Time Domain Astronomy
Focus Session

Enrique Solano
Spanish Virtual Observatory
Centro de Astrobiología (INTA-CSIC)
The Focus Session

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<th>Speaker</th>
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<td>09:00–09:10</td>
<td>Focus session on time domain</td>
<td>Enrique Solano (Session Chair)</td>
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<td>astronomy</td>
<td>- Introduction</td>
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<td>09:10–09:30</td>
<td>CoRoT, Kepler time series</td>
<td>Jonas Debosscher</td>
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<td>09:30–09:50</td>
<td>Designs and Requirements for</td>
<td>Mario Juric (LSST)</td>
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<td>Time Domain Data in LSST</td>
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<td>09:50–10:10</td>
<td>ASKAP/VAST</td>
<td>Paul Hancock</td>
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<td>10:10–10:30</td>
<td>LOFAR Transients and MeerKAT</td>
<td>John Swinbank</td>
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<td>&quot;ThunderKAT&quot; transients</td>
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<td>10:30–11:00</td>
<td>Break</td>
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<td>11:00–12:30</td>
<td>Focus session on time domain</td>
<td>Mark Allen (Moderator)</td>
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<td>Panel:</td>
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<td>Severin Gaudet (TCG)</td>
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<td>Enrique Solano</td>
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<td>Matthew Graham (TD IG, CRTS)</td>
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<td>Pat Dowler (DAL WG)</td>
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<td>Jesus Salgado (DM WG)</td>
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IVOA Standing Committee on Science Priorities

Current Projects

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<td>Multi-dimensional Data</td>
<td>Collecting use cases, preparing focus sessions for May 2013 interop</td>
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VOEvent WG → TimeDomain IG

IVOA Committee on Science Priorities. The primary objective of the CSP “is to identify research needs of the worldwide astronomy community than can benefit from VO related tools and services, and to take action within the context of the IVOA to assist in placing such tools and services into the research community.”
Time Series are important

- Time domain science encompasses every area of astronomy, from Solar System to cosmology.

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**New Worlds, New Horizons**

in Astronomy and Astrophysics

Science frontier discovery areas:

- Identification and characterization of nearby habitable exoplanets,
- Gravitational wave astronomy,
- **Time-domain** astronomy,
- Astrometry,² and
- The epoch of reionization.
Time Series: they are everywhere

- OGLE: > 40 million objects
- SuperWASP: >17 million light curves
- The All Sky Automated Survey: >10 million objects
- Pan-STARRS
- Kepler
- CoRoT
Time Series everywhere

• The future: From pictures to movies

- A 3.2 gigapixel, 15-second exposure image every 20s.

Observing the sky with sub-mJ sensitivity at a 5s cadence.
Time Series and the VO: present

✓ Access to spectroscopic data

Improved variability classification of CoRoT targets with Giraffe spectra

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Astronomy & Astrophysics
Debris disc candidates in systems with transiting planets

A. V. Krivov*, M. Reidemeister, S. Fiedler, T. Löhne, and R. Neuhäuser

Astrophysikalisches Institut, Friedrich-Schiller-Universität Jena, Schillergäßchen 2–3, 07745 Jena, Germany
What can't VO do for Time Series? Discovery

Catalog servers
1. CDS VizieR catalog service (>5000 astronomical catalogues)
2. CDS SIMBAD astronomical database (>3,000,000 objects)
3. NASA/IPAC Extragalactic Database (Caltech/Pasadena)
4. SuperCOSMOS catalog server - Edinburgh (UK)
5. LEDA Hypercat (Lyon-Meudon Extragalactic Database)
6. Generic ConeSearch query
7. Galaxy Evolution Explorer Catalog (STScI)
8. San Pedro Martin Open Cluster Survey
9. Starlight Synthesis Parameters

Image servers
1. The Aladin image server (CDS/Strasbourg)
2. The UKIRT DR7 Infrared Deep Sky Survey
3. SDSS DR7 images
4. Multimission Archive at STScI (MAST)
5. Hubble Legacy Archive Footprint Data (HLA)
6. Canadian Astronomical Data Center (CADC)
7. Hubble press release images
8. VO-Paris Southern Atlas (VOPSAT)
9. Generic SIA query
10. The XMM-Newton Science Archive InterOperability System
11. The ISO Data Archive InterOperability System
12. The Integral Science Data Archive InterOperability System
13. SkyView Virtual Observatory
14. SuperCOSMOS Sky Surveys SSS SIAP Cutout Service
15. UKIDSS DR1 SIAP Service

Data servers
1. AXIS-XMS Optical Spectra
2. Be Star Spectra SSAP
3. HEROS archive of Ondrejov observations
4. SSA Service for Optical Spectroscopy in the CDF-S
5. cutout server of HEROS archive of Ondrejov observations
6. SSA Service for Synthetical Spectra (TMAP)
7. Espadons/Narval legacy database (Castor)
8. HiG - Simple Spectral Access to HI (21 cm) Spectra of Gas
9. International Ultraviolet Explorer
10. International Ultraviolet Explorer
11. Wisconsin Halfwave Spectropolarimeter
12. Wisconsin Halfwave Spectropolarimeter
13. HyperLeda FITS Archive Simple Spectrum Data Access
14. ELODIE archive

And light curves?
What can't VO do for Time Series? Access and description
A multi-wavelength study of the young star V1118 Orionis in outburst

M. Audard1,2, G. S. Stringfellow3, M. Güdel4, S. L. Skinner3, F. M. Walter5, E. F. Guinan6, R. T. Hamilton6,7, K. R. Briggs8, and C. Baldwin-Saxena1,2
TimeSeries in VO
Use Case Assessment

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IVOA Interoperability Meeting.
São Paulo, 21-26 October 2012
VO tools and Time Series

VAO Time Series Tool

Introduction

Discover time series data sets at the Harvard Time Series Center (TSC), the NASA Exoplanet Archive at IPAC/Caltech, and the Catalina Real-Time Transient Survey at CACR/Caltech, and analyze them with the NASA Exoplanet Archive’s periodogram application.

This service is a pathfinder for developing a utility that interconnects repositories of time series data. Please give us your feedback - it is important in driving future VO capabilities.

This service is recommended for use with the most recent versions of Firefox, Chrome or Safari. Internet Explorer 9, old versions of Firefox (prior to version 8) and Opera are not supported.

VAO Time Series Search

Use the fields below to enter a search location and radius.

Location: GSC 03144-00002
Radius: 10 arcsec
Period04 is a computer program especially dedicated to the statistical analysis of large astronomical time series containing gaps. The program offers tools to extract the individual frequencies from the multiperiodic content of time series and provides a flexible interface to perform multiple-frequency fits.

Latest news:
--- 2010-11-24: Period04 v1.2.0 has been released.
This version provides some new features:
- Period04 now supports the SAMP communication protocol to provide interoperability with other applications of the Virtual Observatory.