The ASTERICS Virtual Observatory Schools: Getting closer to the astronomical community

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I. Abstract

The goal of ASTERICS WP4 (Data Access, Discovery and Interoperability) was to ensure that the ESFRI products become openly accessible via the Virtual Observatory framework to the international community. Training activities to efficiently use these new resources was identified as one of the important objectives within this workpackage.

In this context, four Virtual Observatory (VO) schools were organised with a twofold objective:

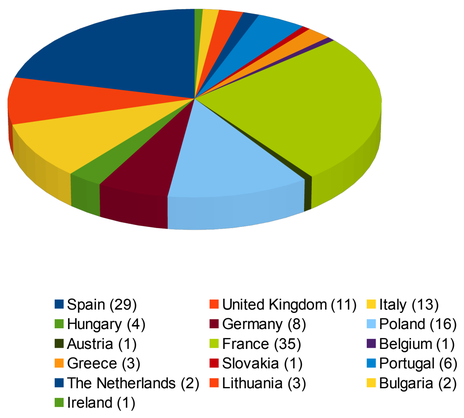
- Expose European astronomers (in particular early-career people) to the variety of VO tools and services available today so that they can use them efficiently for their own research.
- Gather feedback and requirements from this intense and diverse usage.

During the schools, VO experts guided the participants on the usage of VO tools through a series of real life science cases. Participants also had the opportunity to develop their own science cases.

136 participants from 16 different European countries attended the schools. Feedback gathered from participants demonstrated that the goals of the schools were fulfilled and that they were efficient steps forward in the process of building an astronomical VO community both within ASTERICS and beyond the project's borders across Europe.

II. Introduction

- The European Virtual Observatory (Euro-VO) began to organise VO schools during the VO-AIDA FP7 project (2008-2010).
- The usefulness of these schools was immediately obvious and they were continued in the framework of two coordination actions: EuroVO-ICE (2010-2012) and CoSADIE (2012-2015).
- ASTERICS schools were scheduled on a yearly basis at two different venues: Centro de Astrobiología (CSIC-INTA, Madrid, Spain) and l'Observatoire Astronomique de Strasbourg (France). Both venues possessed the necessary infrastructure and technical support to efficiently manage this type of hands-on meetings.



III. Preparatory work

- Several months in advance, the school was widely advertised in the European community beyond ASTERICS through different channels (distribution list of national astronomical societies, ASTRONET, participants in previous schools,...).
- To take more advantage of the school, the students were encouraged to propose a scientific case related to their research. Tutors iterated with the students for several weeks, with the scope of better understanding the science case and to guide them before the school.
- PhD students were requested to provide a letter of recommendation from their supervisor to guarantee that the school fits well with their research interests.
- A web site (Figure 1) was set up to provide participants with all the necessary information before and during the school: registration form, programme, venue, accomodation, transport as well as other links of interest.
- A twitter hastag was created to help the exchange of school-related information during and after the school.

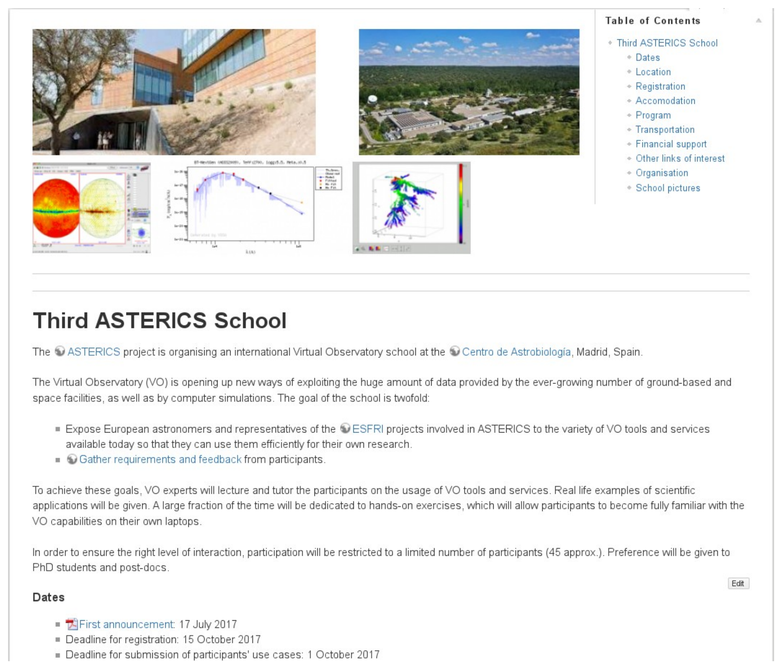


Figure 1. School website

IV. The Programme

- Three working days.
- Similar structure for the four schools:
  - Welcome talk.
  - Brief introduction on the ASTERICS project and the VO tools and services.
  - Hands-on sessions to make participants familiar with the VO capabilities. Due to the heterogeneity in the knowledge of VO tools among the participants, it was decided to use tutorials of two different levels: Beginners and intermediate / advanced users.
  - Tutorials were designed to cover the most important functionalities of the most popular VO tools. The last tutorial (“*Treasure hunt*”) consisted on a series of challenging questions, to be answered using the knowledge acquired with the previous tutorials.
  - Three tutors were assigned to each tutorial. This ensured that the tutorial was carried out smoothly and within the allocated time, providing the participants with personalized support to solve questions that may arise during its execution.
  - Work on the science cases proposed by participants. Presentation of a suite of them highlighting how VO helped in their research.
  - Discussion on feedback and requirements to improve VO tools and services.
  - Wrap-up.

