



# Introduction to the Virtual Observatory and the School

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# Astronomical data



HD	<i>V</i> [mag]	<i>B – V</i>	<i>b – y</i>	<i>A<sub>V</sub></i> [mag]	<i>v sin i</i> [km s <sup>-1</sup> ]	<i>T<sub>eff</sub></i> [K]	log <i>g</i> (phot) [dex]	<i>M<sub>V</sub></i> [mag]	log L <sub>*</sub> /L <sub>⊙</sub>
319	5.93	0.141	0.079	0.004	60	8020(135)	3.74(8)	+1.27(19)	1.45(8)
6870	7.49	0.246	0.164	0.000	165	7330(102)	3.84(11)	+2.29(42)	1.02(17)
7908	7.29	0.272	0.192	0.000		7145(87)	4.10(12)	+2.60(18)	0.90(7)
11413	5.94	0.147	0.105	0.004	125	7925(124)	3.91(21)	+1.49(10)	1.35(4)
13755	7.84	0.318	0.181	0.000		7080(161)	3.26(10)	+0.93(10)	1.57(4)
15165	6.71	0.333	0.191	0.010	90	7010(167)	3.23(10)	+1.12(16)	1.50(6)
23392	8.26	0.020	0.014	0.094		9805(281)	4.35(9)	+1.43(30)	1.45(12)
24472	7.09	0.304	0.214	0.003		6945(131)	3.81(16)	+2.14(11)	1.09(5)
30422	6.19	0.190	0.101	0.014	135	7865(108)	4.00(20)	+2.35(1)	1.01(1)
31295	4.65	0.085	0.044	0.063	115	8920(177)	4.20(1)	+1.66(22)	1.32(9)
35242	6.35	0.122	0.068	0.042	90	8250(103)	3.90(14)	+1.75(22)	1.26(9)
36726	8.84	0.086	0.043	0.202		9515(223)	4.36(10)	+1.74(30)	1.32(12)
42503	7.46	0.176	0.130	0.084		7680(282)	3.10(10)	-0.03(4)	1.96(2)

of the star, such that it can fuel, through HeII-HeIII ionization, the observed pulsations in this type of stars. Using state-of-the-art

Wavelength [Å]

**Astronomical data are diverse**



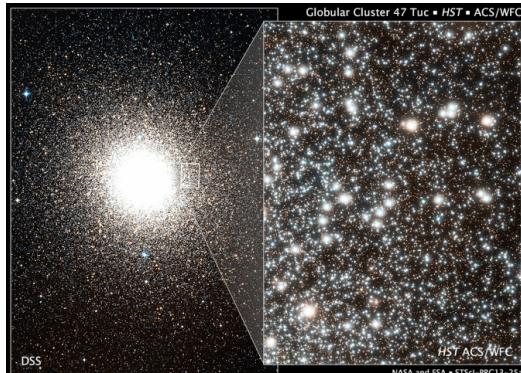
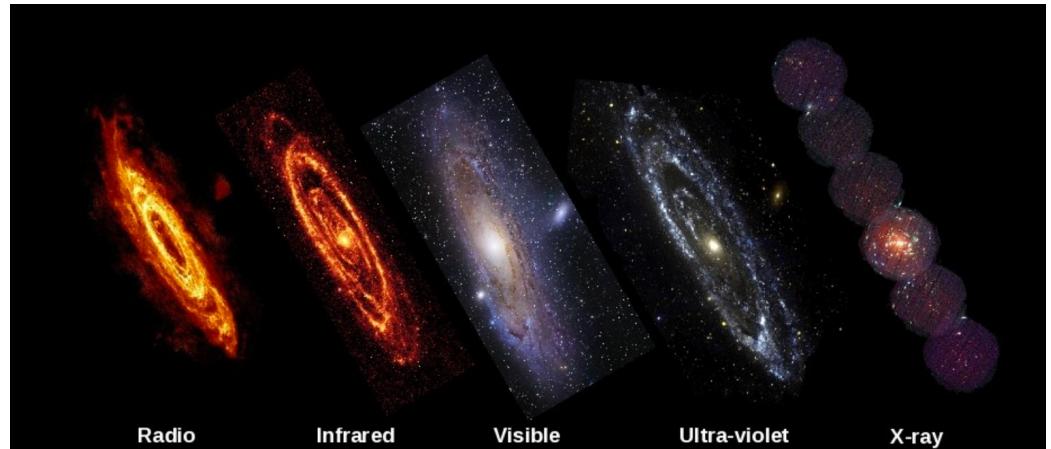
# Astronomy today

