VO Schools Across Europe

ESAVO, CDS, SVO, VObsIt, GAVO, VOParis, AstroGrid, VOFrance, ESO, Groningen

- Exposing many astronomers to VO tools
- Focus on ‘Hands on’ tutorials and projects
- Lessons learned and feedback
- Sharing training materials

from 2009

- EuroVO School 2009
- EuroVO School 2010
- SVO Schools
- Italian VO Day ... in tour
- Journée OV Bordeaux
- ESO VO Day
- Swiss VO Day
- Bonn VO Day
- Dutch VO Day
- Ecole Observatoire OV June 2-4
- VOParis Tutorials June 7
- Swedish VO Days June 8-9

+ contributions to other events

numbers of participants...

- EuroVO School 2009 **39**
- EuroVO School 2010 **38**
- SVO Schools **33 + 44**
- Italian VO Day in tour **242**
- Journée OV Bordeaux **12**
- ESO VO Day **15**
- Swiss VO Day **23**
- Bonn VO Day **7**
- Dutch VO Day **12**
- Ecole Observatoire OV June 2-4 **13**
- VOParis Tutorials June 7
- Swedish VO Days June 8-9 **>9**

+ contributions to other events

numbers of participants...

> 487

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+ contributions to other events

VO-Day ... in Tour

http://wwwas.oats.inaf.it/voday

Since December 2009:

- 11 Sessions (+1) + 1 Videoconf with TNG,
- Touch all city with INAF structures,
- 6 tutors for each session (10 people involved)

Registered: 288 (+20 Ca)
(INAF research staff: ~700 + 300 students, Phd,…)
Attended: 242
Evaluation Form: 181 (sum of the forms will be released at VO-Day page)

- About 70% already known VO as name (mainly they knew the tools but never used a VO feature)
- Several People requested more specific tutorials on VO tools and how to publish their data in the VO

EURO VO AIDA Astronomical Infrastructure for Data Access

Schools 2009, 2010

- Participants: students and post-docs (39 + 38)
- Tutors: VO scientists and developers (~12)

Hands-on tutorials

Core - basics for all participants

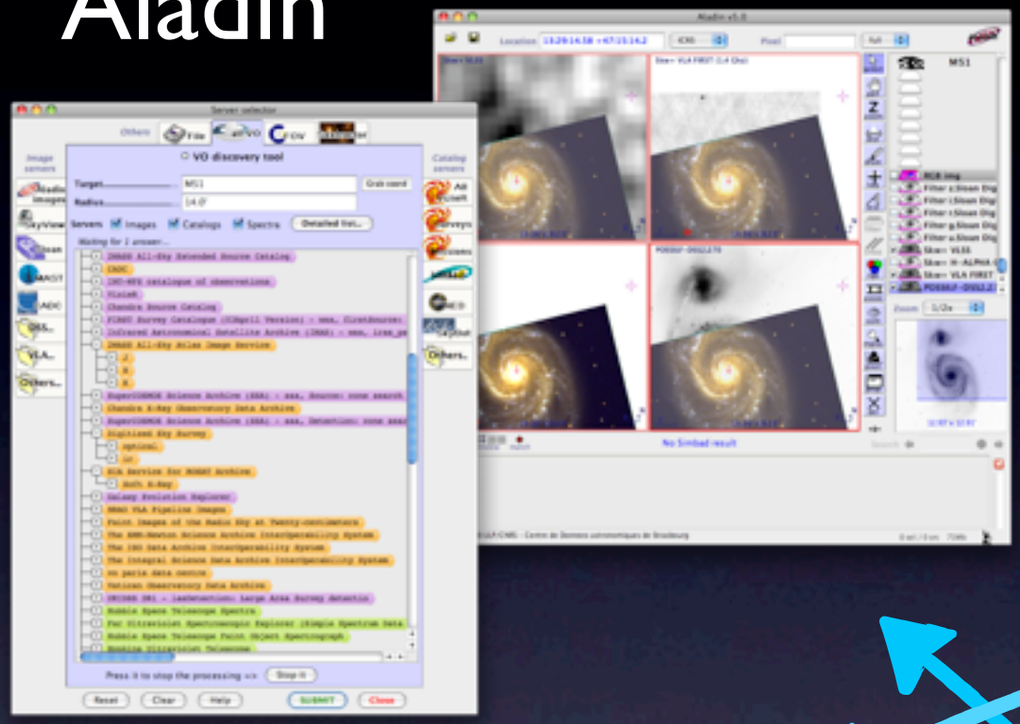
Thematic - more detailed, participants grouped by subject/ function

