/sdss/dr4#80443408262365184 |
ivo://sdss/dr4/spec#80443408262365184 details

class: Galaxy , Z = 0.0000

ra = 180.034561 , dec = 1.146855

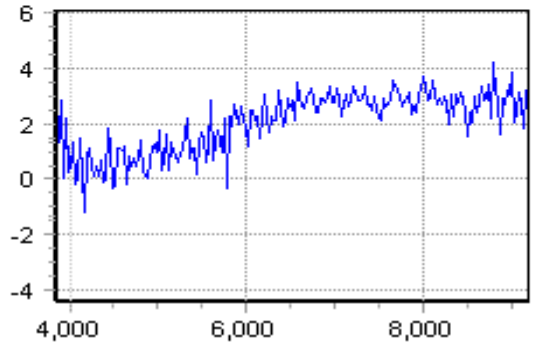


3 . SDSS J115923.80+000000.00

ivo://jhu/sdss/dr4#80443407863906304 |
ivo://sdss/dr4/spec#80443407863906304 details

class: Galaxy , Z = 0.4517

ra = 179.849167 , dec = 0.984768



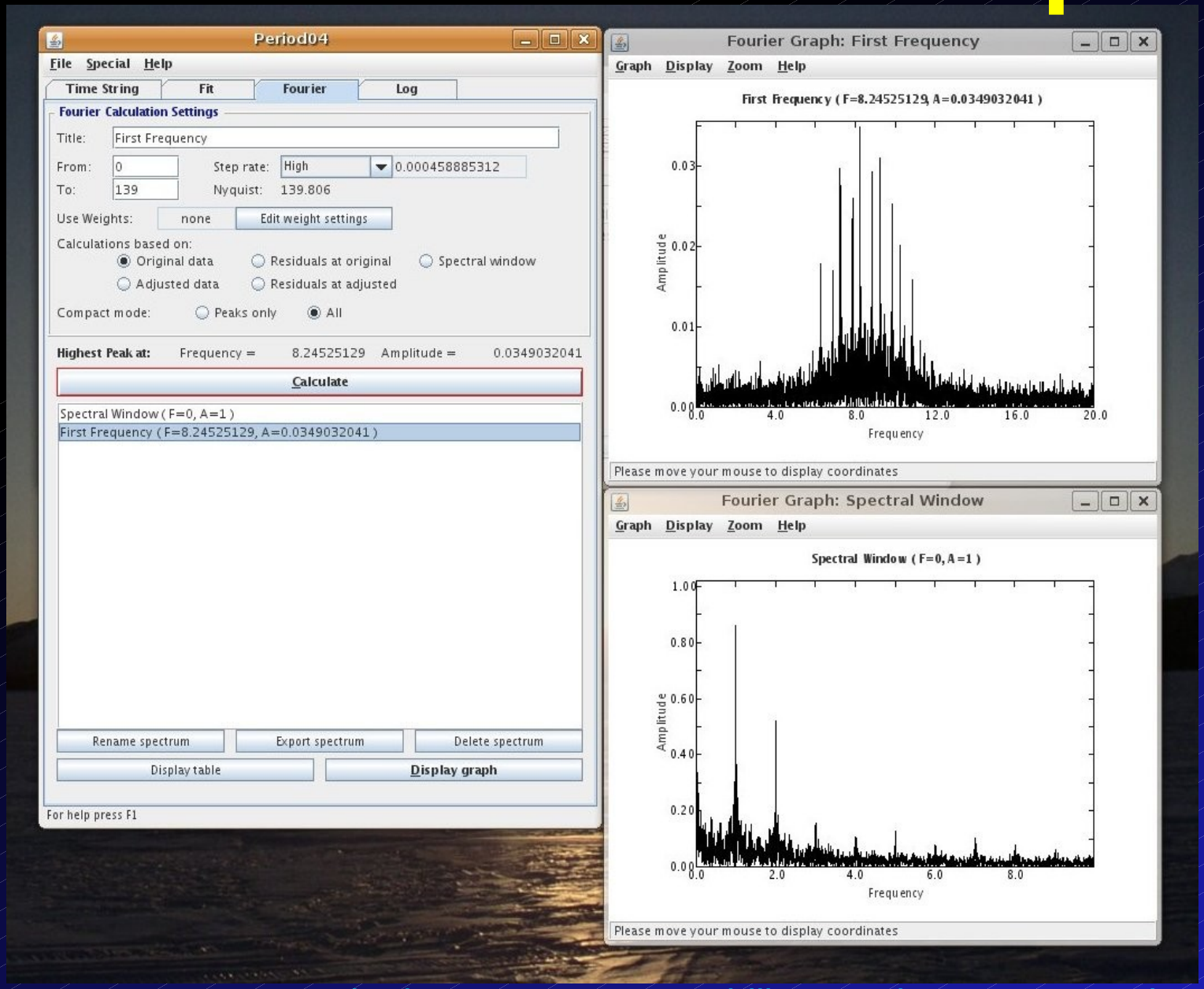
Select All Clear All What do you want to do with the results? Download data

- Download data
- Save to MySpectra
- Plot on a graph
- Calculate composite
- Calculate synthetic magnitudes
- Fit continuum & lines