More data at our disposal than at any other time in history:

- Survey telescopes
  - Multi-wavelength studies



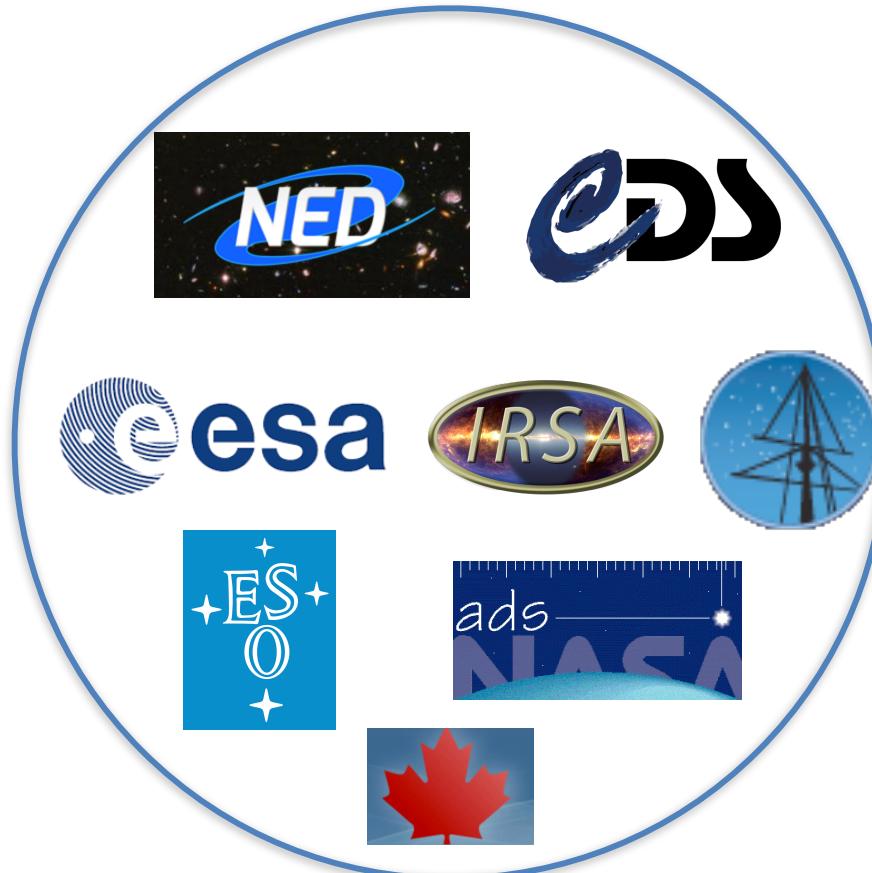
- Better detectors



- Production of huge amounts of data.



