# ¿Que puede aportar VO a proyectos grandes como el Gaia-ESO Survey y a futuros proyectos de la REG?

Enrique Solano

Observatorio Virtual Español

CAB (INTA-CSIC)

# REG Working Groups

- G1: Estrellas masivas y distancias exactas a cúmulos masivos
- G2: Cinturon de Gould
- G3: Cúmulos estelares y asociaciones
- G4: Evolución estelar (tardía)
- G5: Estructura de las estrellas y comparación con modelos
- G6: Análisis estadístico de las poblaciones estelares
- G7: Estrellas de baja masa, enanas marrones y exoplanetas
- G8: Estructura, cinemática y dinámica a gran escala
- G9: Instrumentación
- G10: Sistema Solar
- G11: Observatorio Virtual
- G12: Minería de datos y astroestadística

- VO's main goal: *"Efficient access and analysis of the information hosted in astronomical archives."*

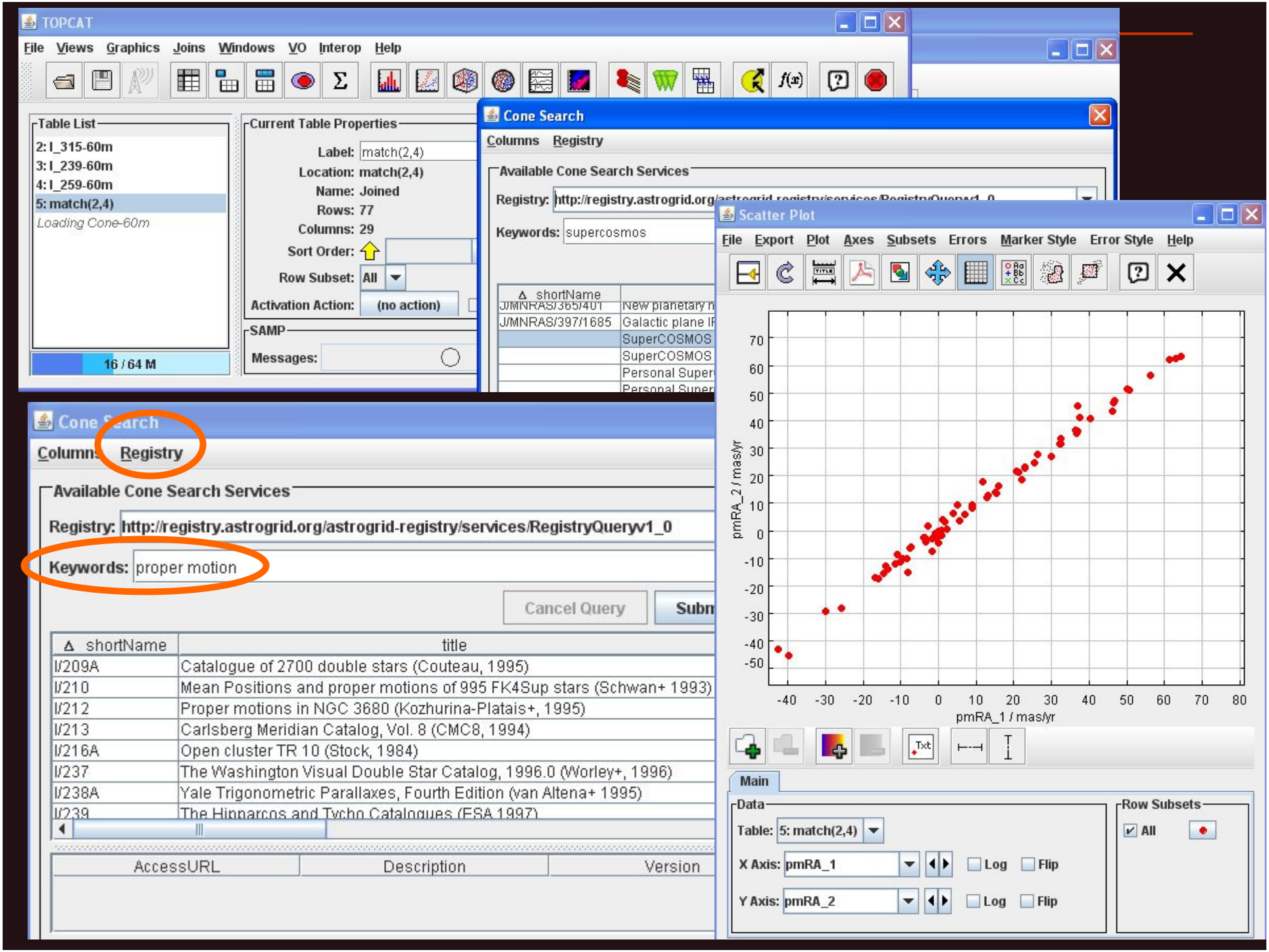
# GAIA-ESO survey

- Public spectroscopic survey (> 100 000 stars)
- Field stars and clusters
- From halo to star forming regions.
- First homogeneous overview of kinematics and abundances.
- FLAMES / GIRAFFE-UVES
- 250 scientists
- 300 nights. P88 - P97

# Gaia-ESO Survey WG4: Cluster Stars Target Selection

- The clusters to be observed
- The stars to be observed in each cluster.
- Identification of the best candidates by looking through archives.
  - What is already available?
    - Cluster: distance, reddening, metallicity,…
    - Stars: photometry, spectroscopy,…

**Virtual Observatory as a discovery tool**


TOPCAT
File Views Graphics Joins Windows VO Interop Help
Table List
2: I_315-60m
3: I_239-60m
4: I_259-60m
5: match(2,4)