Projects - proposed and developed by participants

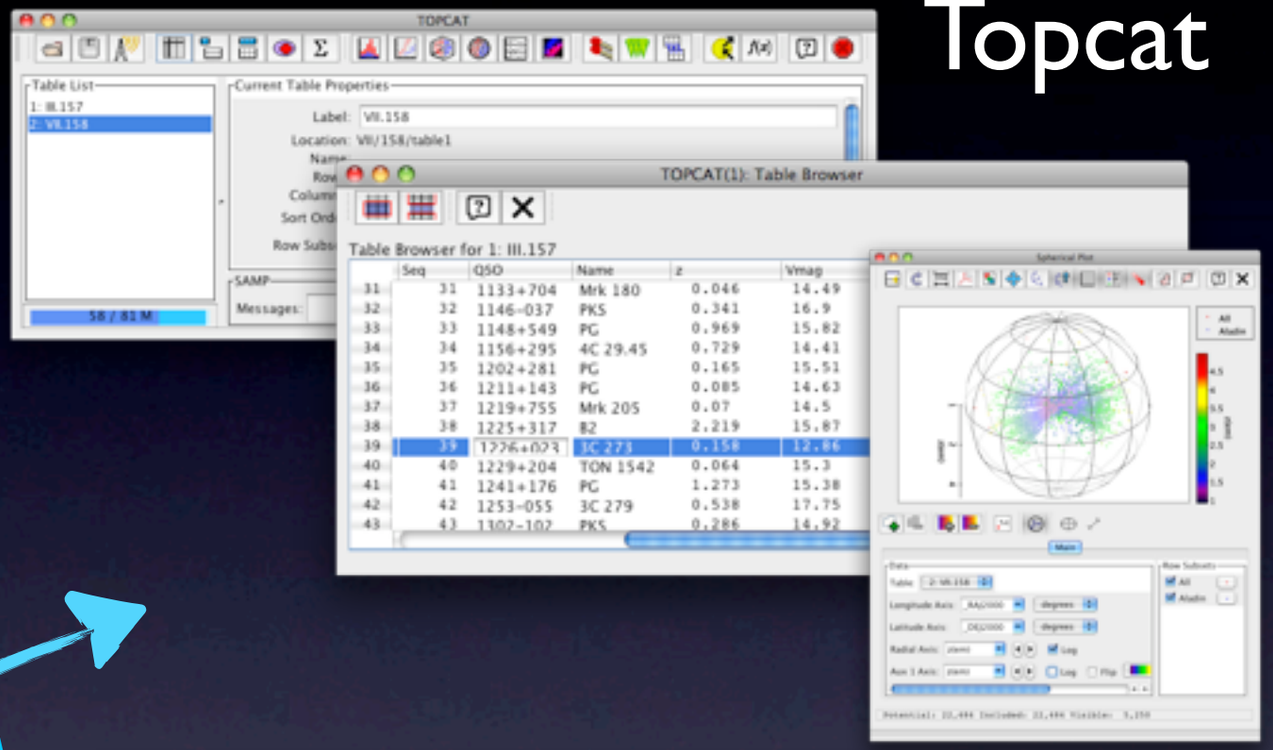
Time	Amphitheatre	salle de reunion	salle de cours	salle de Master
Monday 25 January	**Introduction and Core Tutorials**			
9h30 - 10h30	**Introduction**			
10h30 -11h	coffee break			
11h -12h30	Herbig SEDs (A) *Baines,Solano,Derriere*	SN Candidate (C) *Hatzimin. ,Padovani*		Chamaeleon (B) *Allen, Bot*
12h30-14h	lunch			
14h-15h30	Chamaeleon (A) *Allen, Bot*	Herbig SEDs (C) *Baines,Solano,Derriere*	SN Candidate (B) *Hatzimin. ,Padovani*	
15h30-16h	coffee break			
16h-17h30	SN Candidate (A) *Hatzimin. ,Padovani*	Chamaeleon (C) *Allen, Bot*	Herbig SEDs (B) *Baines,Solano,Derriere*	
Tuesday 26 January	**Thematic Tutorials**			
9h - 10h30	Collinder 69 (A)	ULX (C)	M51 data search (B)	
10h30 -11h	coffee break			
11h -12h30	*Baines, Solano, Derriere*	*Hatzimin., Padovani*	*Allen, Bot*	
12h30-14h	lunch			
14h-15h30	Brown Dwarves (A)	QSO Candidates (C)	Exo Planets (B)	
15h30-16h	coffee break			
16h-17h30	*Rodrigo, Aberasturi, Baines, Derriere*	*Hatziminaoglou, Padovani*	*Allen, Bot*	
20h	***School Dinner: Le Baeckeoffe d'Alsace***			
Wednesday 27 January	**Projects Day**			
9h - 9h30	**Introduction**			
9h30 - 10h30	projects			
10h30 -11h	coffee break			
11h -12h30	projects			
12h30-14h	lunch			
14h-15h30	projects			
15h30-16h	coffee break			
16h-17h30	prepare project presentations			
Thursday 28 January				
9h - 10h30	**Project presentations**			
10h30 -11h	coffee break			
11h -12h30	**& feedback**			