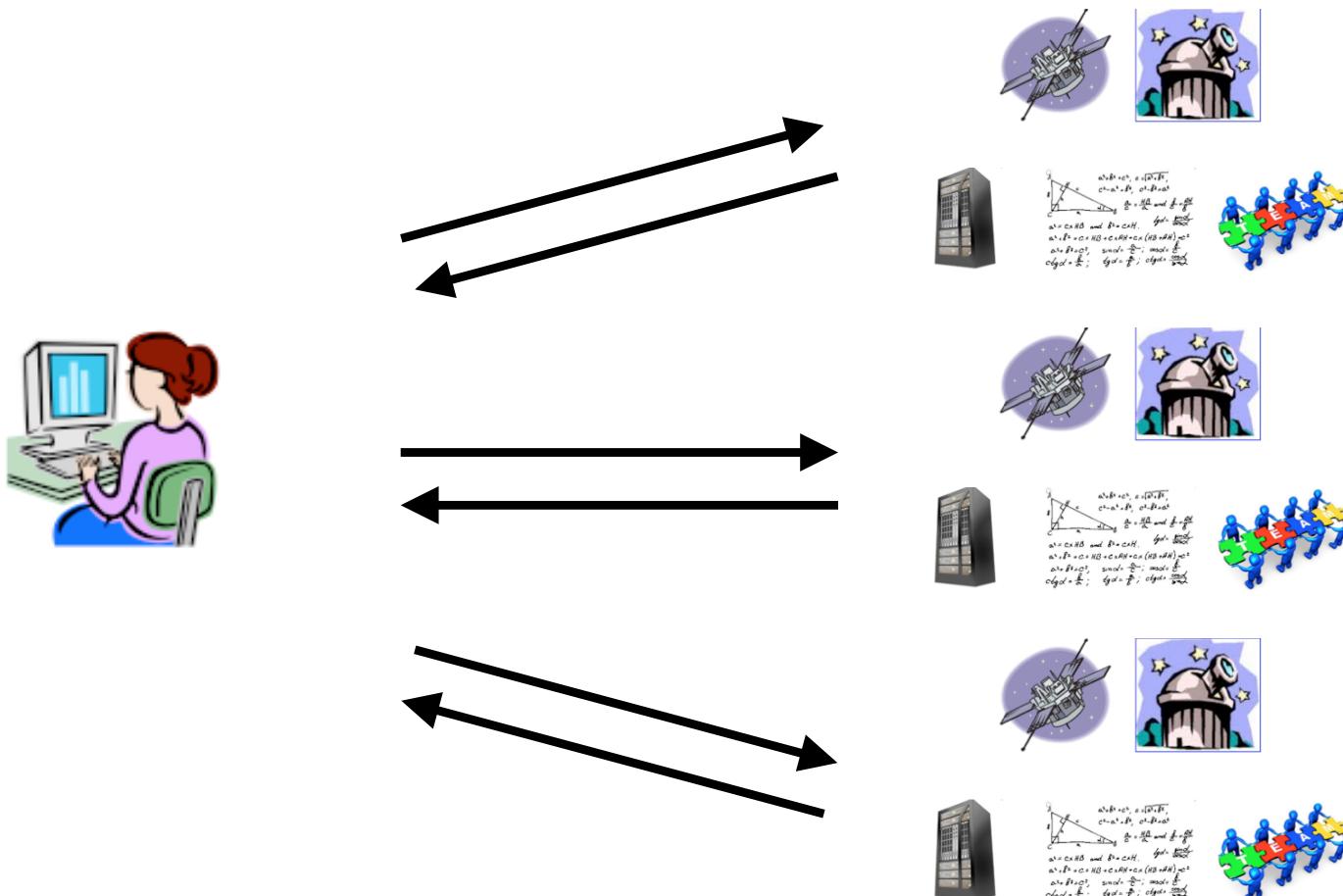
# Astronomical archives and data centers



**Astronomical archives are heterogeneous**



# Accessing data



**Different methods to access data on different astronomical archives**



# The Virtual Observatory

Astronomical data and archives are heterogeneous

homogenisation

definition of standards

*“The Virtual Observatory (VO) is the vision that astronomical datasets and other resources should work as a seamless whole.”*



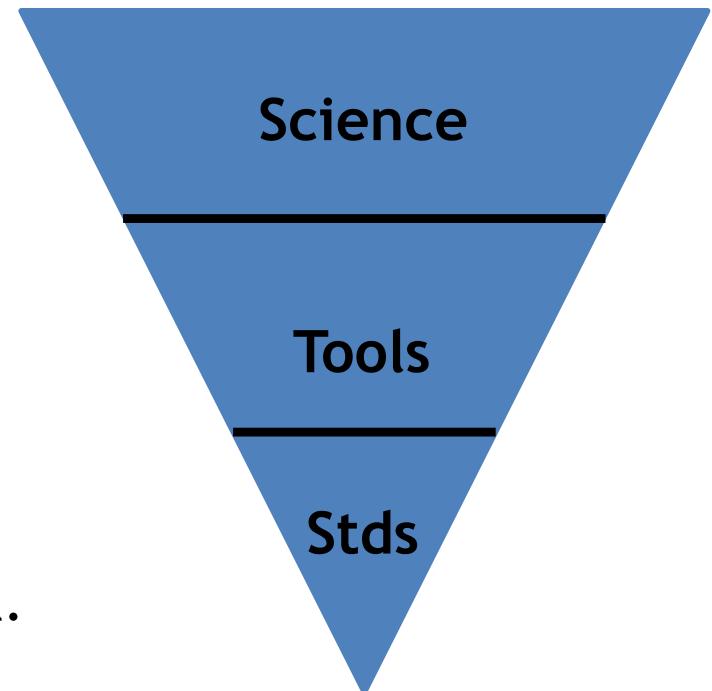
# International Virtual Observatory Alliance

**Goal:** Easy and efficient access and analysis of the information hosted in astronomical archives.



# The Virtual Observatory

- Allows astronomers to interrogate multiple data centres in a seamless and transparent way.
- Provides new powerful analysis and visualisation tools within that system.
- Gives data centers a standard framework for publishing and delivering services using their data.





