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First ASTERICS DADI European School

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Abstract

The First ASTERICS DADI European School was held in Madrid, 15-17 December 2015. It gathered all the teams involved in WP4 except two (KM3NET and LIGO/EGO). The goals were twofold: on the one hand, to expose early-career European astronomers to the variety of VO tools and services available today so that they can use them efficiently for their own research and, on the other hand, to gather feedback and requirements from this intense and diverse usage. During the school, VO experts guide the participants on the usage of such tools through a series of real life science cases. Participants also have the opportunity to develop their own science cases. The school included general presentations about the ASTERICS project and the Virtual Observatory.

The meeting atmosphere was excellent and it allowed many exchanges and discussions.

This school was the first of a series of four to be conducted on a yearly basis until the end of the ASTERICS project.

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II. DELIVERY SLIP

	Name	Partner/WP	Date
From	E. Solano	INTA/WP4	2016, Feb 7th
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Reviewed by	Francoise Genova	CNRS/WP4	2016, Feb 25th
Approved by	Rob van der Meer		2016, Mar 6th

III. DOCUMENT LOG

Issue	Date	Comment	Author/Partner
1	2016, Feb. 7th	First draft (V05) sent for comments to WP4 leader (F. Genova)	E. Solano, INTA
2	2016, Feb. 8th	V06 sent back to E. Solano with comments	F. Genova, CNRS/CDS
3	2016, Feb.9th	V07 sent by E. Solano to F. Genova	E. Solano
4	2016, Feb. 10th	V08 sent by F. Genova to the project manager and partners and by E. Solano to tutors	F. Genova
5	2016, Feb. 17th	V09 with comments from the project manager and project scientist	R. van der Meer
6	2016, Feb. 18th	V10 taking the comments into account	E. Solano, F. Genova
7	2016, Feb. 25th	Final version	E. Solano, F. Genova

IV. APPLICATION AREA

This document is a formal deliverable for the GA of the project, applicable to all members of the ASTERICS project, beneficiaries and third parties, as well as its collaborating projects.

V. TERMINOLOGY

2MASS: 2-Micron All Sky Survey

AGN: Active Galactic Nuclei

AIDA: Astronomical Infrastructure for Data Access

ASTERICS: Astronomy ESFRI & Research Infrastructure Cluster

ASTRON: Netherlands Institute for Radio Astronomy

CNRS: Centre National de la Recherche Scientifique

CDS: Centre de Données astronomiques de Strasbourg

CoSADIE: Collaborative and Sustainable Astronomical Data Infrastructure for Europe

CSIC: Consejo Superior de Investigaciones Científicas

CTA: Cherenkov Telescope Array

D: Deliverable

DADI: Data Access, Discovery and Interoperability

DCA: Data Centre Alliance

E-ELT: European Extremely Large Telescope

EGO: European Gravitational Observatory

ESA: European Space Agency

ESAC: European Space Astronomy Centre

ESFRI: European Strategy Forum on Research Infrastructures

ESO: European Southern Observatory

ET: Einstein Telescope

Euro-VO: European Virtual Observatory

GA: Grant Agreement

ICE: International Cooperation Empowerment

INAF: Istituto Nazionale di Astrofisica

INTA : Instituto Nacional de Técnica Aeroespacial

IVOA: International Virtual Observatory Alliance

KM3-NeT: KM3 Neutrino Telescope

LOFAR: Low Frequency Array

LUTH: Laboratoire de l'Univers et de ses Théories

PU: Public

SDSS: Sloan Digital Sky Survey

SED: Spectral Energy Distribution

SKA: Square Kilometre Array

SME: Small Medium Enterprise

TOPCAT: Tool for Operations on Catalogues and Tables

UEDIN: University of Edinburgh

UHEI: University of Heidelberg

VIRGO: Interferometer for detection of gravitational waves

VO: Virtual Observatory

VOSA: Virtual Observatory SED Analyzer

WP: Work Package

A complete project glossary is provided at the following page:

<http://www.asterics2020.eu/about/glossary/>

VI. PROJECT SUMMARY

ASTERICS (Astronomy ESFRI & Research Infrastructure Cluster) aims to address the cross-cutting synergies and common challenges shared by the various Astronomy ESFRI facilities (SKA, CTA, KM3Net & E-ELT). It brings together for the first time, the astronomy, astrophysics and particle astrophysics communities, in addition to other related research infrastructures. The major objectives of ASTERICS are to support and accelerate the implementation of the ESFRI telescopes, to enhance their performance beyond the current state-of-the-art, and to see them interoperate as an integrated, multi-wavelength and multi-messenger facility. An important focal point is the management, processing and scientific exploitation of the huge datasets the ESFRI facilities will generate. ASTERICS will seek solutions to these problems outside of the traditional channels by directly engaging and collaborating with industry and specialised SMEs. The various ESFRI pathfinders and precursors will present the perfect proving ground for new methodologies and prototype systems. In addition, ASTERICS will enable astronomers from across the member states to have broad access to the reduced data products of the ESFRI telescopes via a seamless interface to the Virtual Observatory framework. This will massively increase the scientific impact of the telescopes, and greatly encourage use (and re-use) of the data in new and novel ways, typically not foreseen in the original proposals. By demonstrating cross-facility synchronicity, and by harmonising various policy aspects, ASTERICS will realise a distributed

and interoperable approach that ushers in a new multi-messenger era for astronomy. Through an active dissemination programme, including direct engagement with all relevant stakeholders, and via the development of citizen scientist mass participation experiments, ASTERICS has the ambition to be a flagship for the scientific, industrial and societal impact ESFRI projects can deliver.

VII. EXECUTIVE SUMMARY

Different logistics constraints as well as the coincidence with other DADI-related meetings made impossible to organise the school as scheduled in the work plan. After consultation with the EC Project Officer for ASTERICS it was decided to hold the First ESFRI Forum & Training Event (Deliverable D4.3) on December 3-4 and the First School on December 15-17 (Deliverable D4.2).

The First ASTERICS DADI School was the first occasion to disseminate, in the ASTERICS framework, the Virtual Observatory concept among the European astronomical community. During the school, using tutorials based on real-life science cases, participants had the opportunity to become familiar with the most important functionalities of the most popular VO tools and services. Enough time was also allocated to work, under the VO-expert's guidance, on the science cases proposed by the participants. Likewise, a session was specifically devoted to gather feedback and requirements to improve the Virtual Observatory tools used in the school, making them more useful for the astronomical community.

The school fulfilled its objectives and was an efficient step forward in the process of building an astronomical VO community both within ASTERICS and beyond the project's borders across Europe.

The next activity in the framework of WP4/Task 4.2 (*"Support to the astronomical community"*) will be the organization of the second ASTERICS VO School to be held in Strasbourg, France, during fall 2016. It will build on the work and lessons learnt from the First School.

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1. Introduction

The main goal of WP4 (*“Data Access, Discovery and Interoperability”*) is to ensure that the ESFRI products are openly accessible via the Virtual Observatory framework to the whole European and also international communities. This will support new and novel approaches to data exploitation, and provides a natural repository where reduced, open data products (*e.g.* survey legacy data) can be reliably maintained and curated. As in many other key areas, training and educating the next generation of facility staff and users will be essential in securing the success of this and many other aspects of the ASTERICS programme.

The European Virtual Observatory (VO) initiative began to organise regular VO schools during the Euro-VO Astronomical Infrastructure for Data Access FP7 project (EuroVO-AIDA, 2008-2010). The goal of these schools were twofold: on the one hand, to expose early-career European astronomers to the variety of VO tools and services available today so that they can use them efficiently for their own research and, on the other hand, to gather feedback and requirements from this intense and diverse usage. During the school, VO experts guide the participants on the usage of such tools through a series of real life science cases. Participants also have the opportunity to develop their own science cases.