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Current Table Properties
Label: match(2,4)
Location: match(2,4)
Name: Joined
Rows: 77
Columns: 29
Sort Order:
Row Subset: All
Activation Action: (no action)
SAMP
Messages:
Cone Search
Columns Registry
Available Cone Search Services
Registry: http://registry.astrogrid.org/astrogrid-registry/services/RegistryQueryv1_0
Keywords: supercosmos
shortName
J/MNRAS/397/1685 Galactic plane I
SuperCOSMOS
SuperCOSMOS
Personal Super
Cone Search
Columns Registry
Available Cone Search Services
Registry: http://registry.astrogrid.org/astrogrid-registry/services/RegistryQueryv1_0
Keywords: proper motion
Cancel Query
Subm
shortName
title
I/209A Catalogue of 2700 double stars (Couteau, 1995)
I/210 Mean Positions and proper motions of 995 FK4Sup stars (Schwan+ 1993)
I/212 Proper motions in NGC 3680 (Kozhurina-Platais+, 1995)
I/213 Carlsberg Meridian Catalog, Vol. 8 (CMC8, 1994)
I/216A Open cluster TR 10 (Stock, 1984)
I/237 The Washington Visual Double Star Catalog, 1996.0 (Worley+, 1996)
I/238A Yale Trigonometric Parallaxes, Fourth Edition (van Altena+ 1995)
I/239 The Hipparcos and Tycho Catalogues (ESA 1997)
AccessURL
Description
Version
Scatter Plot
File Export Plot Axes Subsets Errors Marker Style Error Style Help
pmRA_2 / mas/yr
pmRA_1 / mas/yr
Main
Data
Table: 5: match(2,4)
X Axis: pmRA_1
Y Axis: pmRA_2
Log
Flip
Row Subsets
All

# A typical VO workflow

## Virtual Observatory as an analysis tool

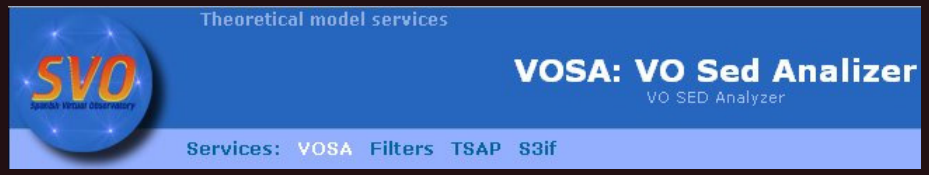
- NGC 1817 (Balaguer & Jordi)
  - *"Given a cone of the sky, give me all stars with photometry in SDSS, 2MASS and Balaguer & Núñez (2004)".*