# VO enabling science

- part of Astronomer's everyday tool kit
- being used in innovative ways
- ‘VO’ not well cited, but tools and services are!



# Science with the VO

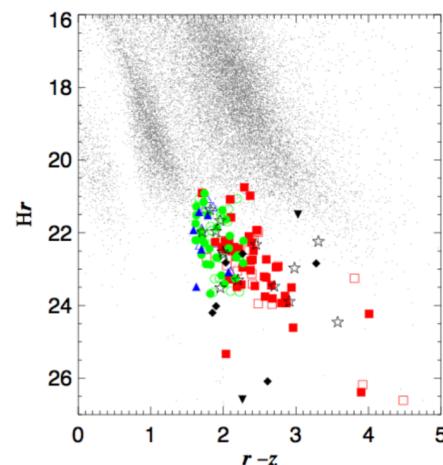
## New ultracool subdwarfs identified in large-scale surveys using Virtual Observatory tools

### II. SDSS DR7 vs UKIDSS LAS DR6, SDSS DR7 vs UKIDSS LAS DR8, SDSS DR9 vs UKIDSS LAS DR10, and SDSS DR7 vs 2MASS

N. Lodieu<sup>1, 2</sup>, M. Espinoza Contreras<sup>1, 2</sup>, M. R. Zapatero Osorio<sup>3</sup>, E. Solano<sup>4, 5</sup>, M. Aberasturi<sup>4, 5</sup>,  
E. L. Martín<sup>3</sup>, C. Rodrigo<sup>4, 5</sup>

#### ABSTRACT

*Aims.* We aim at developing an efficient method to search for late-type subdwarfs (metal-depleted dwarfs with spectral types  $\geq$  M5) to improve the current statistics. Our objectives are: improve our knowledge of metal-poor low-mass dwarfs, bridge the gap between the late-M and L types, determine their surface density, and understand the impact of metallicity on the stellar and substellar mass function.



- Cross-match
- Stilts
- Aladin
- Topcat



# Science with the VO

## A search for new hot subdwarf stars by means of Virtual Observatory tools II

E. Pérez-Fernández<sup>1,2★</sup>, A. Ulla<sup>2</sup>, E. Solano<sup>3,4</sup>, R. Oreiro<sup>5</sup> and C. Rodrigo<sup>3,4</sup>

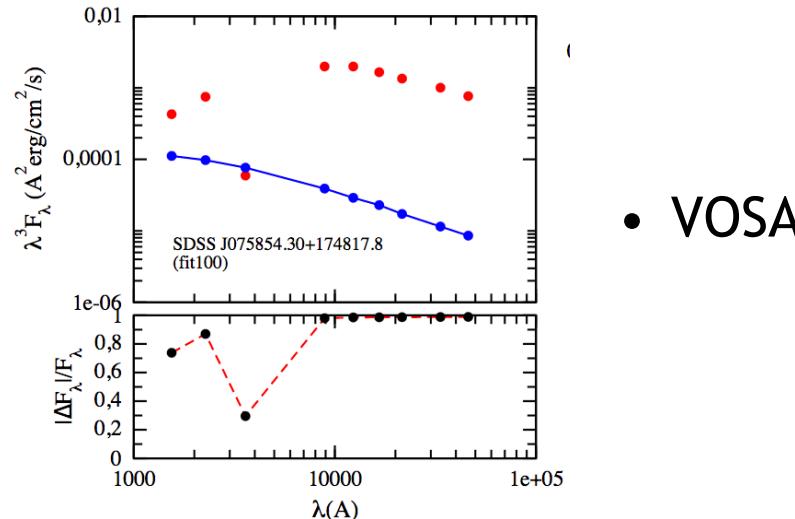
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- VOSA



# Science with the VO

Monthly Notices  
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ROYAL ASTRONOMICAL SOCIETY



Mon. Not. R. Astron. Soc. **406**, 1595–1608 (2010)

doi:10.1111/j.1365-2966.2010.16812.x

## Scalelength of disc galaxies

Kambiz Fathi,<sup>1,2</sup>★ Mark Allen,<sup>3</sup> Thomas Boch,<sup>3</sup> Evangelia Hatziminaoglou<sup>4</sup> and Reynier F. Peletier<sup>5</sup>