<< Results < Back Next > Finish >>

Internet

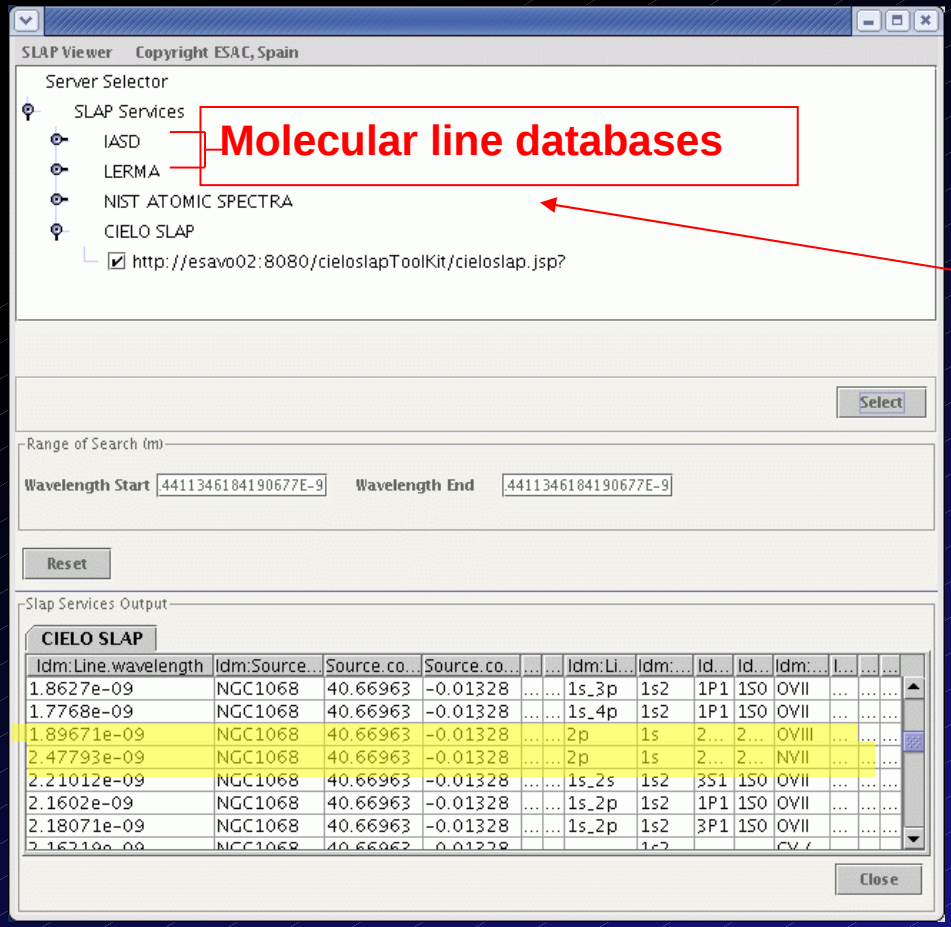
Period04 - PLASTIC compatible

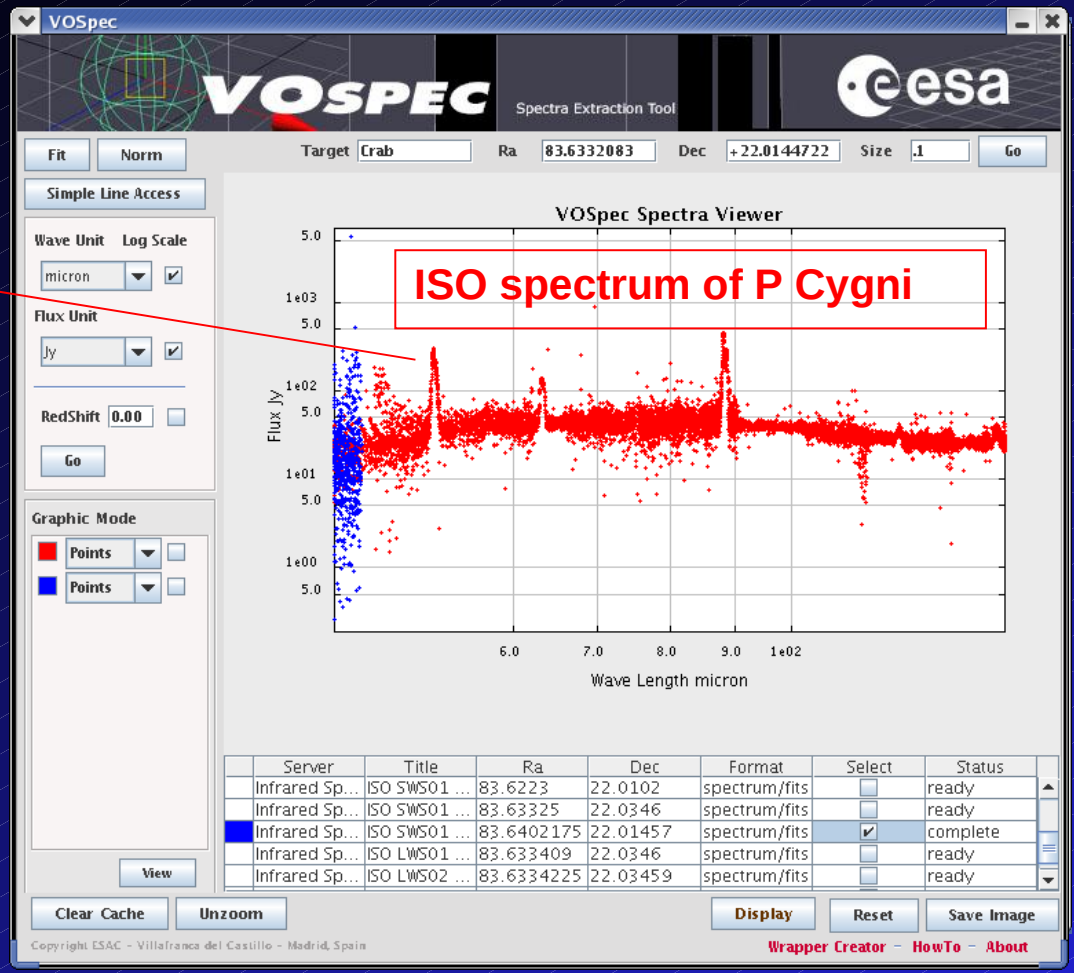


P.Skoda, IVOA Interoperability meeting Apps Session,
STScI Baltimore, 30-th October 2008

CIELO VO implementation

CIELO-AGN is the first astrophysical line catalogue compatible with the (draft) IVOA *Line Data Model* and accessible through the (draft) *Simple Line Access Protocol*