V. Conclusions

- The four schools were rated to be excellent/very good by the participants.
- ESFRI partners actively participated in the schools both as participants (CTA) and as tutors (Figure 2).
- The interactions with participants before the school was time-consuming but rewarding given the successful outcome. This approach allowed the tutors to check the adequacy of the proposed projects with the VO beforehand and to identify the best methodology to conduct the project. Most of the participants submitted a science case (Figure 3).
- The answers provided by participants in the feedback form were discussed in the last session of the school and served to identify new functionalities for the VO tools as well as to improve the organization and structure of the school itself.
- The schools had a positive impact on the usage of VO tools to carry out astronomical research in Europe. Although most of the participants were early career researchers, 11 refered papers and 7 contributions to conference proceedings have been published by them since 2015 (Figure 4).
- Participants were encouraged to act as VO-ambassadors in their research institutes by giving informal talks with colleagues, seminars and scientific workshops and conferences, and making use of the material employed during the school.
- Tutorials were “recycled” for similar initiatives at national level: 5 schools in Spain (one of them focused on Pro-Am activities), 2 in Poland, 1 in France and 1 in Italy.

- **Name:**
- **Institute: University of Leeds**
- **Profile: PhD student**
- **Science case:**
  - I want to learn how to estimate astrophysical parameters of clusters of stars.
  - Keywords:
    - Cluster characterization
    - Herbig Ae/Be stars
    - Astrometric parameters (parallax and proper motion)
  - Want to know:
    - I am interested in learning about HR diagrams and estimation of the astrophysical parameters.
- **Previous usage of VO tools:**
  - No familiar with VO tools.
- **Do you have data to cross-match with catalogues? If so, which catalogues?**
  - My main catalog is TGAS, the parallax and proper motions are the principal parameters I am interested in. To be able to build colour-magnitude diagrams (B-V vs V or J-K vs K) I will cross-match with UCAC4 and 2MASS
    - VO tools → Aladin, TOPCAT
- **Are you interesting in determining physical parameters from SED fitting? If do, which models do you want to use?, and in which wavelength range?**
  - I am interested in determining physical parameters like age, mass, extinction. Also I want to be able to fit isochrones and evolutionary tracks.
    - VO tool → VOSA

Figure 3. Screenshot of the document describing a participant's science case.

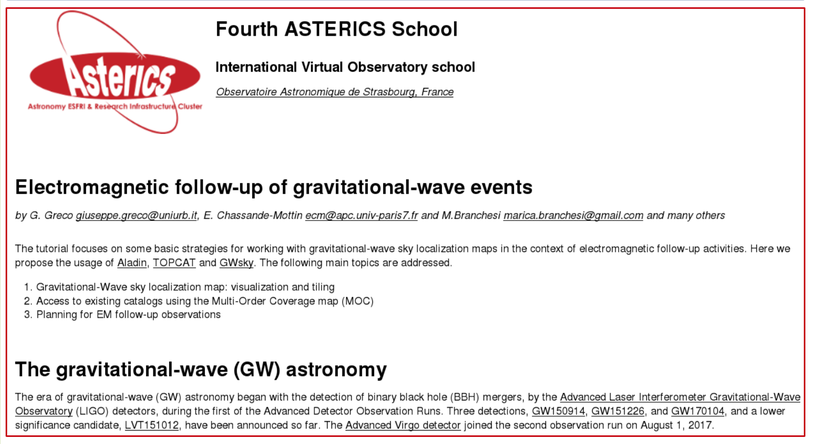


Figure 2. Tutorial prepared by EGO/VIRGO/ET on the follow-up of GW events using Virtual Observatory tools.

Introductory talks.

Support during the tutorial sessions.

THE ASTROPHYSICAL JOURNAL

A Large Moving Group within the Lower Centaurus Crux Association

Bertrand Goldman[1,2],
Published 2018 Novembe
The Astrophysical Journal

4.1. *Circumstellar disks*

With ages below 20 Myr, a fraction of our CMG members is likely to harbor a circumstellar disk at various stages of evolution.

We have used the Virtual observatory SED analyzer (VOSA Bayo et al. 2008) to analyze the spectral energy distribution of our members. In a nutshell, VOSA adjusts theoretical isochrones available in the Virtual observatory (VO) to the photometric information provided by the user and/or collected on the VO, by χ^2 minimization. It detects deviations from the photospheric emission, such as the infrared excess of interest here, and ignores the corresponding data points when the fit is repeated. We used all available VO photometry and fitted the data with the CIFIST models with Solar metallicity

Figure 4. VO paper published in ApJ as first author by a school' participant.