

The Virtual Observatory

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Astronomy ESFRI & Research Infrastructure Cluster
ASTERICS - 653477



Information sharing

- Astronomy has been a pioneer in scientific info. sharing:
 - A common data format since the 70s (FITS).

1981MNRAS...44...363W

ASTRONOMY & ASTROPHYSICS
SUPPLEMENT SERIES

JUNE 1981, PAGE 363

Astron. Astrophys. Suppl. Ser. **44**, (1981) 363-370

FITS : A FLEXIBLE IMAGE TRANSPORT SYSTEM

D. C. WELLS (1), E. W. GREISEN (*) (2) and R. H. HARTEN (**)

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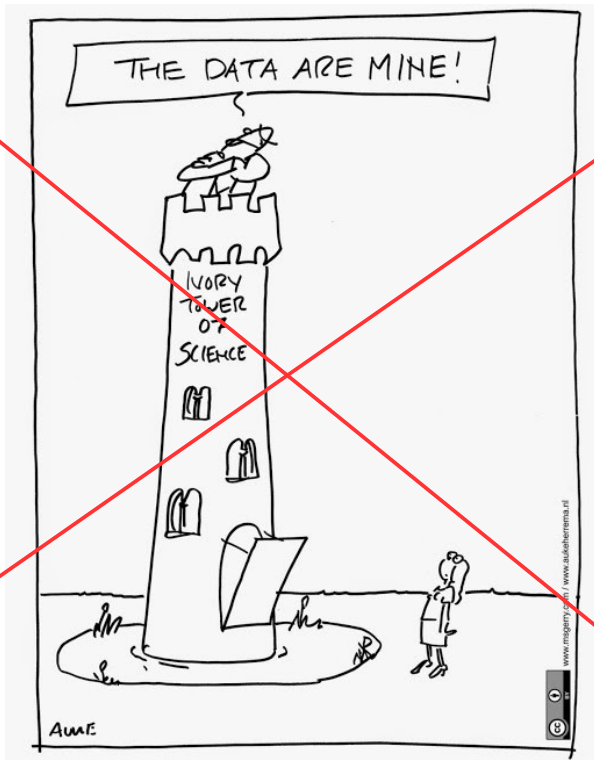
Summary.- A format for the interchange of astronomical images and other digital arrays on magnetic tape is described. This format provides a simple but powerful mechanism for the unambiguous transmission of n -dimensional, regularly spaced data arrays. It also provides a method for the transmission of a virtually unlimited number of auxiliary parameters that may be associated with the image. The parameters are written in a form which is easily interpreted by both humans and computers. The FITS format has been adopted for the transmission of astronomical image data by several large observatories including the Very Large Array, the Westerbork synthesis telescope, the Kitt Peak Observatory and the Anglo-Australian Observatory.

Key words : data analysis

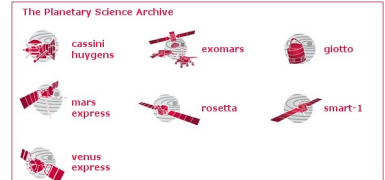
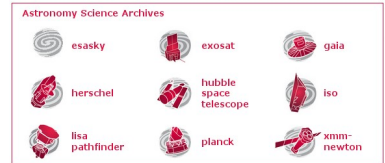


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 - Open data (after a short proprietary time).

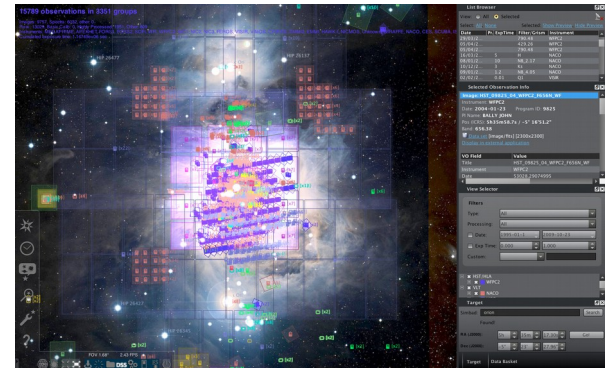


ESAC SCIENCE DATA CENTRE



Information sharing

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 - Open software.