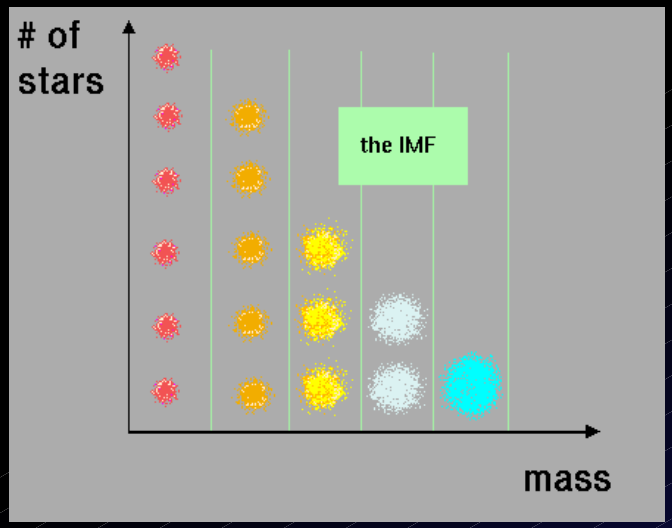


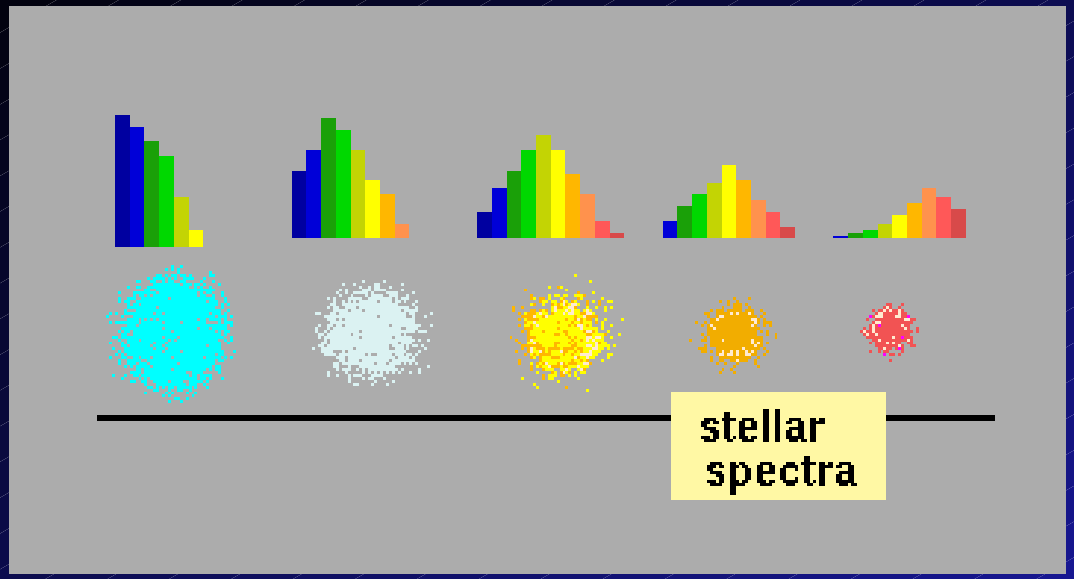
(IVOA Line Data Model: Dubernet, Osuna et al., in preparation)
(Simple Line Access Protocol: Salgado et al., in preparation)

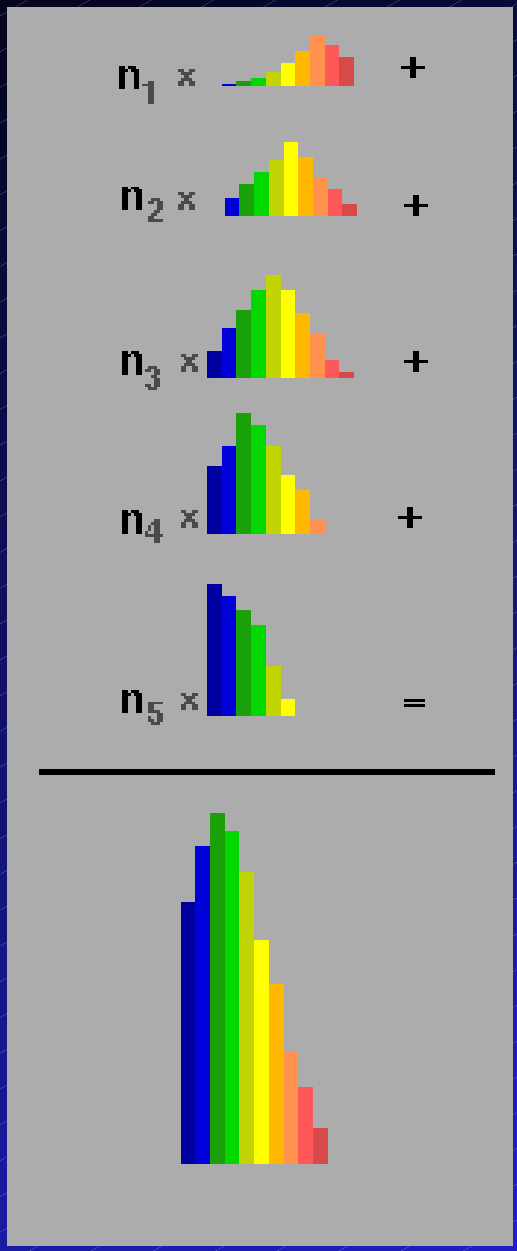
Teoretická VO (TVO)

- Metody VO (parametry v DB, SQL...) pro výzkum výsledků simulací, katalogy simulovaných objektů jako SDSS...
- Prohlížení simulačního prostoru podle různých os – parametrů, výřezy na oblasti...
- Virtuální vesmír (AstroGrid)
- Formování umělých galaxií, kulových hvězdokup – N částicové modely
- Srážky galaxií