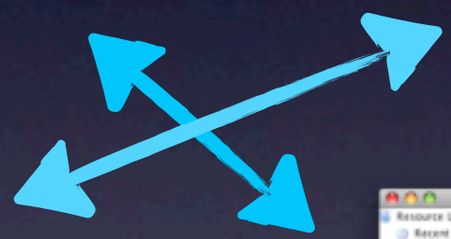
Tools

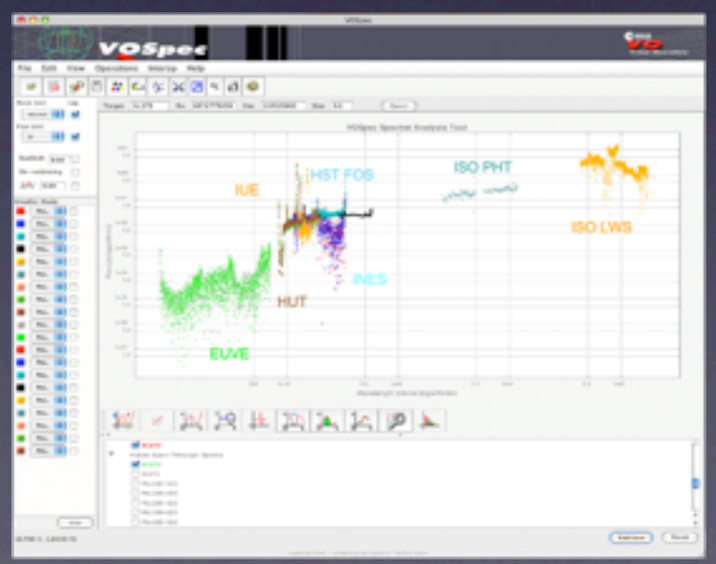
Aladin



Topcat





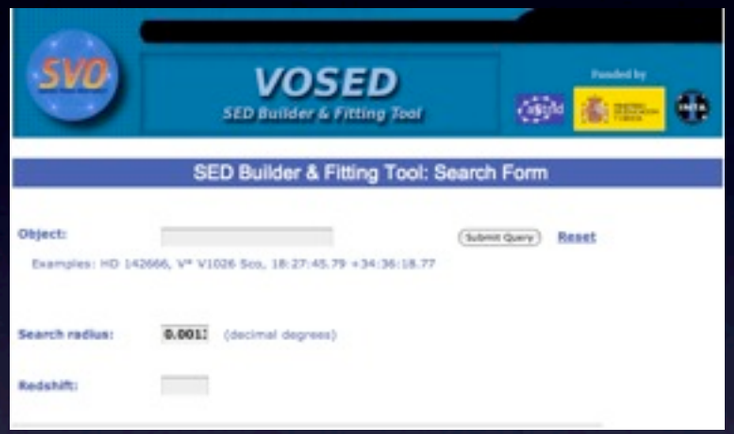


VOSpec

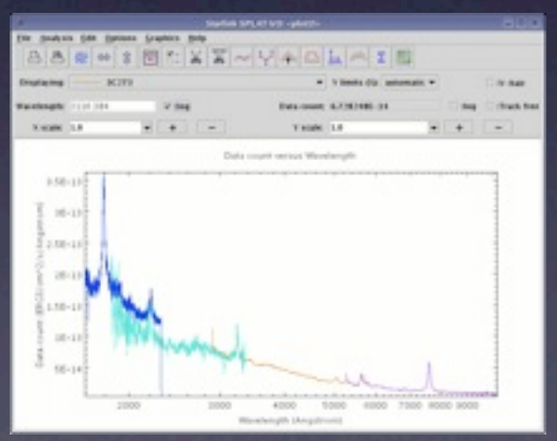
VODesktop

also...

VOSED & VOSA



Splat



- Scripting
  - AstroGrid python
  - Shell - STILTS etc.
  - Simbad
  - Aladin
- VOPlot
- Virgo

Science case tutorials

- Confirmation of a supernova candidate
- Searching for data on the bright galaxy M 51
- X-ray sources in the Chamaeleon star forming region
- Study of exoplanets
- Classifying SEDs of Herbig Ae/Be stars
- Quasar candidates in selected fields
- Search for ULX sources

VO capabilities used

- Cross Matching
- Searching for data
- Using metadata, UCDs etc.,
- Interoperability between tools
- Scripting, comparing with models, visualisation...

e.g. Search for ULX sources

- Starts from a catalogue of galaxies
- Find and add information about galaxy sizes from HyperLeda database
- Find all 2XMMi X-ray sources within the diameters of these galaxies
- Select sources based on X-ray power >10^39 erg/s

Search for ULX sources and X-ray binaries in nearby galaxies (developed by M.A. Perez-Torres, P. Padovani, E. Hatziminaoglou)

Uses Aladin, and TOPCAT

ULXs (Ultra-Luminous X-ray sources) are X-ray sources that are less luminous than AGN but more luminous than any known stellar process (Lx > 10^39 erg/sec)

- launch Aladin, TOPCAT
  tip: launch TOPCAT with a larger memory buffer; try `java -Xmx512M -jar topcat-full.jar`
- load the NED-1D galaxy catalogue (a .csv (coma-separated values) version of the catalogue can be found here: NED-1D.csv)
- the RA and Dec are in sexadecimals; convert RA, Dec to decimal: select **Display Column Metadata** and then **Add new sky coordinate column based on existing one**; get rid of the multiple entries using the option **Internal match**, under **Joins**, selecting the Action *Eliminate All But First of Each Group*
- *optional*: apply a filter in distance (e.g. D<10 Mpc) using TOPCAT (the stricter the criterion, the smaller the number of objects!) and send the filtered nearby galaxies catalogue to Aladin
- this catalogue does not contain any information about the size of the objets; load the hyperLeda catalogue in Aladin [(VII/237) from All VizieR] (this might take a while as it contains about a million objects; place the cursor on the plane as it loads to get an idea of the number of objects still to be loaded); the catalogue is also available here in a .gz VOTable format (unzip the table before uploading it);
- cross-match the two catalogues and send the match back to TOPCAT; **add new column** (under **Display Column Metadata**) with radius in arcmin: pow(10.,$diameter_column)*0.1/2 (where "diameter_column" is the number of the relevant column)
- you can now delete the hyperLEDA plane in order to save memory; then load the 2XMMi catalogue (0.2-12 keV band) in Aladin (IX/40), which gives the calibrated fluxes for sources; a copy of the 2XMMi catalogue in gzipped VOTable format can be obtained from here: 2xmmi.xml.gz (unzip the table before uploading it);
- send it to TOPCAT and cross-correlate (**Joins; Pair Match; "Sky with Errors"; "1&2"; "All Matches"**) the 2XMMi with the nearby galaxies catalogue using the new radius and the X-ray position uncertainty (ePOS) as errors
- **add new column** with the luminosity Lx for the point like sources from the calibrated flux and distance (D) to each galaxy, i.e. Lx = 4*pi*D^2*fx = (do the math!) 50.078+2*log10($distance_column)+log10($fx_column)
- filter those sources with Lx >= 1e39 erg/s (our ULX candidates)
- plot Lx vs cross-correlation separation: some objects are at very low offsets and large Lx, therefore X-ray emission most probably comes from the nucleus; some objects are clearly off; keep those above a given separation which you can select based on the separation distribution
- send the catalogue to Aladin keeping only a few columns: name, distance, X-ray coordinates, Lx (select **Display Column Metadata** and then **Make all table columns invisible**)
- cross-match with X-ray binaries table(s) to find the non-matches
- cross-match with quasars and/or AGN catalogue(s) to find the non-ULX sources
- find images of the galaxies, plot the positions of the AGN and ULX candidates; verify their separation as well as from the galaxy centre (try NGC 6946, M 84, NGC 253, NGC 5128)
- find existing ULX catalogues to confirm candidates; compare the X-ray power in these catalogues with the one in our list of ULX candidates