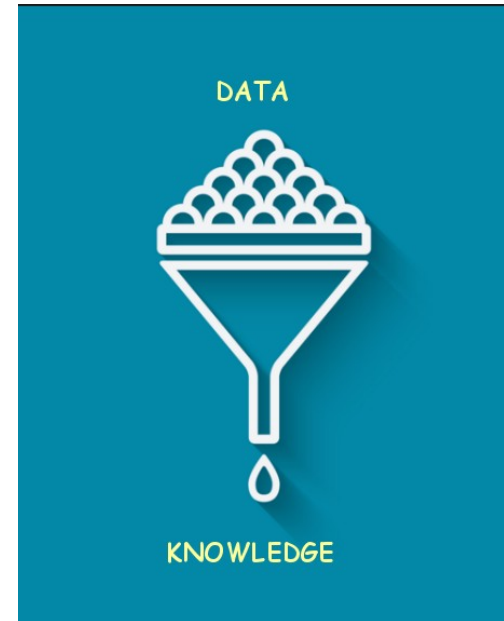
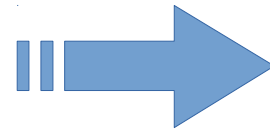
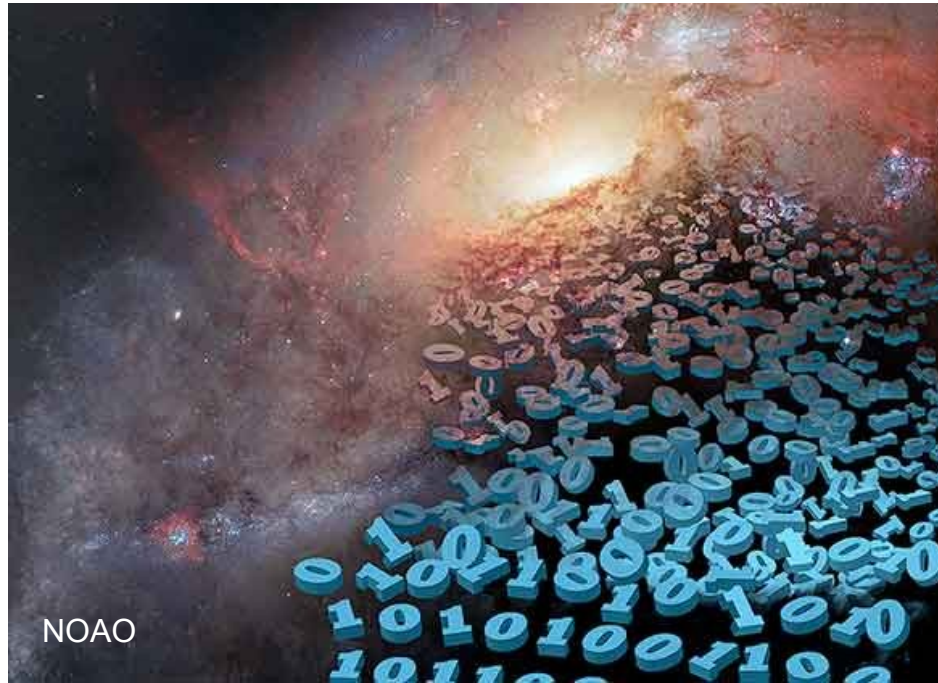


Information sharing

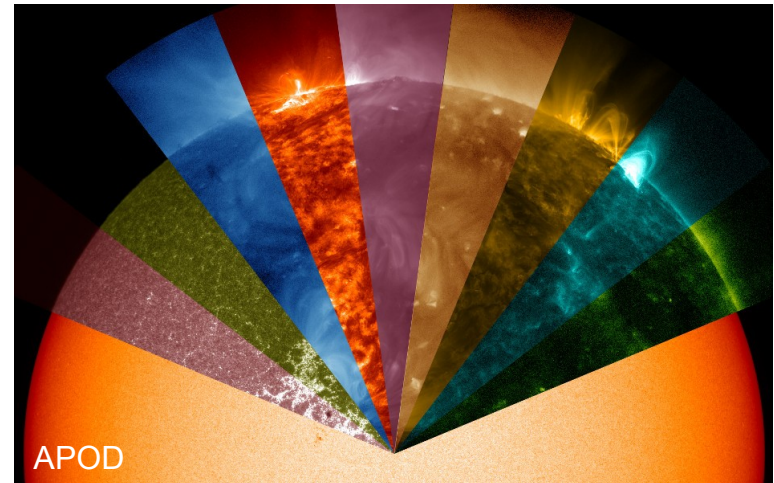
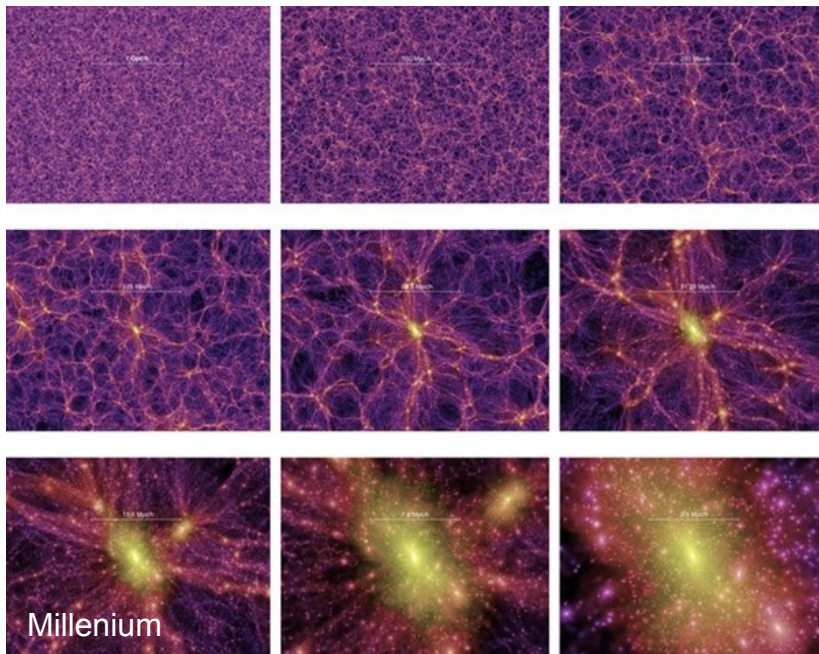
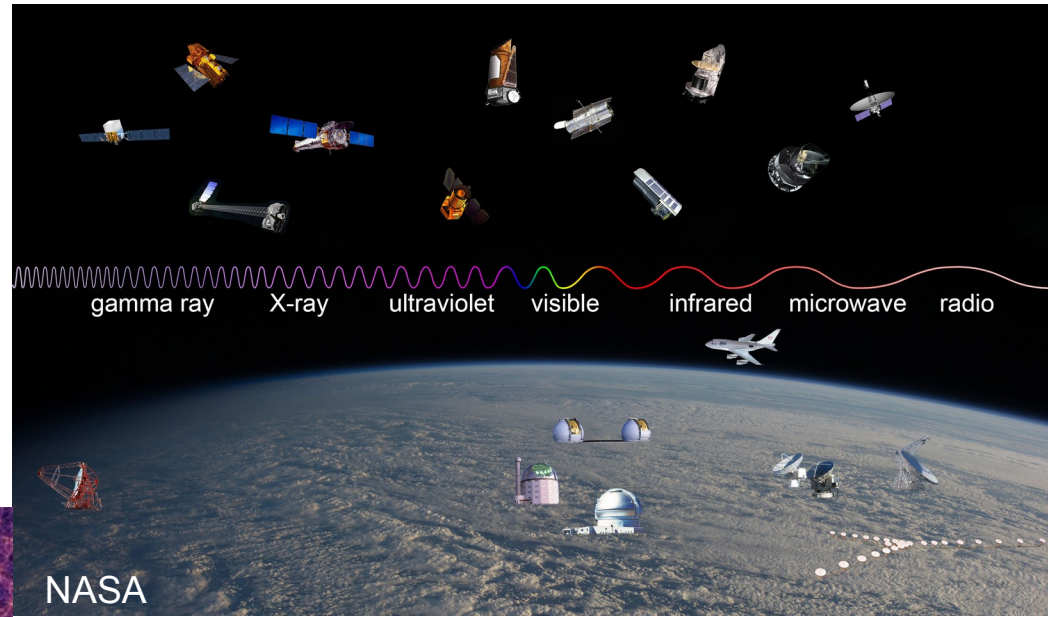