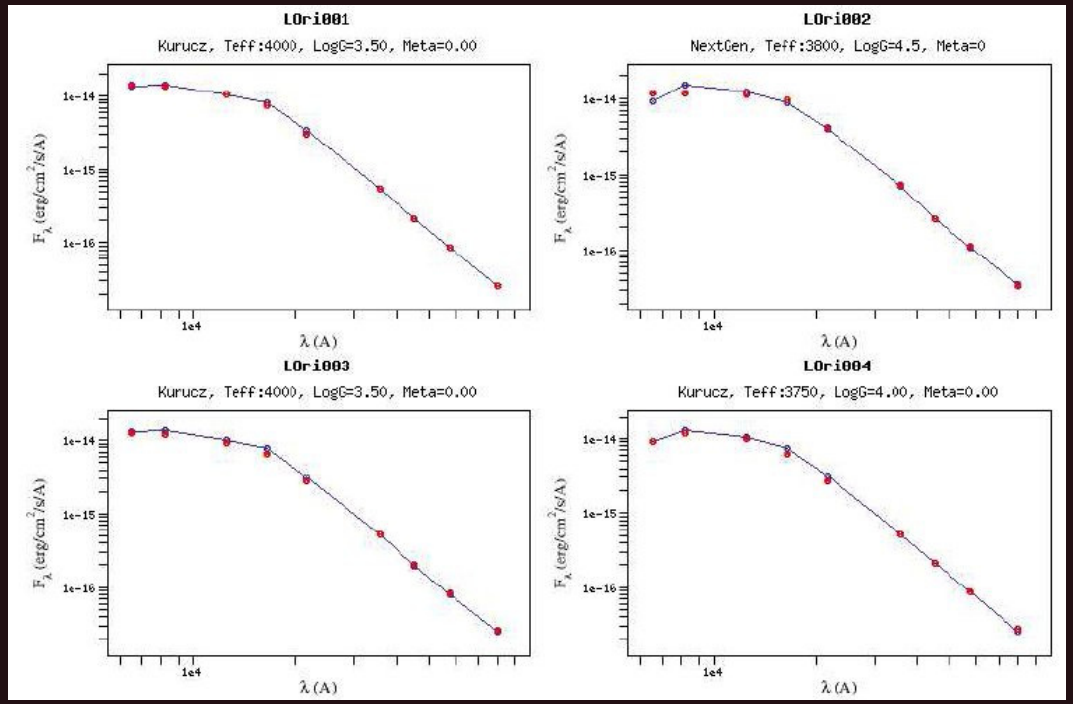

• java -jar ~esm/stilts.jar tpipe in='http://vizier.u-strasbg.fr/viz bin/votable/-A?-source=II/294&RA=78.025&DEC=16.7&SR=0.5' out=sdss.xml ofmt=votable

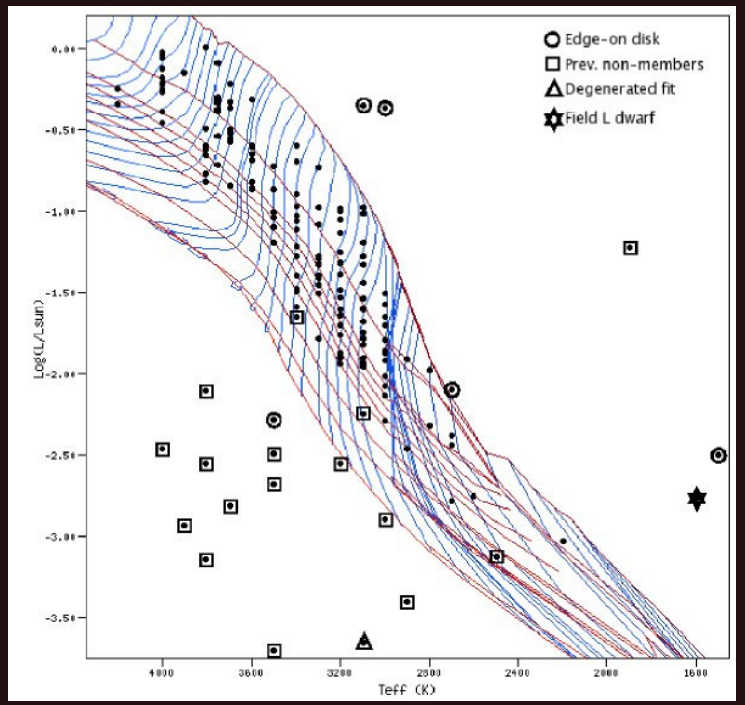
• java -jar ~esm/stilts.jar tskymatch2 ifmt1=votable in1=sdss.xml in2=2mass.xml ra1="RAJ2000" dec1="DEJ2000" ra2="RAJ2000" dec2="DEJ2000" error=2 find=best out=cross.xml ofmt=votable