Stellar populations are modeled with synthesis models

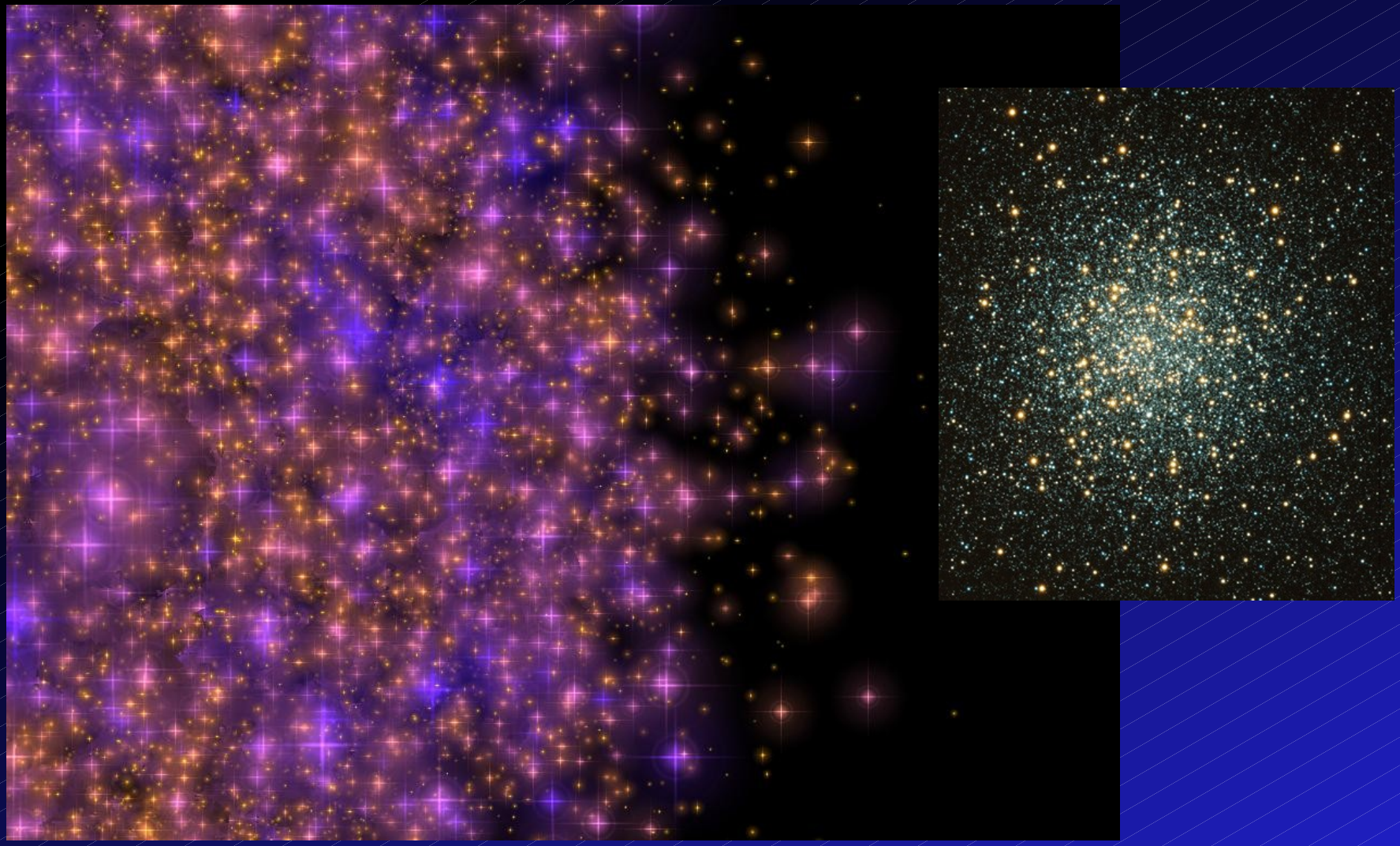




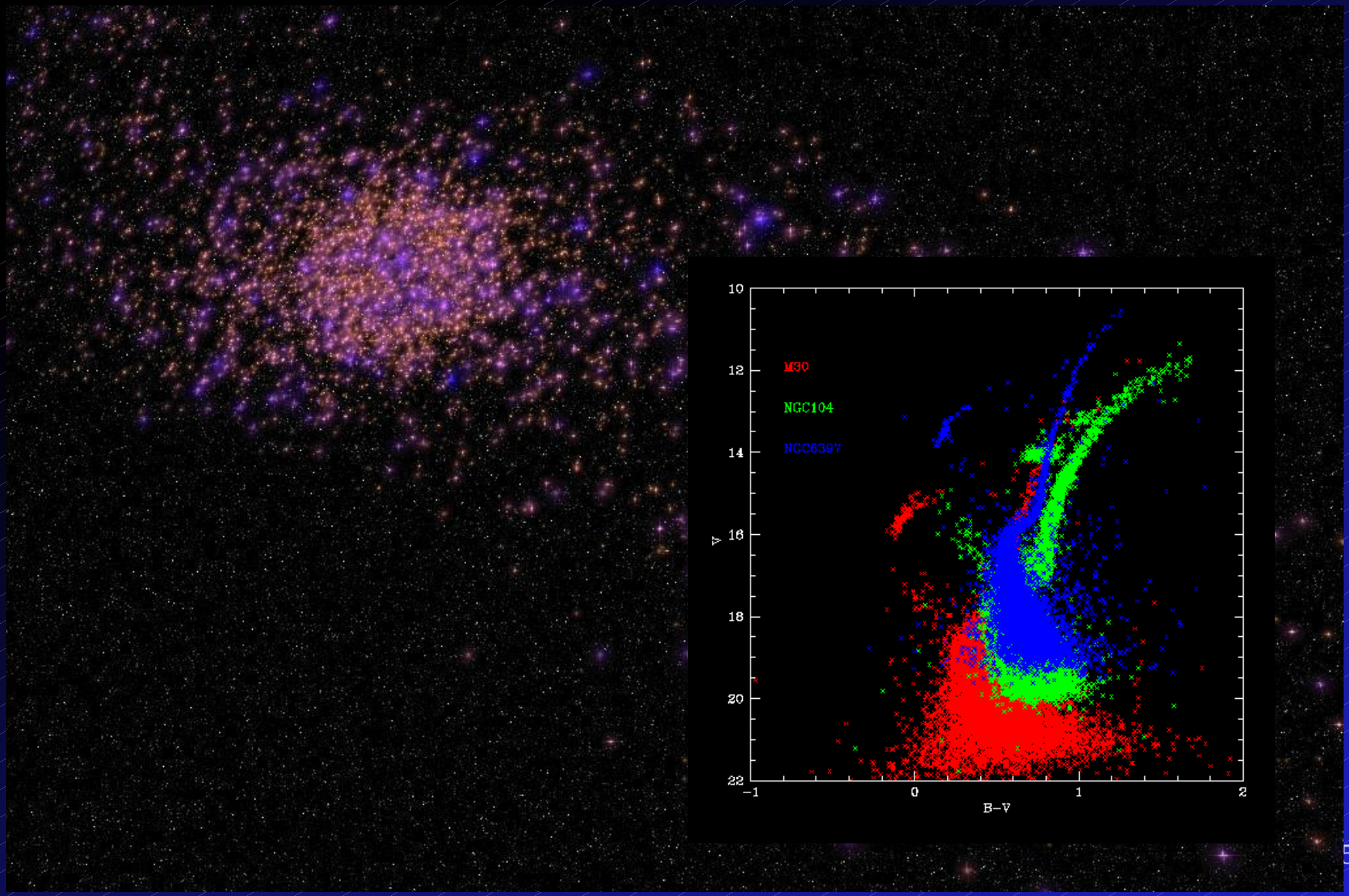


(Available as *Theoretical Simple Access Protocol* server at: http://ov.inaoep.mx)