Information at zero meters from you

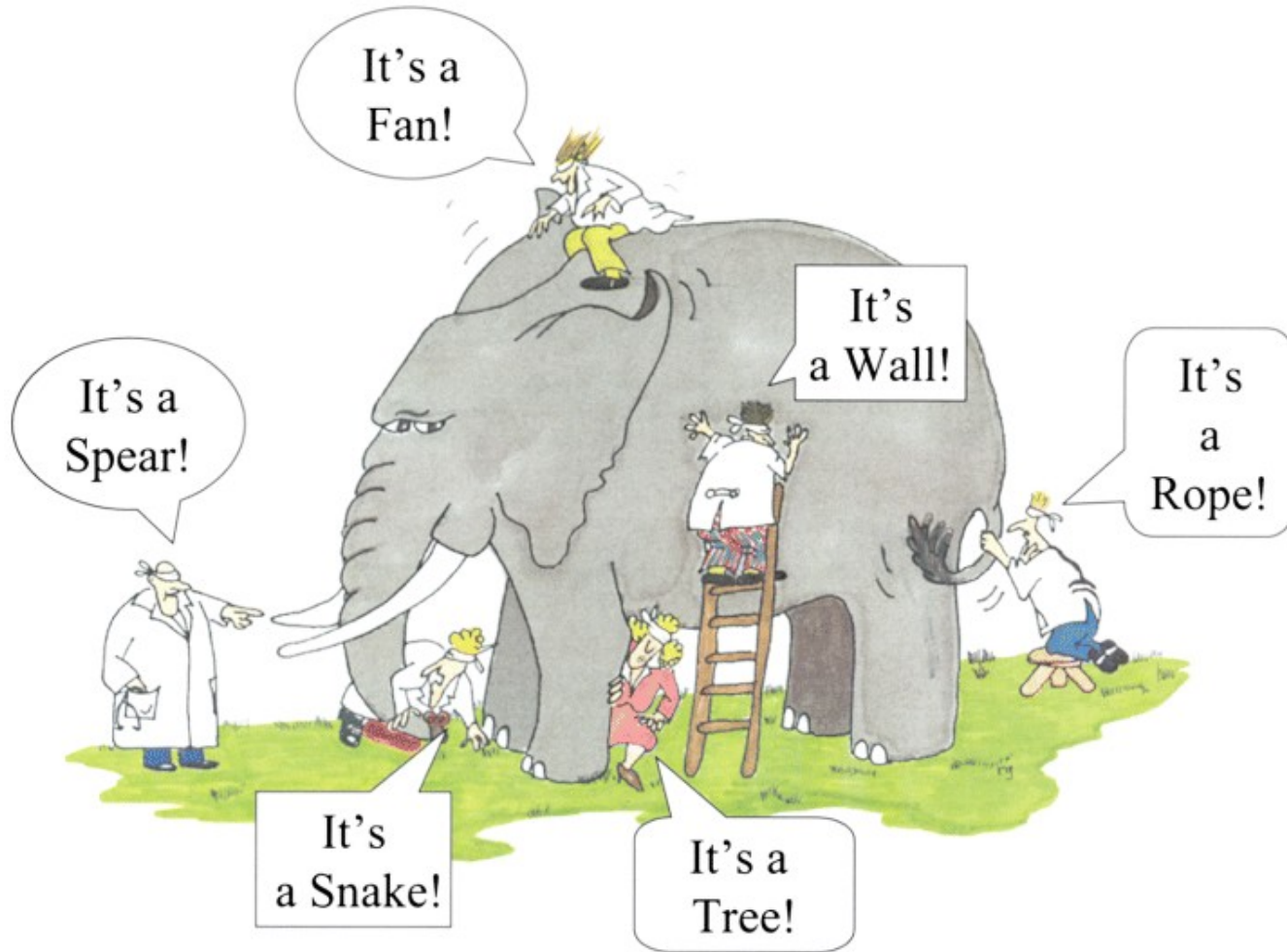
From data to knowledge



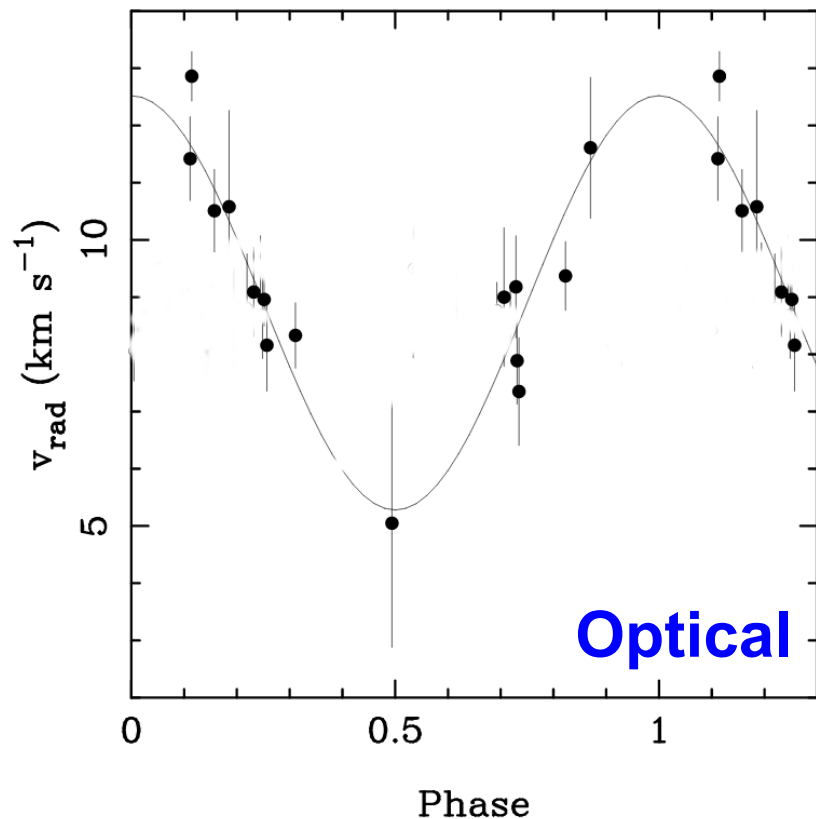