# A typical VO workflow: NGC1817

- *"And I want to complement this photometry with other available in archives and derive physical parameters (e.g. Teff) and build and H-R diagram."*



# A typical VO workflow: NGC1817

- *"And I want to get all the spectroscopic information that is available in VO archives."*


SED Building Tool: Search Form

Object List:

Submit Query Reset

| | | |
|---|---|---|
| ☑ | 6dF DR3 Simple Spectra Access | http://wfaudata.roe.ac.uk/6dF- |
| ☑ | AXIS-XMS Optical Spectra | http://venus.ifca.unican.es:80 |
| ☑ | Be Star Spectra SSAP | http://basebe.obspm.fr/cgi-bi |
| ☑ | Be Stars Spectra database | http://basebe.obspm.fr/cgi-bi |
| ☑ | CENCOS-VVDS_DEEP SSA (VVDS Deep survey) | http://lamwws.oamp.fr/DAL/SS |
| | ELODIE archive (Service not working) | http://atlas.obs-hp.fr/elodie/E. |
| ☑ | ESO Spectrum Service | http://archive.eso.org/apps/ss |
| ☑ | Epic Spectra SSAP of the SSC Interface for the 2XMMi Catalogue | http://xcatdb.u-strasbg.fr/2xm |
| ☑ | Epic Spectra SSAP of the SSC Interface for the 2XMMi DR3 Catalogue | http://xcatdb.u-strasbg.fr/2xm |

# Gaia-ESO Survey WG9: Determination of stellar parameters

- Comparison with theoretical models

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## ATLAS VERSUS NEXTGEN MODEL ATMOSPHERES: A COMBINED ANALYSIS OF SYNTHETIC SPECTRAL ENERGY DISTRIBUTIONS

E. BERTONE
Instituto Nacional de Astrofísica, Óptica y Electrónica, Luis Enrique Erro 1, 72840 Tonantzintla, Mexico

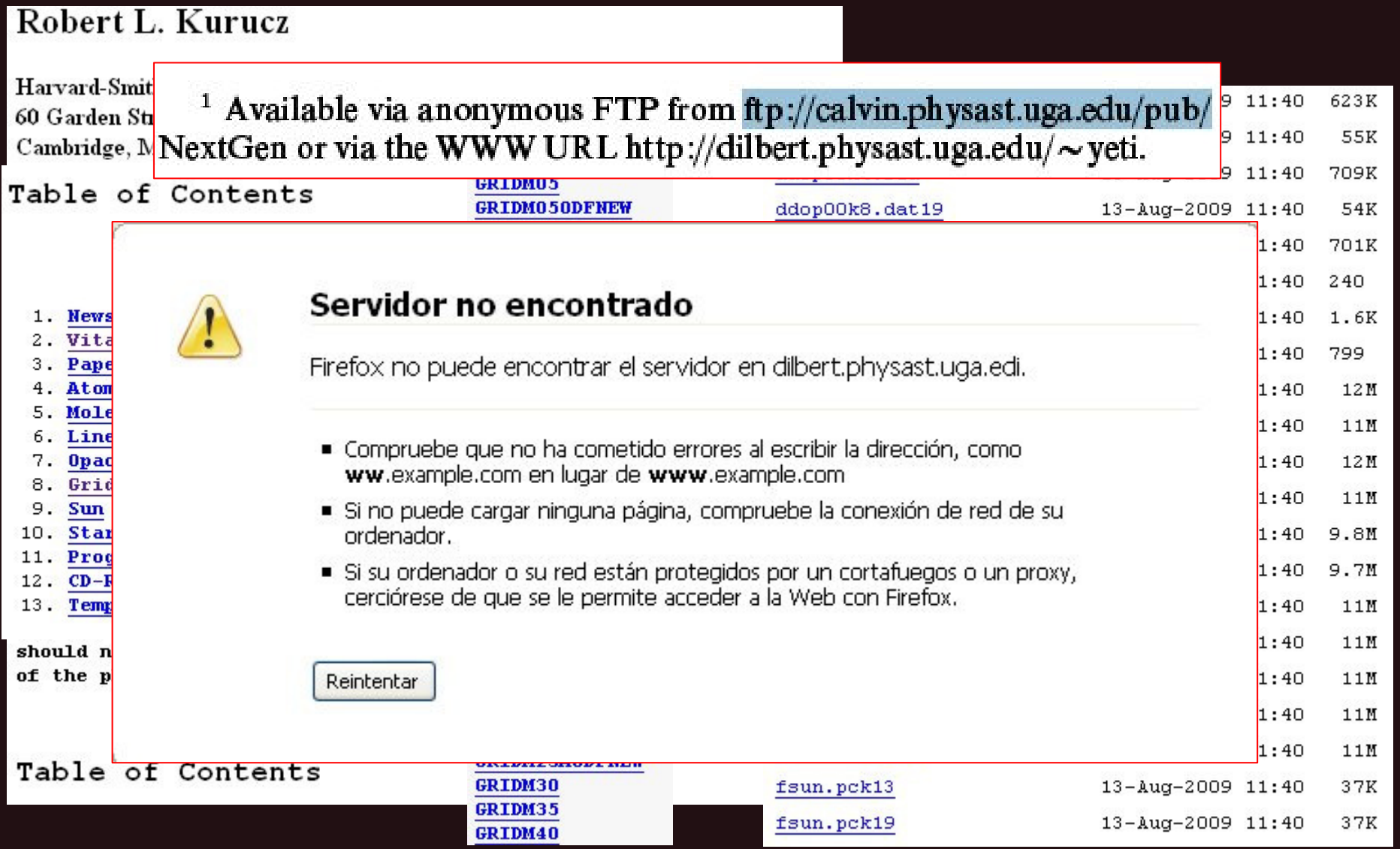
A. BUZZONI
INAF, Osservatorio Astronomico di Bologna, Via Ranzani 1, 40127 Bologna, Italy