N Body Simulations of Globular Cluster Evolution



N Body Simulations of Globular Cluster Evolution

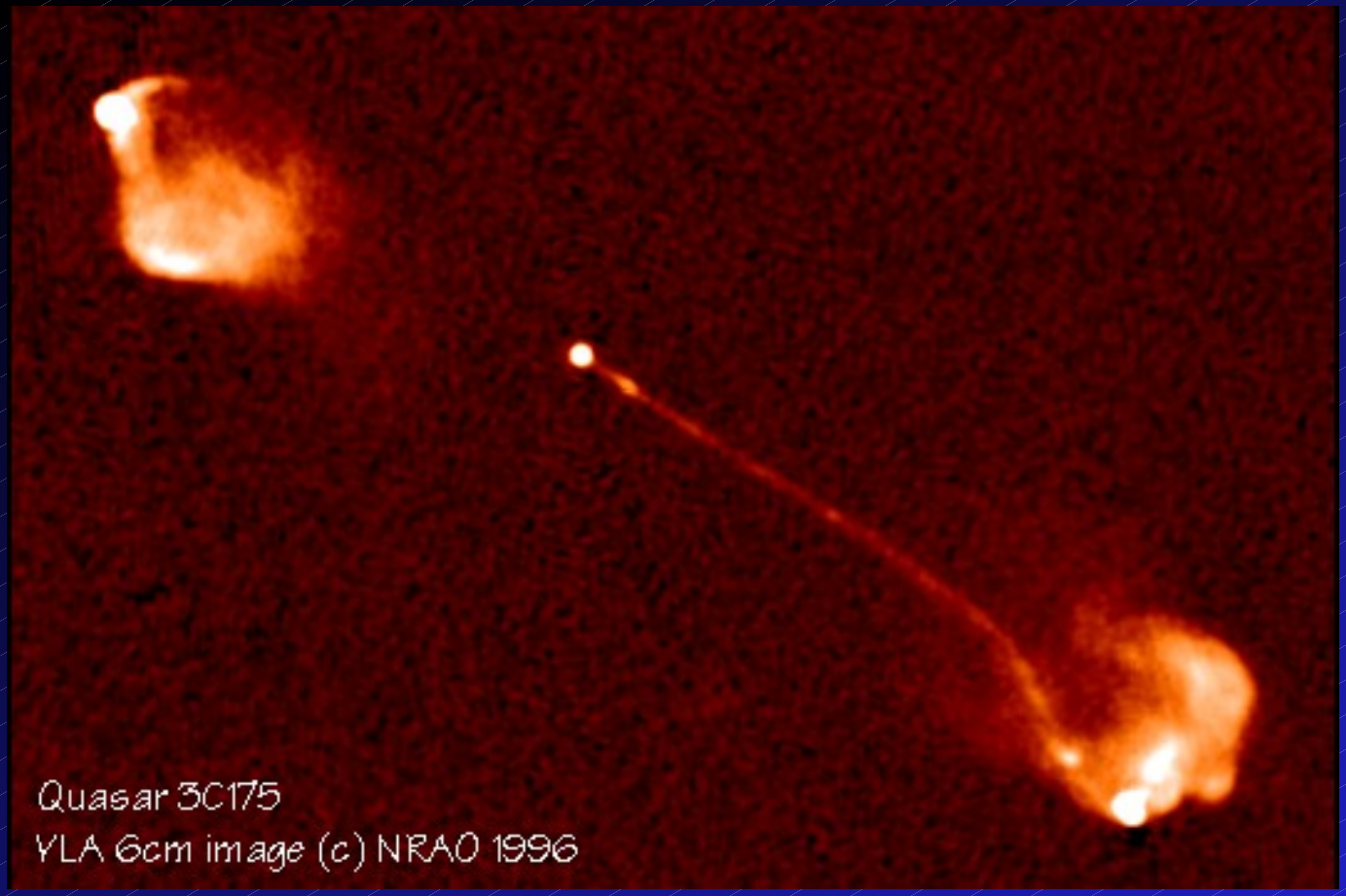


Virtuální dalekohled

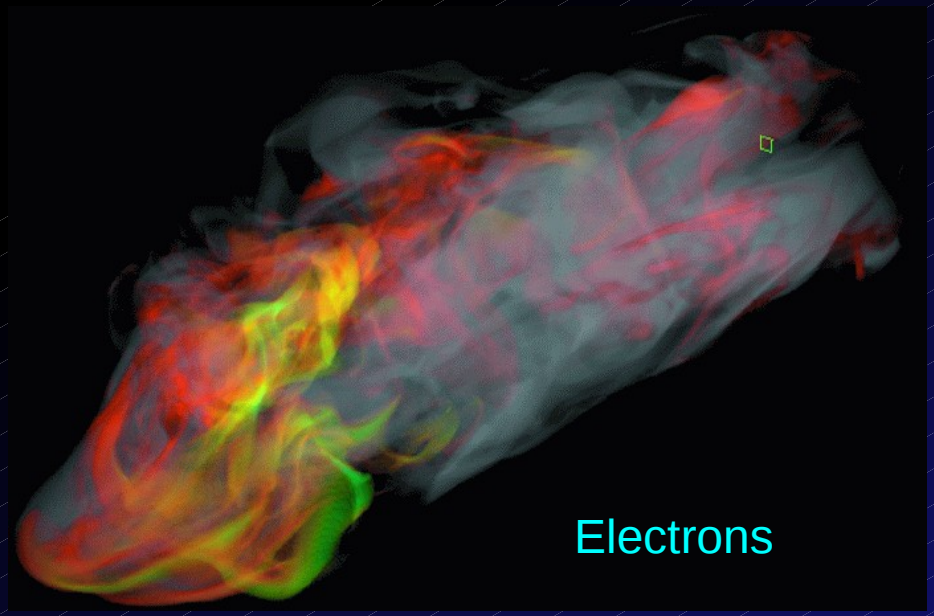
- Výpočet na GRIDu (Superpočítači)
- Vizualizace dat ve 3D
- Konvoluce s PSF daného přístroje (přehlídky)
- Příslušné natočení , perspektiva
- Hledání vhodných podobností ve VO
  - Automaticky
  - Chi^2 match
  - NN analýza