The usefulness of these schools was immediately obvious, and they were continued by the two small Coordination Actions on which the coordination of European VO activities relied from 2010 to 2015: the Euro-VO International Coordination Empowerment (EuroVO-ICE, 2010-2012) and Collaborative and Sustainable Astronomical Data Infrastructure for Europe (CoSADIE, 2012-2015).

ASTERICS Deliverable D4.2 (*“First ASTERICS DADI VO School”*) was organised by INTA in Madrid on 15-17 December 2015. The school was opened to all European countries, including non-partner countries and it mainly focused on young people at PhD or post-doctoral level. The DADI ESFRI partners and associated partners were also invited to send participants to learn about the scientific usage of the VO. The school will serve as template for the partners to organise similar activities towards their communities.

The preparation of the school is described in Section 2 of this document. The profile of the attending participants and the meeting programme are reported in Sections 3 and 4 while the analysis and conclusions after the school are addressed in Sections 5 and 6. A detailed description of the participant’s feedback and comments is given in Annex I and II, whereas some pictures taken during the school are shown in Annex III.

2. Preparation of the school

The first announcement of the school was released on October 16, 2015 with the deadline for registration originally set for November 13, 2015 and later extended to November 20, 2015. The school was widely advertised in the European astronomical community beyond ASTERICS through different channels:

- In the ASTERICS partner countries:
 - Spain
 - Distribution list of the Spanish Astronomical Society.
 - Universities: Autónoma and Complutense Universities (Madrid).
 - European Space Astronomy Centre distribution list.
 - Spanish Virtual Observatory distribution list
 - France
 - French Astronomical Society distribution list.
 - Action Spécifique Observatoires Virtuels France distribution list.
 - Italy
 - Distribution list of the Istituto Nazionale di Astrofisica (INAF).
 - United Kingdom
 - Distribution list of the Science and Technology Facilities Council (809 people).
 - Germany
 - Distribution list of the German astronomical community.
 - Astroparticle community.
 - The Netherlands
 - Distribution list of the Dutch astronomical community
- In countries outside the project
 - By contacts established in previous Euro-VO projects in Austria, Belgium, Greece, Denmark, Lithuania, Poland and Portugal.
 - By ASTRONET (the Astronomy ERA-NET) through its list of contacts in the different European countries. This was a very efficient communication way.
- Other channels:
 - IVOA Newsletters: <http://www.ivoa.net/newsletter/015/index.html>
 - European Astronomical Society e-Newsletters
<http://eas.unige.ch/news.jsp?id=20151203>

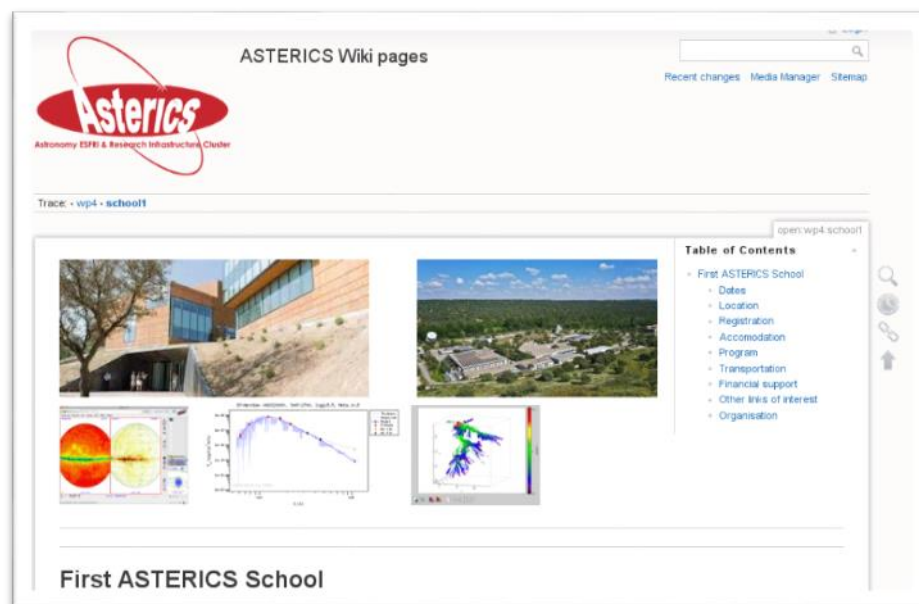
A web site (<https://www.asterics2020.eu/dokuwiki/doku.php?id=open:wp4:school1>, see Figure 1) was set up to provide participants with all the necessary information before and during the school: registration form, list of registered participants, programme, feedback form, information on venue and accommodation, as well as other links of interest.