The challenge



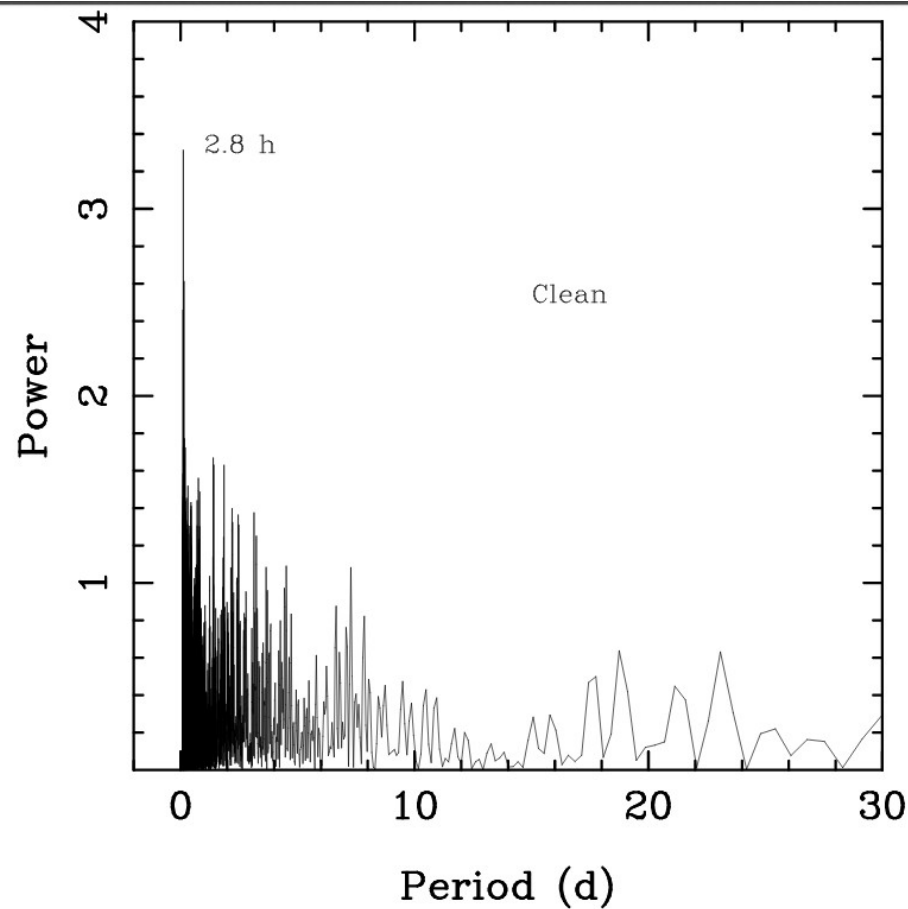
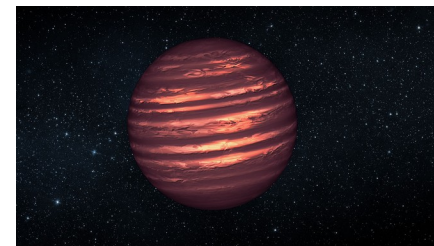
Multi- λ Astronomy