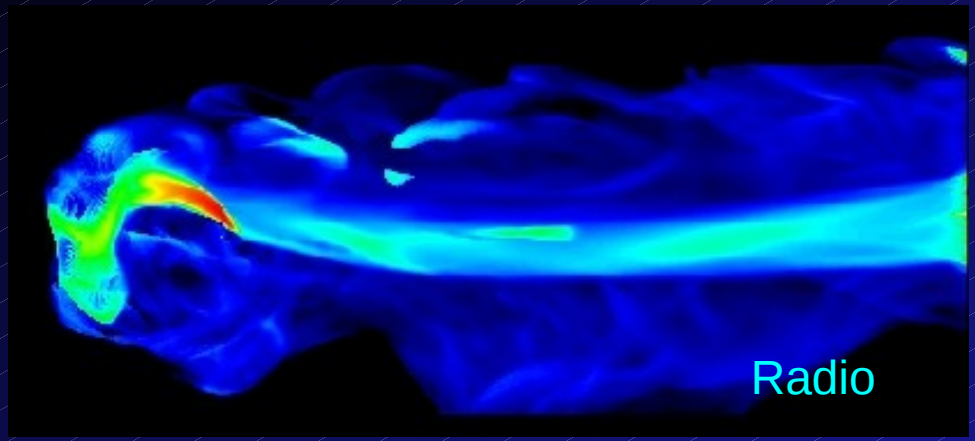
Collimated Outflows from AGN

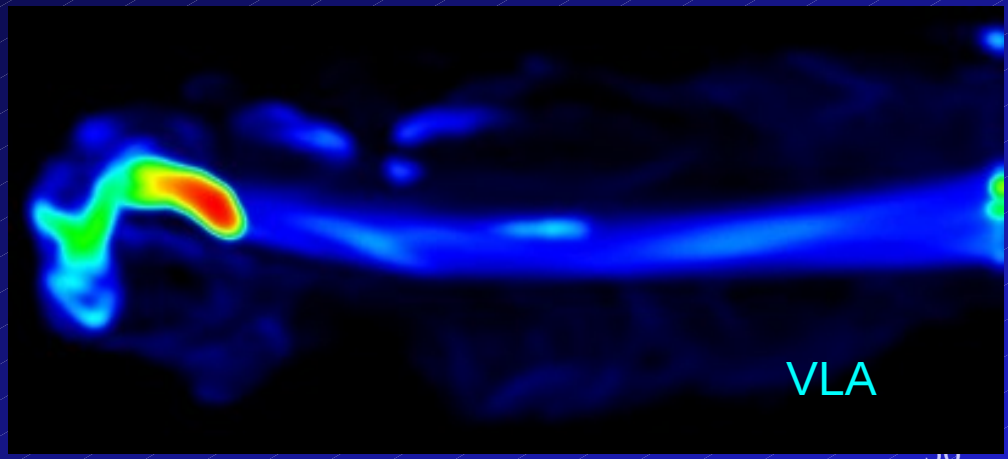
- 3C 175



MHD Simulations of Collimated Outflows from AGN – Virtual Telescope Observations





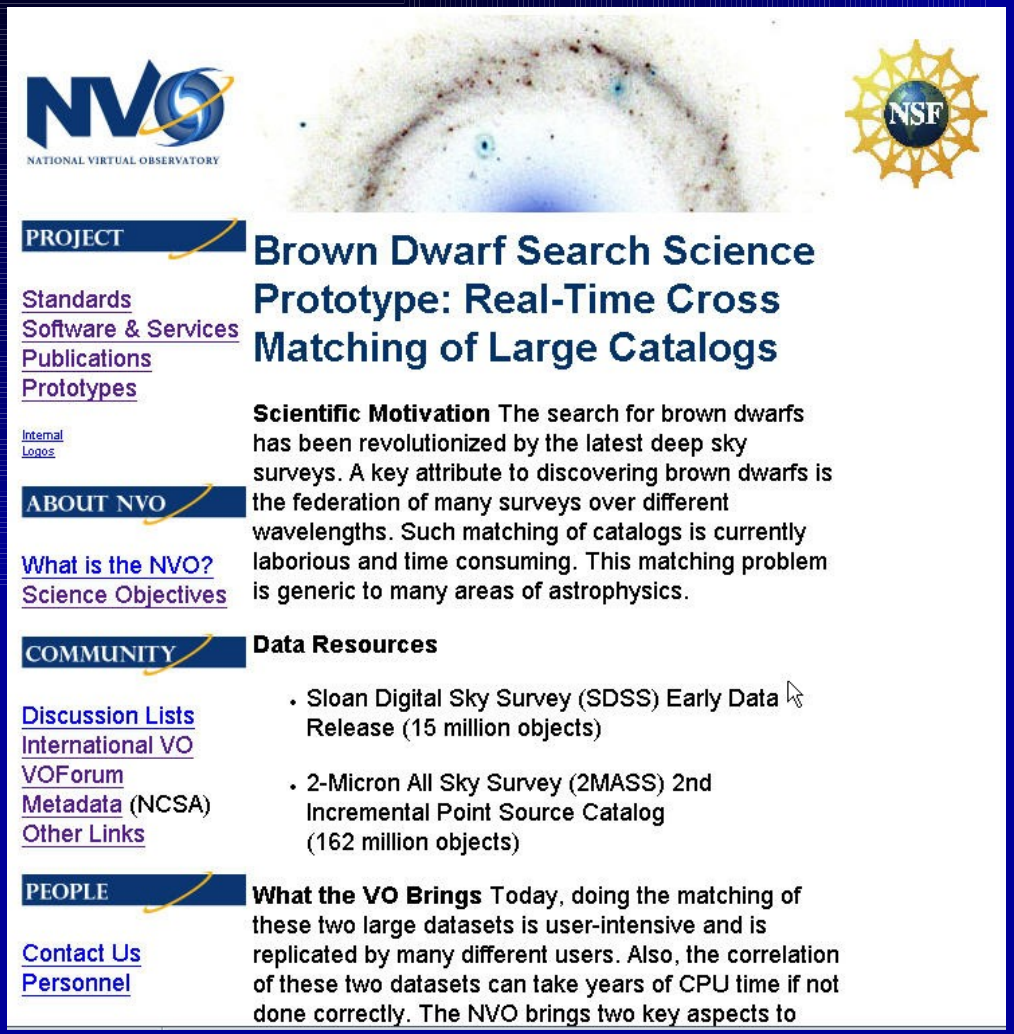


Compare with Radio Archives

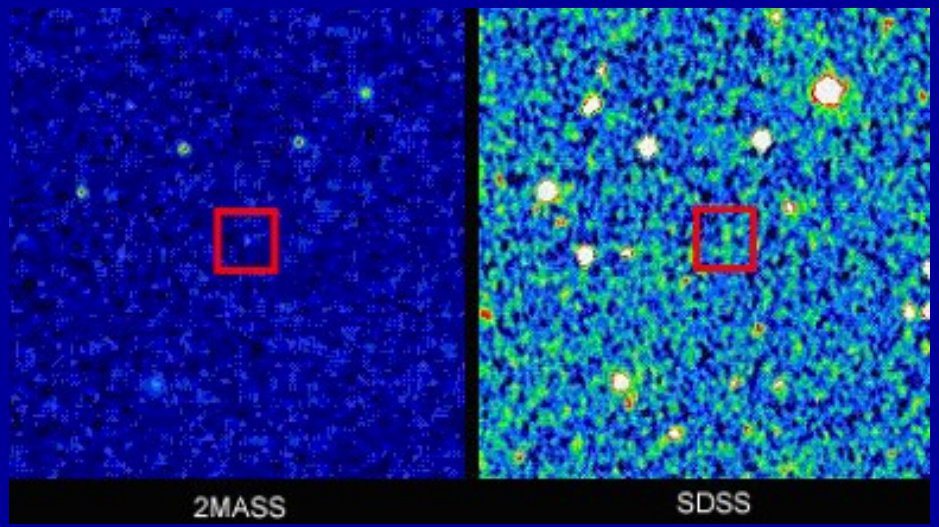
Ukázky aplikací

- Objevy hnědých trpaslíků (jako eps Ind)
- Přechod od AGB k PN (100 nových k 200 dosud známým pomocí VO)g
- SED (Spectrum Energy Distribution)
- Bolometrická jasnost
- Porovnání snímků (POSSI vs. POSSII) změny