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<sup>2</sup>Oskar Klein Centre for Cosmoparticle Physics, Stockholm University, 106 91 Stockholm, Sweden

<sup>3</sup>Observatoire de Strasbourg, UMR 7550, Strasbourg 67000, France

<sup>4</sup>European Southern Observatory, Karl-Schwarzschild-Str. 2, 85748 Garching bei München, Germany

<sup>5</sup>Kapteyn Astronomical Institute, Postbus 800, 9700 AV Groningen, the Netherlands

### ABSTRACT

We have derived disk scale lengths for 30374 non-interacting disk galaxies in all five SDSS bands. Virtual Observatory methods and tools were used to define, retrieve, and analyse the images for this unprecedentedly large sample classified as disk/spiral galaxies in the LEDA catalogue. Cross correlation of the SDSS sample with the LEDA

- Aladin
- Topcat



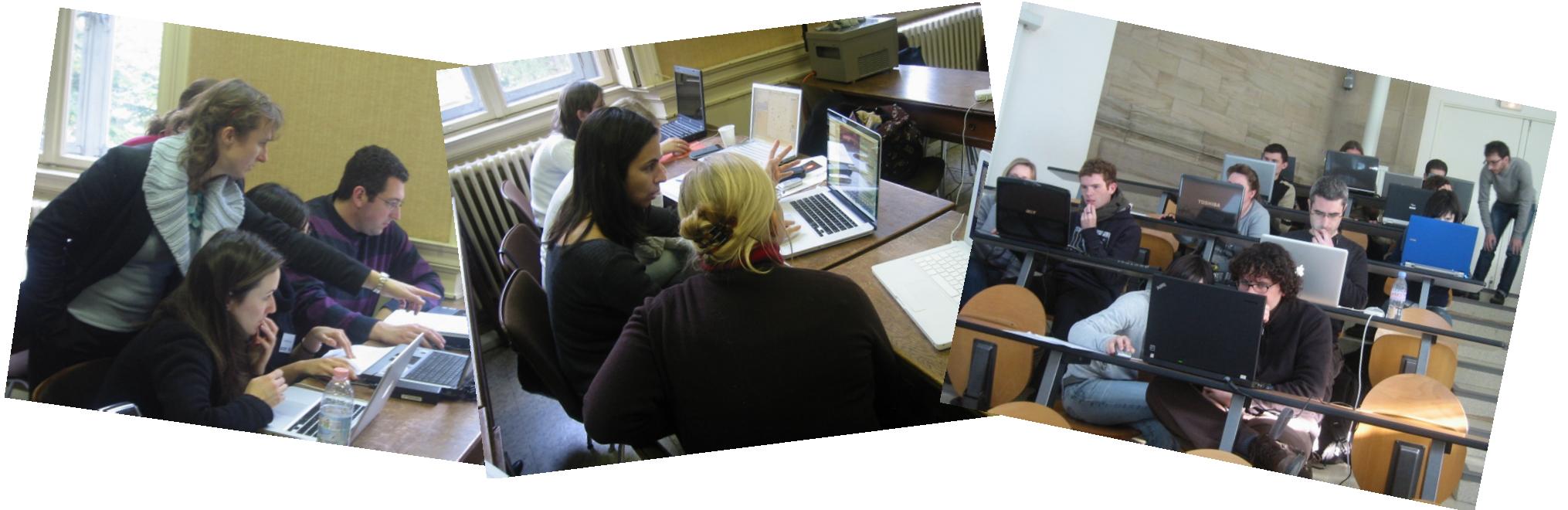
# To keep in mind

- VO: Federation of data centres sharing data through a common set of standards.
- VO tools:
  - Not a “does-it-all” software
  - Different tools for different problems
  - VO science: A reality since 5-10 years ago.
- What is VO for?
  - For programmers, for data centres, for astronomers, for big data projects.
  - For educators, amateurs, general public.



# Learning how

- Workshops and schools
- On-line training materials - EuroVO
- From your colleagues





# The School

- Goal
  - Teach participants on how to efficiently use the VO tools for their own research.
  - Gather your feedback and requirements on VO tools and services.
- Methodology:
  - Tutorials based on real science cases.
  - Feedback form.