Multi- λ Astronomy

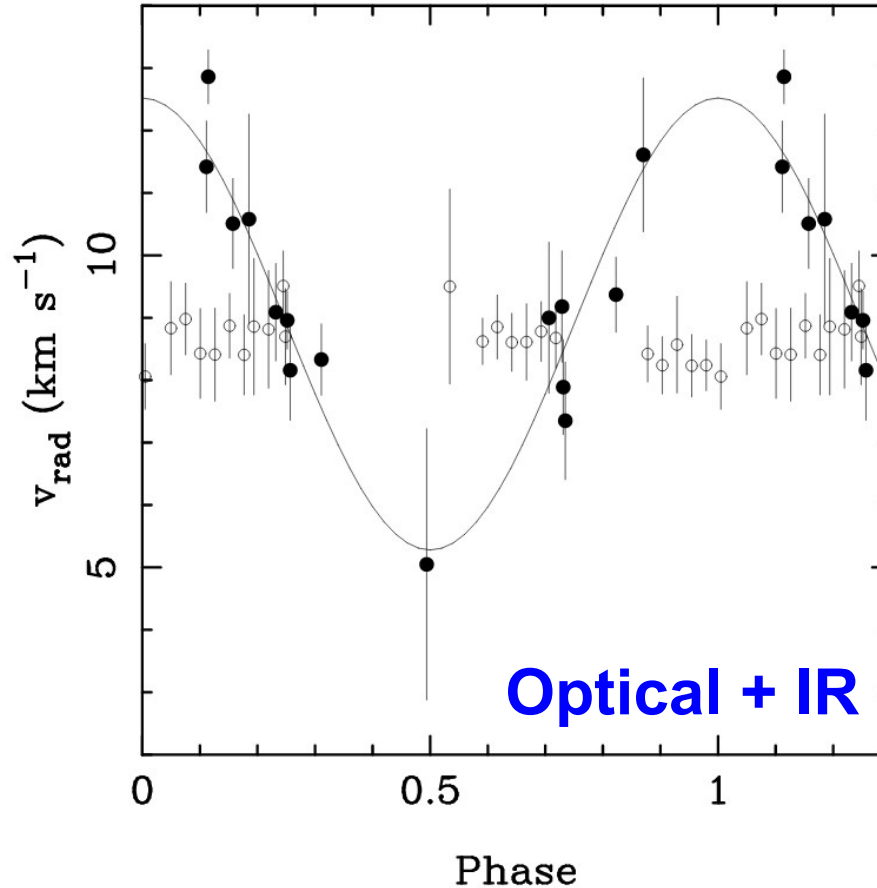


LP 944-20



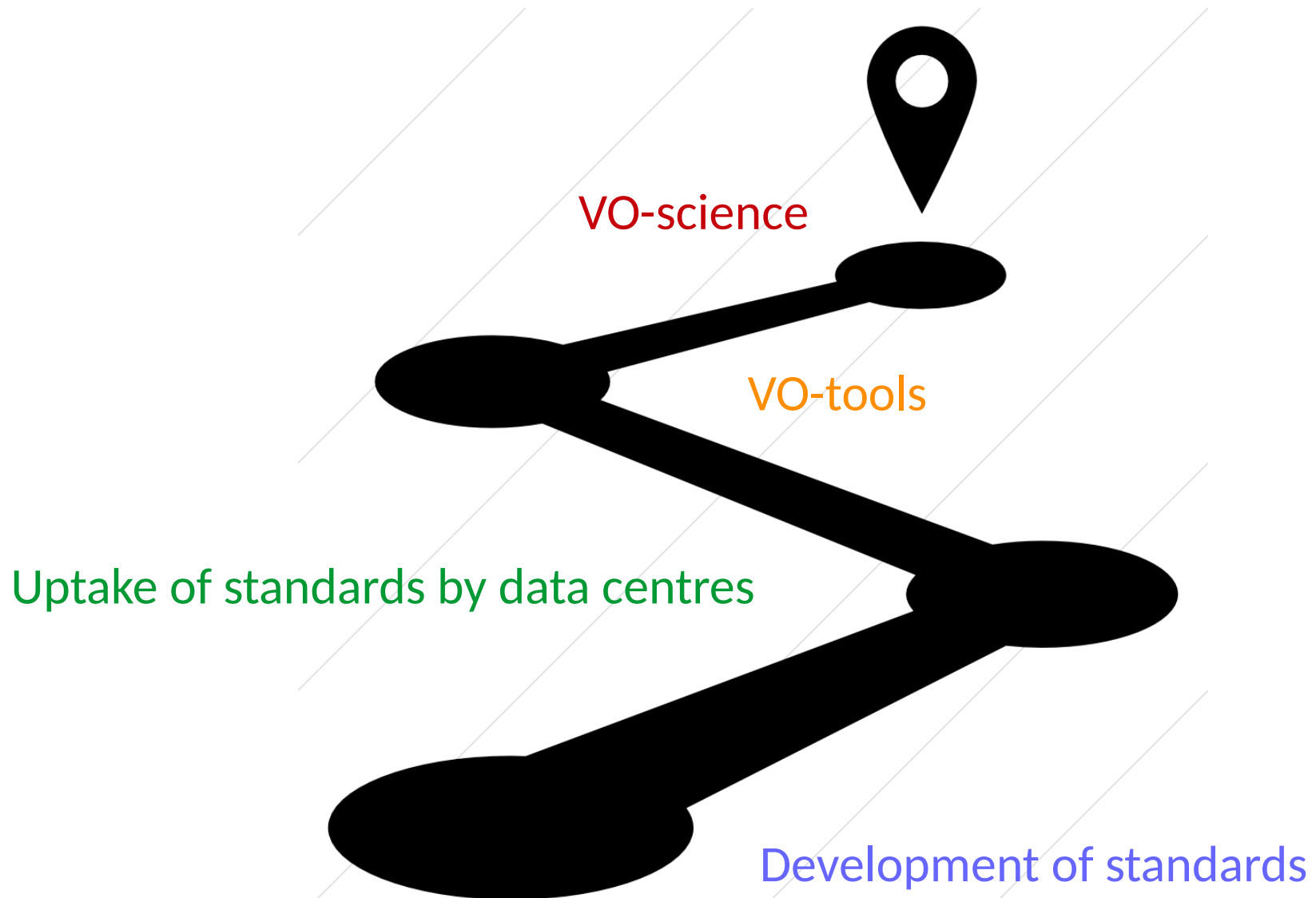
- 14 nights covering 841 days
- Period: 2.5 – 3.7 hours

Multi- λ Astronomy



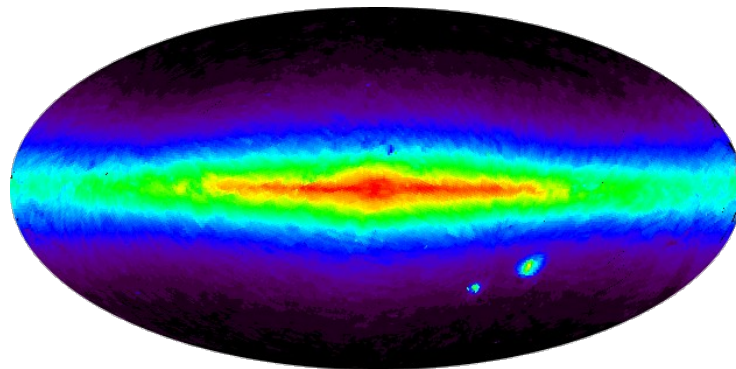
IR data rules out the planetary hypothesis

The VO roadmap



VO-tools (I)

- *“I have a list of objects, I want to get the (G-Ks) colour .”*



Gaia DR1
(1142679769 sources)

VO-tools (II)



International
Virtual
Observatory
Alliance

HiPS – Hierarchical Progressive Survey

Version 1.0

IVOA Recommendation
19th May 2017

Aladin v8.0

File Edit Image Catalog Overlay Coverage Tool View Interop Help

Location Frame ICRS

*DSS *SDSS *2MASS *WISE *GALEX *PLANCK *AKARI *XMM *Fermi *Gaia *Simbad *NED +

SDSS-DR9 MOC

Mouse controls:

- Left: source selection.
- Middle: quick panning.
- Right: constrast adjustment.
- Wheel: quick zoom on the reticle.
- Simple-ctrl: move the reticle.
- Double-ctrl: re-center.

Let you mouse pointer on an object for discovering associated Simbad data.

Properties

Properties of the plane "Int SDSS-DR9 MOCgtcMOC(1)"

PlaneID:

Origin: Computed by Aladin

Color:

Format: Multi-Order Coverage map (MOC)

Coverage: 1.765% of sky => 728**2

Best MOC ang.res: 6.871' (max order=9)