AND

M. CHÁVEZ[1] AND L. H. RODRÍGUEZ-MERINO
Instituto Nacional de Astrofísica, Óptica y Electrónica, Luis Enrique Erro 1, 72840 Tonantzintla, Mexico
*Received 2004 January 28; accepted 2004 May 12*

[2] See http://kurucz.harvard.edu.
[3] See ftp://calvin.physast.uga.edu/pub/ and http://dilbert.physast.uga.edu/~yeti. Note that the libraries of dwarf and giant stars available at these sites have lower $T_{\rm eff}$ limits than the published ones.

# Accessing Kurucz & Nextgen models



# Kurucz: data characterisation

```
SDSC GRID  [+0.0]  VTURB 2.0 KM/S   L/H 1.25
      PROGRAM READFLUX
C     SAMPLE PROGRAM READS THIS FILE ON UNIT 1
      DIMENSION Hnu(1221),HnuCONT(1221),WAVE(1221)
      CHARACTER*80 TITLE
      DO 11 ISKIP=1,22
   11 READ(1,1)
C     wavelength in nm
      READ(1,1)WAVE
    1 FORMAT(10F10.2)
      DO 8 MODEL=1,500
C     ergs/cm**2/s/hz/ster
      READ(1,2,END=9)TITLE
    2 FORMAT(A80)
      PRINT 3,MODEL,TITLE
    3 FORMAT(I5,1X,A80)
      READ(1,4)Hnu
      READ(1,4)HnuCONT
    4 FORMAT(8E10.4)
    8 CONTINUE
    9 CALL EXIT
      END
      9.09      9.35      9.61      9.77      9.96     10.20     10.38     10.56
     10.77     11.04     11.40     11.78     12.13     12.48     12.71     12.84
     13.05     13.24     13.39     13.66     13.98     14.33     14.72     15.10
     15.52     15.88     16.20     16.60     17.03     17.34     17.68     18.02
     18.17     18.61     19.10     19.39     19.84     20.18     20.50     21.05
     21.62     21.98     22.30     22.68     23.00     23.40     24.00     24.65
```

# Gaia-ESO Survey WG9: Determination of stellar parameters

- Comparison with theoretical models

## Granada Stellar Seismic Models

Documents Models Services

Granada Stellar Seismic Models (GSSM-VO) adapts the Granada Team numerical package outputs to be used in VO in order to perform on-line stellar seismology. This package contains the evolutionary codes CESAM and CESAM2K and two oscillation codes: GraCo and FILOU.

**CESAM2k evolutionary code + GraCo oscillation code**

You can search the database in terms of several parameters (move your mouse over the (?) symbol to see a descrip available range of values for each one).