Aladin v5.0

Location 09:46:39.00 +64:36:45.8 ICRS Pixel full

.Users.allen.Desktop.NED-1D.csv

select pan zoom dist draw tag text

15' 52.07' x 0.0'

grid multiview match 77 superimposed objects – click

dist	Name tab1	m-M tab1	err tab1	D tab1	Method
1.42	UGC 05423	28.61	...	5.27	BS
0.4838	DDO 063,...	27.92	0.26	3.84	TRGB
3.2817	Cam A, [...	27.97	...	3.93	TRGB
0.0	kkh 034	28.32	...	4.61	TRGB
3.305	UGC 06456	28.19	0.04	4.34	TRGB

TIP: Create image mosaics or blink sequences [assoc button]

TOPCAT(1): Table Columns

Table Columns for 1: NED-1D.csv

	Visible	Name	$ID	Class	Description
0	☐	Index	$0	Long	Table row index
1	☑	Name	$1	String	
2	☑	m-M	$2	String	
3	☑	err	$3	String	
4	☑	D	$4	Float	
5	☑	Method	$5	String	
6	☑	REFCODE	$6	String	
7	☑	Notes	$7	String	
8	☑	RA	$8	String	
9	☑	Dec	$9	String	
10	☑	GLON	$10	Float	
11	☑	GLAT	$11	Float	
12	☑	Type(RC3)	$12	String	
13	☑	Vsgr(RC3)	$13	String	

TOPCAT

Table List

1: NED-1D.csv

Current Table Properties

Label: NED-1D.csv

Location: /Users/allen/Desktop/NED-1D.csv

Name:

Rows: 3716

Columns: 13

Sort Order:

Row Subset: All

Activation Action: (no action) Broadcast Row

TOPCAT(1): Table Browser

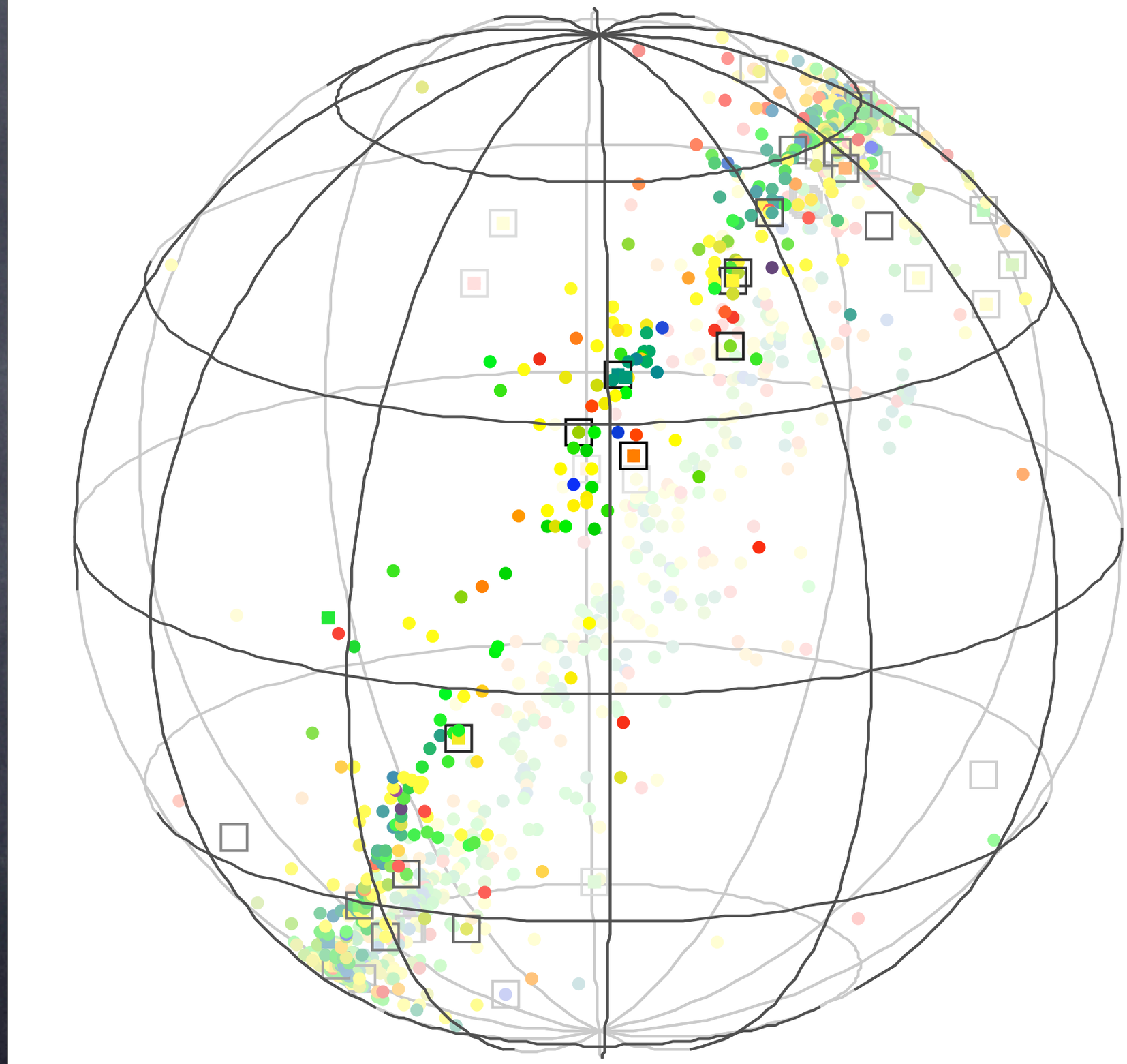
Table Browser for 1: NED-1D.csv

	Name	m-M	err	D	Method	REFCODE	Notes	RA	Dec	GLON	GL
1	UGC 12914	33.57	0.20	51.8	Sosies	2002A&A...393....57T		00:01:38.3	+23:29:01.1	108.4	-
2	WLM	25.10	0.15	1.05	Cepheids	1991PASP..103..933M	I	00:01:58.2	-15:27:39.3	75.9	-
3	WLM	24.92	0.21	0.964	Cepheids	2004ApJ...608...42S	LMC VIHJK	00:01:58.2	-15:27:39.3	75.9	-
4	WLM	24.75	0.10	0.891	TRGB	1997AJ....114..147M	I	00:01:58.2	-15:27:39.3	75.9	-
5	WLM	24.77	0.09	0.899	TRGB	2004ApJ...608...42S		00:01:58.2	-15:27:39.3	75.9	-
6	WLM	24.85	0.08	0.932	TRGB	2005MNRAS.356..979M		00:01:58.2	-15:27:39.3	75.9	-
7	WLM	25.88	...	1.5	Tully-Fisher	LEDA [April 2006]		00:01:58.2	-15:27:39.3	75.9	-
8	WLM	24.88	0.09	0.946	CMD	2000ApJ...531..804D		00:01:58.2	-15:27:39.3	75.9	-
9	WLM	24.95	0.13	0.977	CMD	2000AJ....120..801R		00:01:58.2	-15:27:39.3	75.9	-
10	NGC 7814	30.44	0.14	12.2	SBF	2003ApJ...583..712J	I	00:03:14.9	+16:08:43.5	106.4	-
11	NGC 7814	30.60	0.14	13.2	SBF	2001ApJ...546..681T	I	00:03:14.9	+16:08:43.5	106.4	-
12	NGC 7814	31.26	0.13	17.9	Sosies	2002A&A...393....57T		00:03:14.9	+16:08:43.5	106.4	-
13	NGC 7814	32.70	...	34.7	Tully-Fisher	LEDA [April 2006]		00:03:14.9	+16:08:43.5	106.4	-
14	ESO 349- G 031	27.53	...	3.21	TRGB	2006AJ....131.1361K		00:08:13.4	-34:34:42.0	351.5	-
15	ESO 349 -G 031	28.06	...	4.1	Tully-Fisher	2003A&A...404....93K		00:08:13.4	-34:34:42.0	351.5	-
16	2dFGRS S839Z607	37.297*	0.04	271.	SNIa	2006ApJ...647..501P	SN 1992au, z = 0.06100:	00:10:38.1	-49:56:51.7	319.1	-
17	2dFGRS S839Z607	37.30*	0.22	272.	SNIa	2004ApJ...607..665R	SN 1992au, z = 0.06100:	00:10:38.1	-49:56:51.7	319.1	-
18	2dFGRS S839Z607	37.41	0.14	303.	SNIa	2005ApJ...624..532R	SN 1992au	00:10:38.1	-49:56:51.7	319.1	-
19	NGC 0048	33.92	0.20	60.8	Sosies	2002A&A...393....57T		00:14:02.2	+48:14:05.5	116.5	-
20	NGC 0045	30.13	0.35	10.6	Sosies	2002A&A...393....57T		00:14:03.9	-23:10:55.5	55.9	-
21	NGC 0045	29.51	...	7.98	Tully-Fisher	LEDA [April 2006]		00:14:03.9	-23:10:55.5	55.9	-
22	UGC 00139	33.45*	0.05	48.4	SNIa	2006ApJ...647..501P	SN 1998dk, z = 0.01322	00:14:31.9	-00:44:15.2	102.9	-
23	UGC 00139	33.85	0.14	58.9	SNIa	2005ApJ...624..532R	SN 1998dk	00:14:31.9	-00:44:15.2	102.9	-
24	NGC 0055	26.5	...	2.	TRGB	2005ApJ...622..279D		00:14:53.6	-39:11:47.9	332.9	-
25	NGC 0055	26.63	0.03	2.12	TRGB	2005AJ....129.1331S	disk	00:14:53.6	-39:11:47.9	332.9	-