Size: 14240 cells - about 59.1KB

Drawing method: borders fill in diagonals

Adaptive resolution: on off

HEALPix Coordsys: ICRS

Overlay opacity/transparency

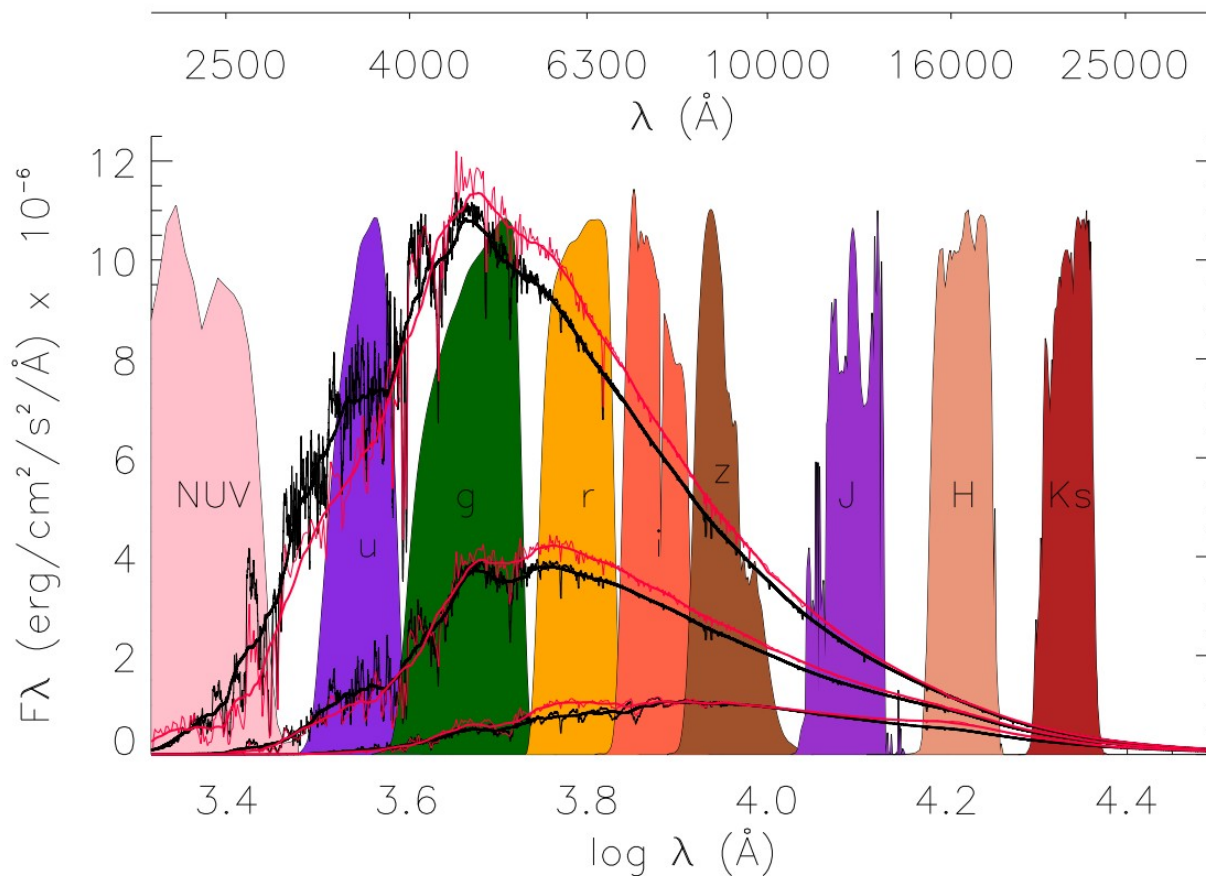
0 20 40 60 80 100

Apply Close

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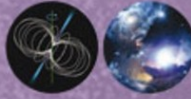
VO-tools (III)

- “I want to estimate the effective temperatures of thousands of objects from SED fitting.”



VO-science

MONTHLY NOTICES
of the Royal Astronomical Society



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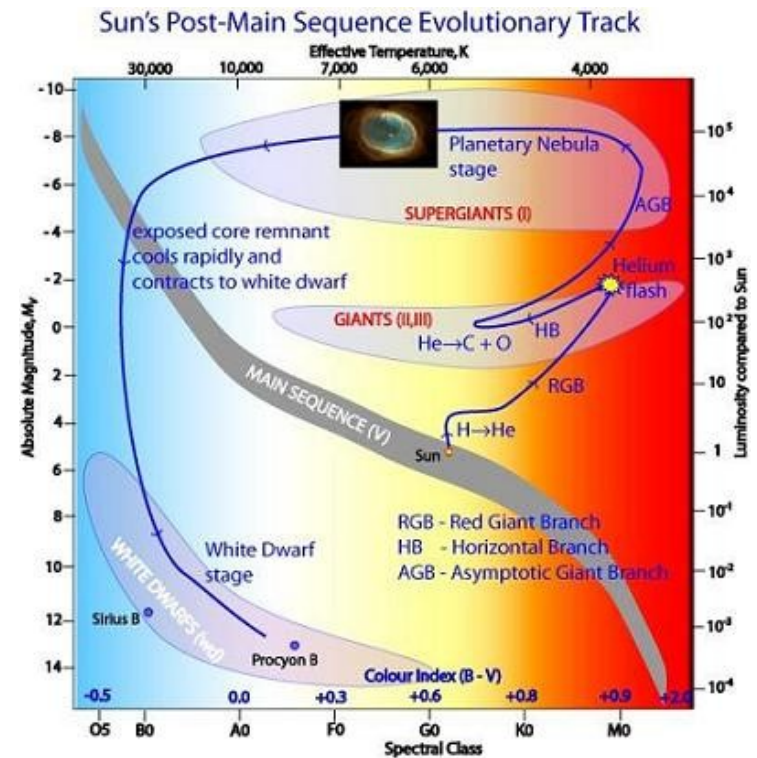
Oxford Journals > Science & Mathematics > MNRAS > Volume 457, Issue 3 > Pp. 3396-3408.

