

ASTROVIRTEL: Accessing Astronomical Archives as Virtual Telescopes

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Abstract. We present here ASTROVIRTEL¹: a project supported by the European Commission within the “Enhanced Access to Research Infrastructures” action. ASTROVIRTEL is already being used by European astronomers as a Virtual Telescope, enabling them to access a huge amount of astronomical data with the support of the ASTROVIRTEL personnel. At the same time, operating ASTROVIRTEL—that is, being involved in the definition of the user requirements, and in the implementation of the necessary tools—is an ideal way to get acquainted with the scientific drivers and the technology required to build a Virtual Observatory.

1. Introduction

The ASTROVIRTEL Project is supported for a three year period by the European Commission (EC), within the “Enhanced Access to Research Infrastructures” action of the “Improving Human Potential & the Socio-economic Knowledge Base” section of the EU Fifth Framework Programme. It is managed by the Space Telescope European Coordinating Facility (ST-ECF) on behalf of ESA and ESO and is aimed at improving the scientific return of the ESO/ST-ECF Archive.

European users can exploit ASTROVIRTEL as a Virtual Telescope, retrieving and analyzing large quantities of data with the assistance of the Archive operators and personnel. In addition to serving the scientific community directly, the Project will be used to define the scientific requirements for a more comprehensive and sophisticated multi-wavelength Virtual Observatory.

2. ASTROVIRTEL

Although individual grants cannot be funded under the current scheme (“Enhanced Access to Research Infrastructures”), we believe that the strength of ASTROVIRTEL is to be found in the support, both in terms of manpower and of computing power, that it is able to offer to its users. Once a submitted proposal has been accepted by the scientific review panel and has been judged

¹<http://www.stecf.org/astrovirtel/>

technically feasible, its investigators are invited to ESO for a period of one to two days.

The aim of this preliminary visit is to understand the requirements of the scientific program. Once that has been achieved, work on the program starts. The role of the ASTROVIRTEL team at this stage is similar to that of a team of assistant astronomers at an observatory on a mountain, i.e., to offer help and consulting in data mining and retrieval, data reduction, and software development. Moreover, investigators can store and process their data using the computing facilities available at ESO, if the tasks are too demanding for the resources of their home institutions.

Another strength of the ASTROVIRTEL project is its ability to help investigators access, retrieve and process data residing in archives and data bases not housed at ESO. These include ISO, CFHT, ING, and MAST.

3. Accepted Proposals

The ASTROVIRTEL Cycle I Call-for-Proposal deadline was June 15, 2000. By that date a number of proposals were submitted, out of which five were accepted by the science review panel and by the technical feasibility team. The accepted proposals, listed below, are publicly available on the web from the ASTROVIRTEL home page:

- D. Burgarella, “A quantitative Approach of Rest-Frame Ultraviolet Morphology”,
- D. Egret, “Multi-wavelength Cross-identification of Star Catalogues towards the Magellanic Clouds”,
- G. Hahn, “Search for Precovery Images of Near-Earth Asteroids in the ESO Schmidt Plate Archive”,
- S. Smartt, “From galaxy formation to supernovae - stellar populations in resolved galaxies”,
- C. Zwintz, “Asteroseismology with the HST Fine Guidance Sensors”.

The present cycle will be followed by two other calls for proposals; one every year, with deadlines, probably, at the beginning of the summer. It is intended that work on accepted proposals will be concluded in one year’s time, in order to avoid work-load pile-ups.

4. Resources Already Available in House

The following resources are already available to ASTROVIRTEL PIs:

- ESO/ST-ECF archive²: 1 million observations (HST and ESO data), 8.0 TB of scientific data, growth rate: 5 TB/year, one big robotized jukebox with 1100 DVD slots and 6 DVD drives, two jukeboxes with 670 DVD disks each, on the fly calibration pipelines for HST data, and on the fly calibration of VLT data (soon).

²<http://archive.eso.org>

- Catalogues and survey data access: GSC1 and GSC2,³ Tycho-2,⁴ Hipparcos,⁵ USNO A2.0,⁶ IUE final archive (INES),⁷ DSS1 and DSS2 red, blue and IR,⁸ the HST Hubble Deep Fields, ESO Imaging Survey (EIS), NTT SUSI Deep Field (NDF) and SOFI Infrared Images of the NTT Deep Field, Science Verification and Commissioning Data from the VLT and WFI, HST NICMOS and STIS parallel observations, ESO Schmidt Plates Collection, and ESO Lauberts and Valentijn Images.
- Computing power: two Beowulf systems (1 master + 9 nodes each, 10 times faster than state of the art quad-processors servers on WFI (wide field imager) reduction pipelines, 8 x 36 GB fiber channel RAID each, Gigabit network switches), state of the art SUN workstations, and Alpha VMS systems.
- Manpower: dedicated personnel to assist ASTROVIRTEL PIs, in-house development of data mining tools, search and retrieval of datasets not available in-house (ISO, CFHT, MAST, etc.), support for reduction and analysis of the data, and ASTROVIRTEL can take advantage of the extra expertise available within ESO.

5. Goals & Future

One important goal of the ASTROVIRTEL project is to enhance the ESO/ST-ECF archives by making tools developed for any of its approved proposals publicly available. This will empower the whole astronomical community with new and more powerful browsing/data mining tools, dedicated reduction/analysis pipelines, and real cross-archive interoperability.

Another important goal of ASTROVIRTEL is to understand the requirements of tomorrow's Virtual Observatories. This implies an understanding of the scientific drivers of a Virtual Observatory as well as of the technology it needs. Handling in a technically efficient and scientifically meaningful way several interconnected multi-wavelength (and multi-instrument) archives is an ambitious task that constitutes the core of the VOs. ASTROVIRTEL aims at tackling this very problem by making use of the experience gained during its years of operation.

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