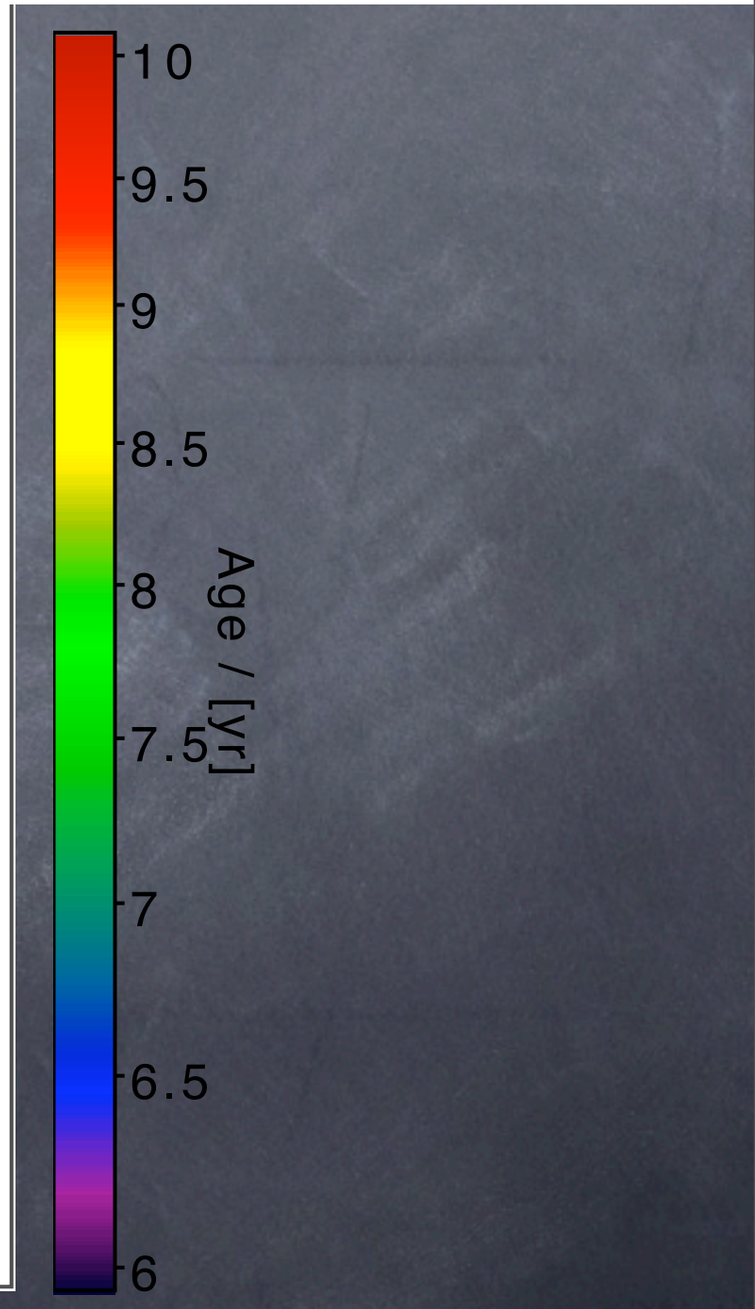
Projects

- Participants' own science projects
- Outline submitted to wiki prior to school
- Working in groups was encouraged
- Presentations on last day