A search for new hot subdwarf stars by means of virtual observatory tools II

E. Pérez-Fernández^{1,2,*}, A. Ulla², E. Solano^{3,4}, R. Oreiro⁵ and C. Rodrigo^{3,4}

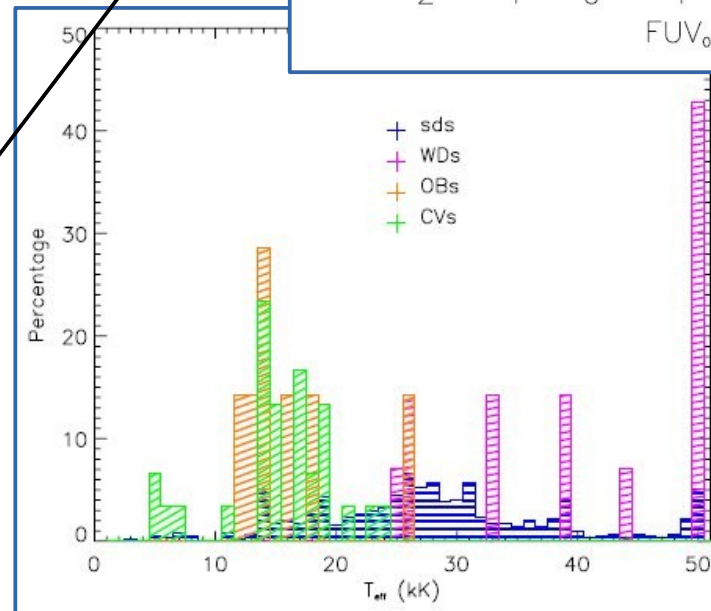
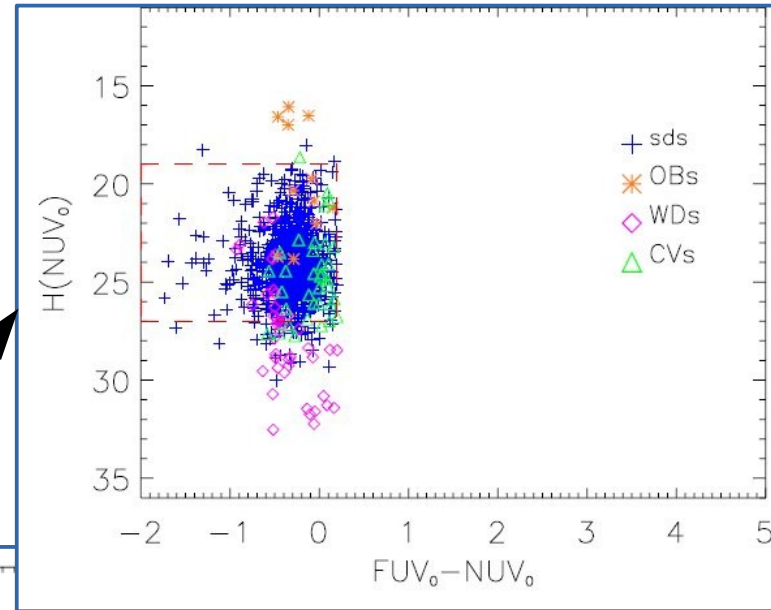
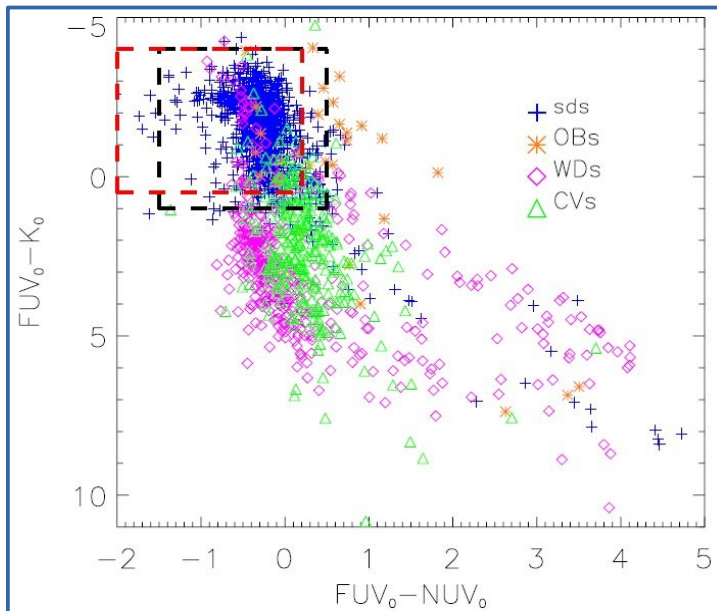
- Increase the number of hot subdwarfs
 - More robust statistical confrontation with theoretical evolutionary scenarios.
- Discovering of rare, interesting objects
 - Pulsating sdBs, sdOs in asteroseismic fields.
 - Subdwarfs as central stars of planetary nebulae.

- $T_{\text{eff}} > 19000 \text{ K}$
- $R: 0.3-0.5 R_{\text{sun}}$
- $\log g > 5 \text{ dex.}$
- $M: 0.5 M_{\text{sun}}$
- $M_{\text{env}} < 0.05 M_{\text{sun}}$



VO-science: Methodology

- Described in Oreiro et al. (2011)
 - Photometric, astrometric and phys. param criteria.
 - GALEX (GR6/GR7), 2MASS (PSC), SDSS (DR7), Supercosmos
 - High rate of success: > 90%
 - Census increased in 20%.



To keep in mind

- 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 10 years ago.