- Modelování stelárních populací – spektra

BDs discovered using VO

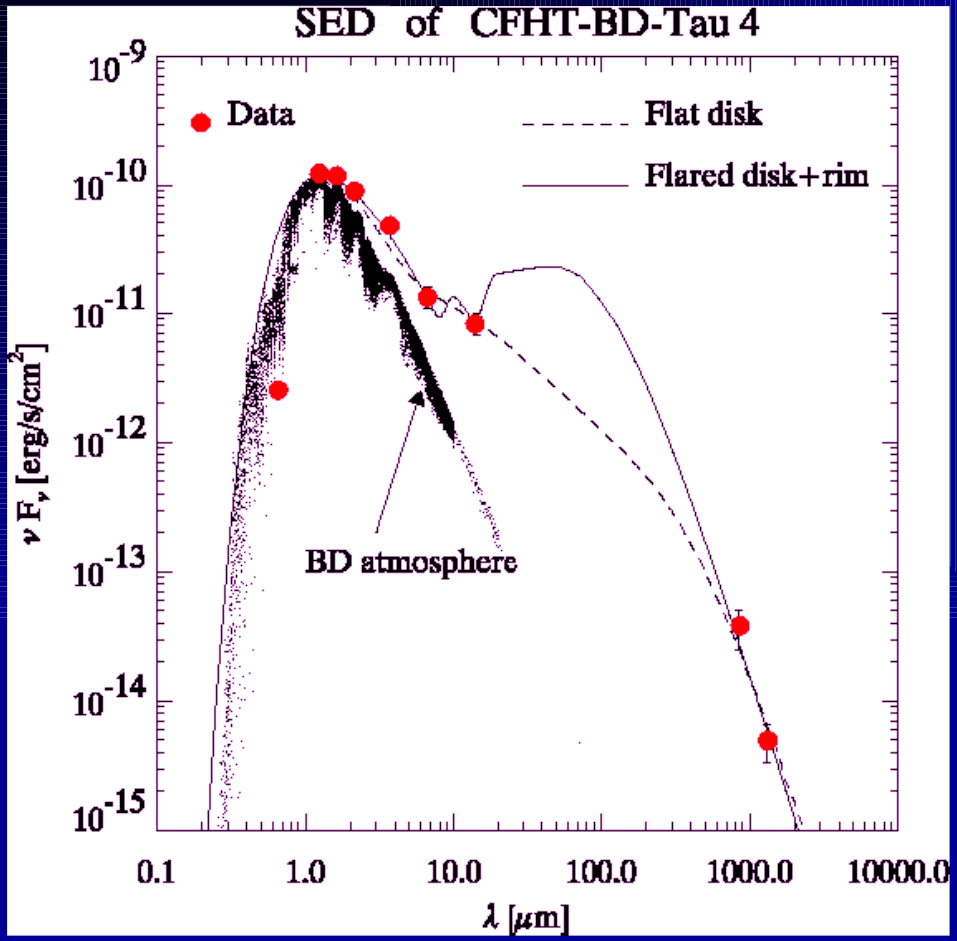


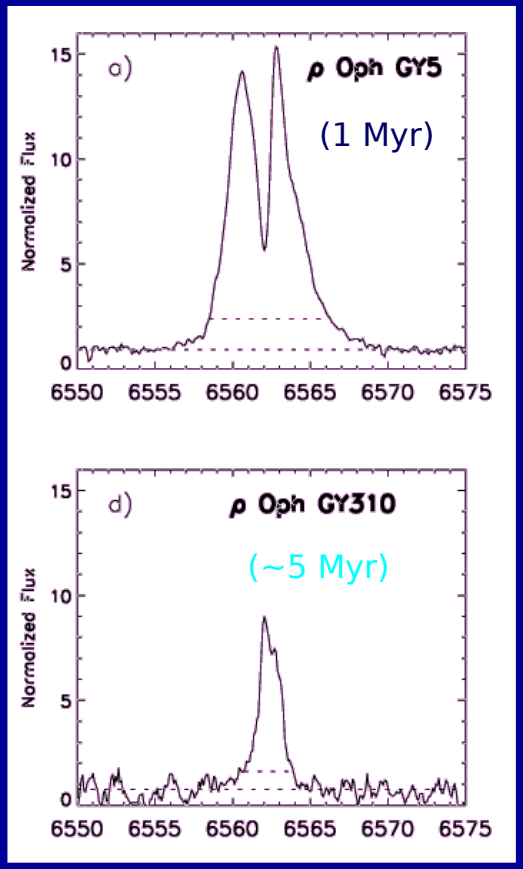
- **Filtering criteria:** z & J-only detections with *z- J > 2.75*
- *SDSS: 15M obj.*
- *2MASS: 160M obj.*
- *300000 objects in common.*



✓ *However, systematic searches using a VO methodology have not been performed so far.*

The observational evidences





✓ A high percentage of BDs found in Star Forming Regions show IR excesses → Existence of disks.