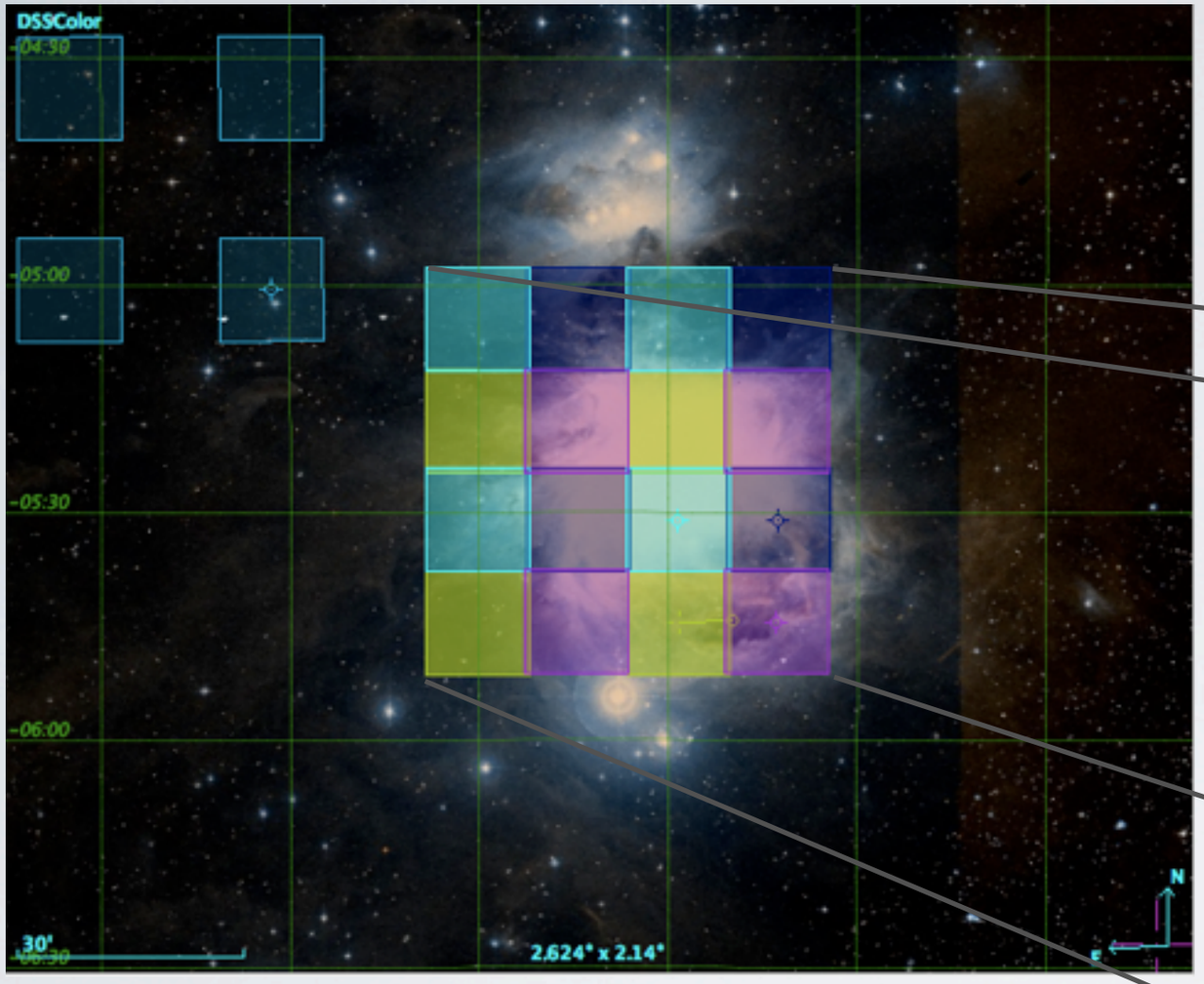
Tools to study Variable Stars in Stellar Clusters