- Please, select a range for each parameter that you want to use in the search and then click the "Search" button list of the available files.
- Take into account that some combinations of values could correspond to no result.

**Structure search parameters**

| | | | | |
|---|---|---|---|---|
| (?) | $T_{eff}$ | 4000 - 5000 | (K) |
| (?) | Lum | - | (Lsun) |
| (?) | Log(g) | - | |
| (?) | Density | - | (g/cm3) |
| (?) | Age | - | (Myr) |
| (?) | [Fe/H] | - | |
| (?) | Z | - | |
| (?) | Hcent | - | |
| (?) | $R_*$ | - | (Rsun) |
| (?) | Mass | - | (Msun) |
| (?) | Vrot | - | cm/s |
| (?) | Wrot | - | rad/s |
| (?) | Trot | - | sec |
| (?) | $\alpha_{MLT}$ | - | |
| (?) | Over. | - | |

**Sismology search parameters**

| | | | |
|---|---|---|---|
| (?) | F0 | - | (muHz) |
| (?) | F1 | - | (muHz) |
| (?) | F0/F1 | - | |
| (?) | Δ(v) | 25 - 30 | (muHz) |
| (?) | Vsta | - | (muHz) |

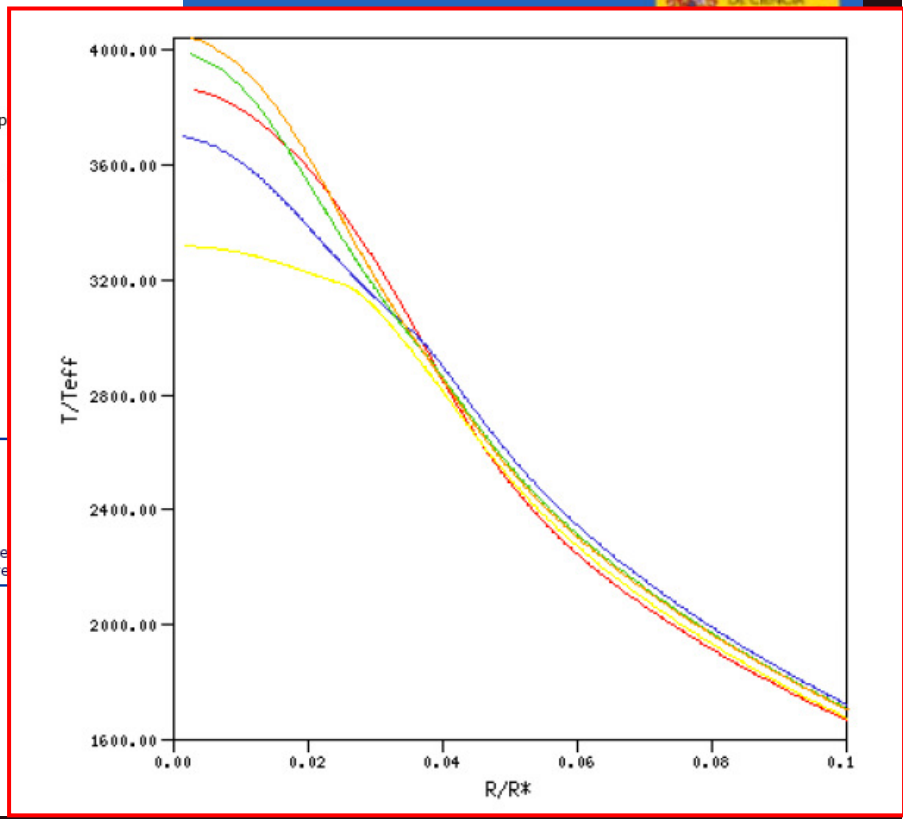
**Δ(v)**

Large separation

Δ(v) = freq (n, l, m=0) - freq (n-1, l, m=0)

The large separation is computed as an average of the ave for the oscillation modes with Frequency and a mode degre

Search Reset



# Archive of preparatory / follow-up data.

- Raw, calibration, reduced
- High level data products
  - Radial velocities, metallicities, equiv. widths, classification,…
- VO-compliance
  - Easy interoperability with the rest of archives.

# How to undertake all these activities?

- VO-REG
  - VO support to REG scientific projects
  - Technical developments:
    - Development and maintenance of VO archives and services
  - Data Mining