✓ Hα double peak → Indicator of accretion.

✓ Scenario compatible with a disk dissipation in a timescale similar to T Tauris.

IVOA


Aus-VO
EURO VO
China-VO
VO-i
Astro Grid
CVO
RVO
SVO
NVO
IVOA
ArVO
JVO
HVO
GAVO
France

Ostatní VO

- Virtual Solar Observatory
- Virtual Solar-Terrestrial Observatory
- Virtual Magnetospheric Observatory
- Virtual Space Physics Observatory
- Virtual Meteor Observatory
- Zájem klimatologové, meteorologie
- Start nového odvětví vědy = e-Science

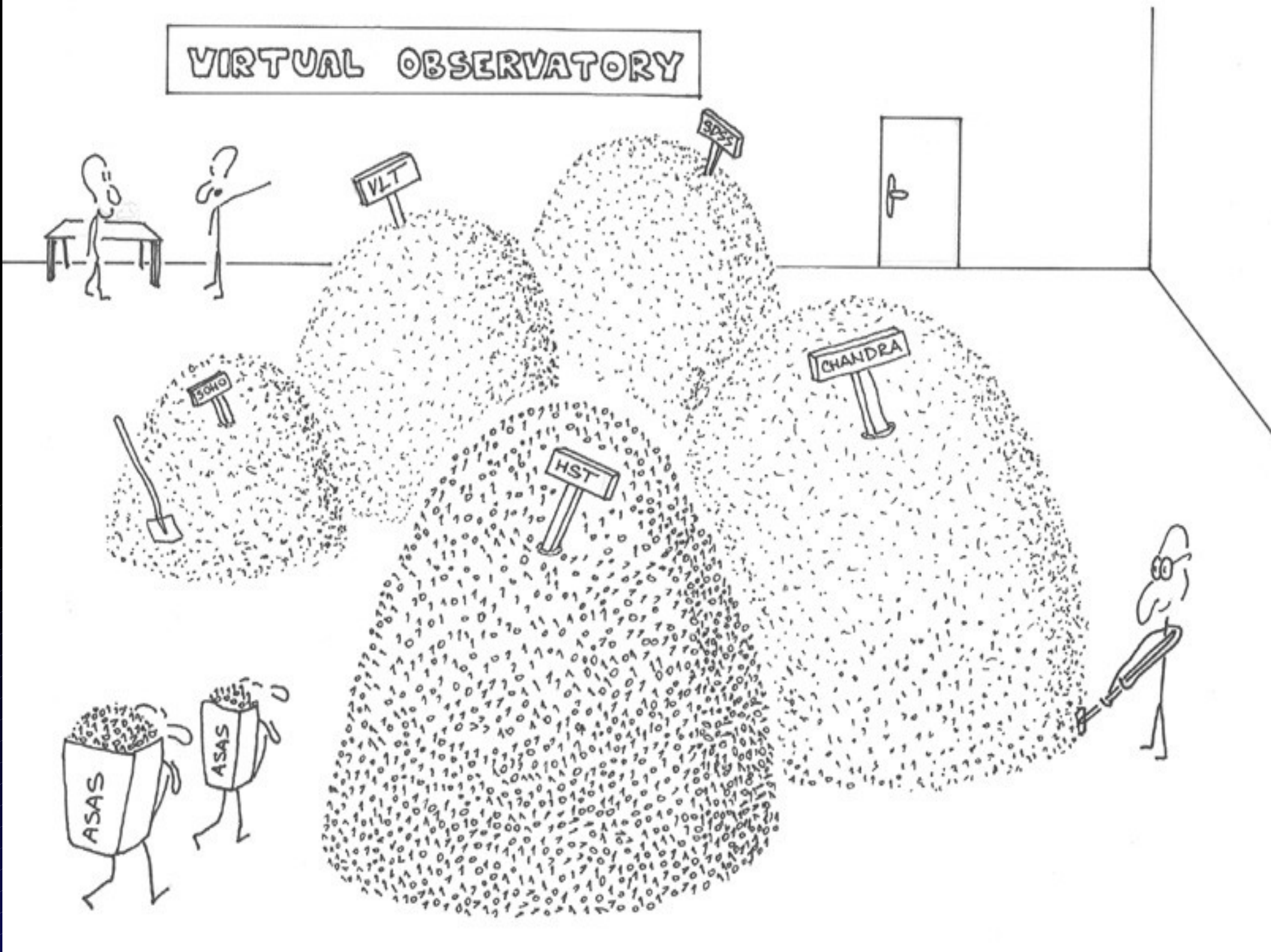
Demokratizace vědy

- Digital Divide (data access free, journals ?)
- International Council for Science (ICS UNO) CODATA (Committee on Data for Science and Technology)
- OECD, UNESCO
- CASPAR - Cultural, Artistic and Scientific knowledge for Preservation, Access and Retrieval
  - Digital curation centers , members ESA-ESRIN, Science and Technology Facilities Council (=PPARC+CCLRC, UK)
  - David Giaretta (Starlink, Astrogrid)
- IAU 2003 – open astro data, ESO archiv opened, open source SW success
- Archive importance: 5x IUE , 3x HST results from archives than PI articles
- Effectivity – 50% of published data appears in Journals, links to data automatic ?

The Astronomer's Data Manifesto

at 26 IAU GA Prague SPS3

- (a) All significant tables, images, and spectra published in journals should appear inastronomical data centres.
- (b) All data obtained with publicly-funded observatories should, after appropriate pro-prietary periods, be placed in the public domain.
- (c) In any new major astronomical construction project, the data processing, storage,migration, and management requirements should be built in at an early stage of theproject plan, and costed along with other parts of the project.
- (d) Astronomers in all countries should have the same access to astronomical data and information.
- (e) Legacy astronomical data can be valuable, and high-priority legacy data should be preserved and stored in digital form in the data centres.
- (f) The IAU should work with other international organisations to achieve our commongoals and learn from our colleagues in other fields. ”


VIRTUAL OBSERVATORY
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