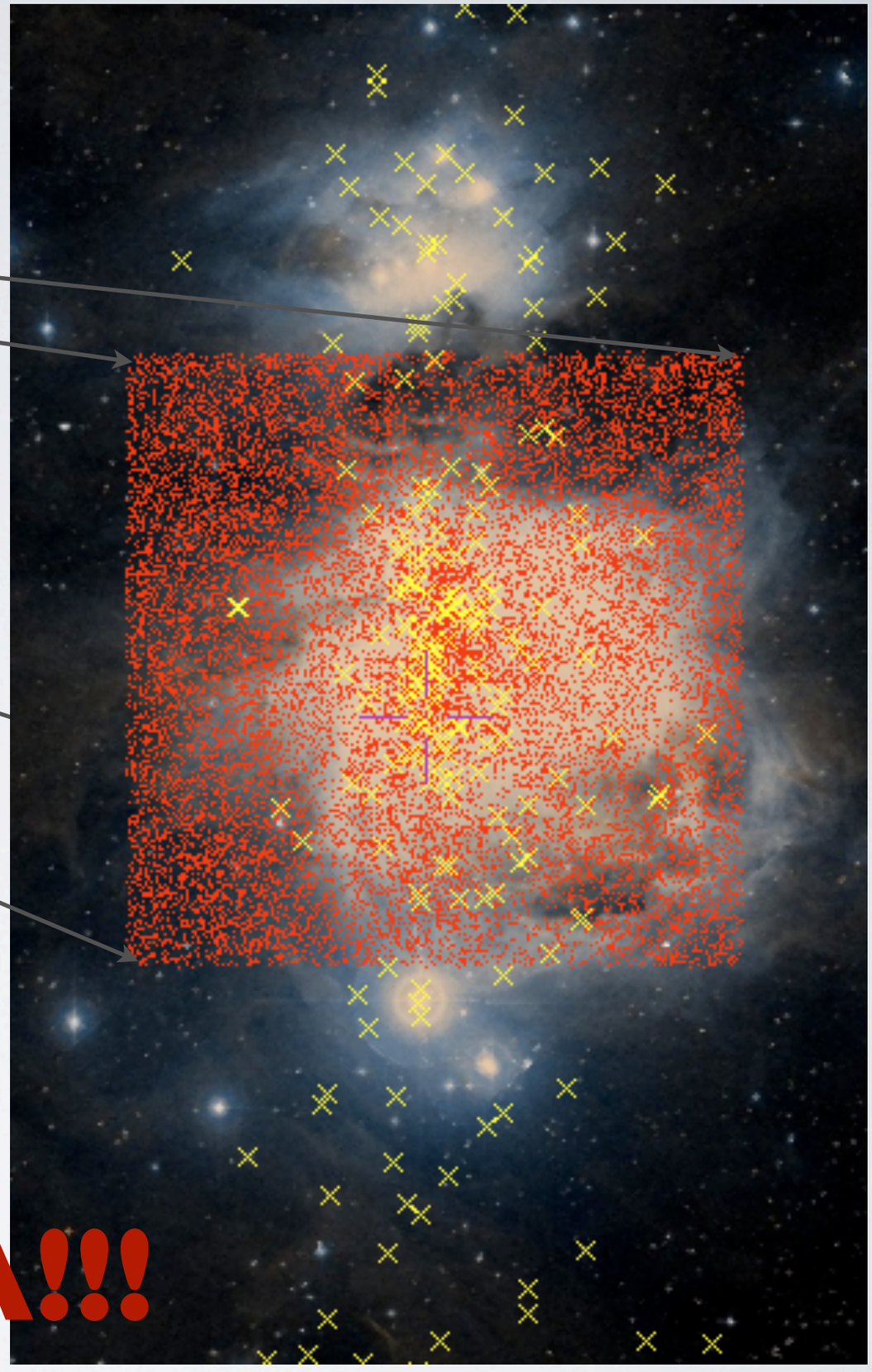


Very few Open Clusters have been searched for delta Scuti



Claudia Greco @ VO School 2010





1 fits file with 4 extensions x 4 points

on sky x 2 filters x 13 epochs

= 416 tables

= **ALOT OF DATA!!!**

which sat on my laptop for more than 1 year... until... the VO School 2010!

Lessons learned and feedback

- minimal intro - straight into hands-on sessions works well
- most effective way to interact with community (c.f other forums)
- very positive results on feedback forms

- common participant requests:

  ‘is data X in the VO’

  ‘is there a front door to the VO’

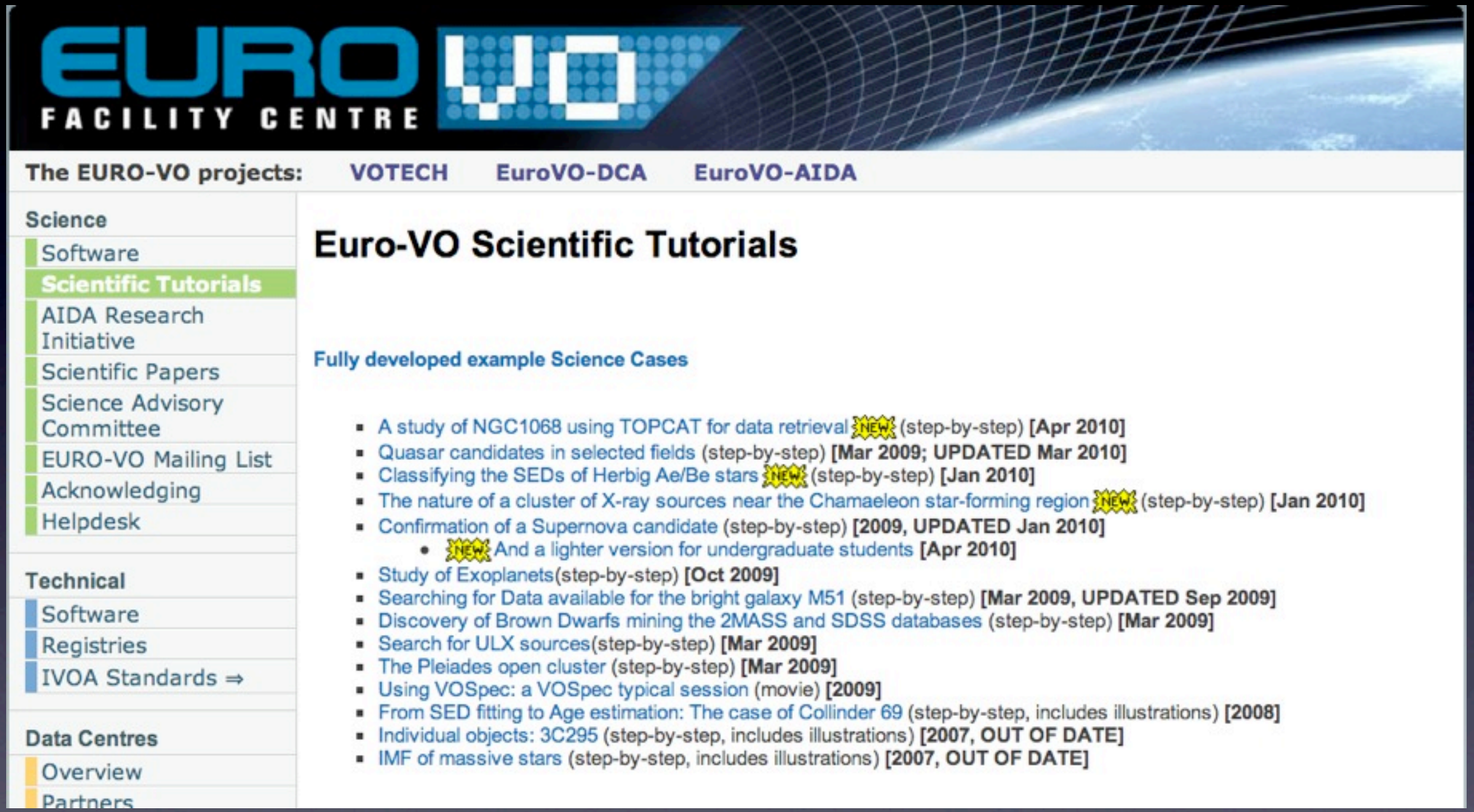
  ‘undo button’

  ‘how do I know what tool to use’

  ‘how do I do ... for 10^9 sources’

- Does it result in papers? - too early to tell...
- Creates ambassadors: participants have given ‘mini-schools’ back at their institutes
- Italian VO Day ... in tour is having a follow-up event for participants projects

Training materials



euro-vo.org