# The School: participation

- 31 participants + 20 tutors
- Countries:
  - The VO partners
  - The ESFRI partners
  - External countries
- Scientific profile: Graduate / PhD, Postdoc , Senior



# The School: groups

- Division into two groups:
  - Group 1: last name A – G Room 1
  - Group 2: last name H – Z Room 2



# The School: tutors groups

- Group 1:
  - D. Baines
  - E. Chassande-Motin
  - G. Mantelet
  - F. Jimenez
  - V. Kulikovskiy
  - M. Molinaro
  - A. Nebot
  - S. Derriere
- Group 2:
  - C. Bot
  - G. Greco
  - H Heinl
  - E. Solano
  - J. Lefaucheur
  - M. Ramella
  - F-X Pineau
  - M. Taylor



# The School: the schedule

## Day 1. Tuesday 15 November

- 10:15 - 10:45 Coffee break
- 10:45 - 12:30 Tutorial #1 (1h45m).
  - Title: [The CDS tutorial](#)
  - VO-tools: Simbad, Vizier, Aladin
  - Tutor: S. Derriere + J. Sorce (group 1) / C. Bot + F.-X. Pineau (group 2)
- 12:30 - 14:00 LUNCH
- 14:00 - 15:45 Tutorial #2 (1h45m)
  - Title: [Discovery of Brown Dwarfs mining the 2MASS and SDSS databases](#)
  - VO-tools: Aladin, Topcat
  - Tutor: F. Jiménez + M. Molinaro (group 1) / E. Solano + M. Ramella (group 2)
- 15:45 - 16:15 Coffee break
- 16:15 - 18:00 Tutorial #3 (1h45m)
  - Title: [Determination of stellar physical parameters using VOSA](#)
  - VO-tools: VOSA
  - Tutor: F. Jiménez-Esteban + M. Molinaro (group 1) / E. Solano + M. Ramella (group 2)



## Day 2. Wednesday 16 November

- 09:00 - 10:45 Tutorial #4 (group 1) / Tutorial #5 (group 2) (1h45m)
  - Tutorial #4
    - Title:  Multi-instrument, multi-wavelength study of high energy sources with the virtual Observatory.
    - VO-tools: Aladin, Topcat, Simbad
    - Tutor: A. Nebot + V. Kulikovskiy + D. Baines (group 1) /
  - Tutorial #5
    - Title:  Exploring Gaia data with TOPCAT and STILTS
    - See also:  supporting materials
    - VO-tools: TOPCAT, STILTS
    - Tutor: M. Taylor + F-X Pineau (group 2)
- 10:45 - 11:15 Coffee break
- 11:15 - 13:00 Tutorial #5 (group 1) / Tutorial #4 (group 2)
  - Tutorial #5
    - Tutor: M. Taylor + F-X Pineau (group 1)
  - Tutorial #4
    - Tutor: J. Lefaucheur + C. Bot + J Sorce (group 2)
- 13:00 - 14:30 LUNCH



- 14:30 - 15:45 Tutorial #6 (group 1) / Tutorial #6 (group 2) (2h)
  - Title: Accessing and cross matching of big data sets with ADQL <http://docs.g-vo.org/adql/html/>
  - VO-tools: Topcat, ADQL, TAP
  - Tutor: M. Demleitner + G. Mantelet (group 1) / H. Heinl + M. Taylor (group 2)
- 15:45 - 16:15 Coffee break
- 16:15 - 17:00 Tutorial #6 (group 1) / Tutorial #6 (group 2) (cont.)
- 17:00 - 17:30 Tutorial #7 (group 1 and 2)
  - Title:  Handling gravitational-wave sky maps for EM-followUP observations
  - VO-tools: Aladin beta version + Topcat
  - Tutor: E. Chassande-Motin + D. Baines (group 1) /G. Greco + C. Bot (group 2)
- 17:30 - 18:15 Treasure hunt
- 18:15 - 18:30 Organization of participants projects
- 20:00 - Social school dinner at Restaurant Au Pont Saint Martin (see  map), rue des Moulins.



### Day 3. Thursday 17 November

- 09:00 - 10:45 Participants projects
- 10:45 - 11:15 Coffee break
- 11:15 - 13:00 Participants projects
- 13:00 - 14:30 LUNCH
- 14:30 - 15:45 Projects presentations
- 15:45 - 16:15 Feedback



# Internet access

**osiris**  
login : conf-asterics  
passwd : Pan0Ram1X