The venue of the school was the ESAC conference center¹, located 30 km north-west of Madrid. ESAC possesses the necessary infrastructure and technical support to efficiently manage hands-on meetings like the ASTERICS school. In particular, having an auditorium able to accommodate all participants in a single room allowed us to conduct the school in plenary sessions instead of parallel sessions, which ensured that all participants were brought to the same level of knowledge of the VO tools at the end of the school.

As ESAC is in the middle of the countryside and difficult to reach by public transport, a bus service was organized to transport participants from the hotel to ESAC in the mornings and back in the afternoons.

Participants were hosted in Madrid at “Residencia de Estudiantes”², a hosting facility which belongs to the Spanish Council of Scientific Research (CSIC). Easily reachable by public transport (bus, metro or train), it offers the facilities of a four star hotel at reduced price.

Finally, a press note about the school, the Virtual Observatory and the ASTERICS Project was released to media. The press note is available in English from the ASTERICS web site (<https://www.asterics2020.eu/press>) and in Spanish from the Centro de Astrobiología web page (<http://cab.inta-csic.es/es/noticias/273/como-extraer-conocimiento-a-partir-de-millones-de-datos>).



Figuur 1 School website

¹ http://www.esa.int/About_Us/ESAC

² https://www.asterics2020.eu/dokuwiki/lib/exe/fetch.php?media=open:wp4:staying_at_the_residencia.pdf

3. Participants

The meeting gathered 42 participants and 11 tutors. All WP4 partners except KM3Net and EGO/VIRGO/ET were represented, i.e. representatives from ASTRON (LOFAR), CNRS/CDS, CNRS/LUTH (CTA), INAF, INTA, UEDIN and UHEI attended the meeting. It is worth noting that ESO, which is an associate partner of ASTERICS and in particular of WP4 for E-ELT, was represented.

The school was aimed at targeting early-career scientists. This requirement was fully achieved as demonstrated by the fact that the large majority of the 42 participants are currently carrying out their PhDs (29) or post-docs (11) in institutes in the following countries: Spain, France, Germany, Italy, United Kingdom, Poland, Belgium, Greece, Lithuania, Portugal and Slovakia. This clearly demonstrates the interest for the VO beyond the project's borders.

PhD students were requested to provide a letter of recommendation from their supervisor to guarantee that the school fits well with their research lines. All the participant expenses (flights, local transportation, accommodation, meals...) were covered by ASTERICS.

4. Meeting programme

The meeting programme, very similar to that of previous Euro-VO schools, was prepared by INTA and CNRS. It was built around the following sessions: Introduction (45 minutes), tutorials (11 hours 30 minutes), uses cases proposed by participants (5 hours 15 minutes) and feedback and wrap-up (45 minutes).

Two introductory talks about the ASTERICS project, the school, the Virtual Observatory and the new lines of research that can be addressed with it (*“VO Science”*) were run during the first session. Given the different levels of knowledge on Virtual Observatory among the participants, the Organising Committee considered it necessary to have this type of presentations before starting with the practical cases.

Seven tutorials were selected by the Organising Committee. They had been used in previous Euro-VO projects and were updated specifically for the ASTERICS School. The tutorials were available at the school web page but, to facilitate their use by the participants, they were also printed and distributed at the beginning of the school. One of the activities defined in Task 4.2 is the “provision of on-line science tutorials”. Therefore, we added the tutorials to the Euro-VO web page (<http://www.euro-vo.org/?q=science/scientific-tutorials>) which was updated accordingly.

- Tutorial 1: *“The CDS tutorial”*. An adequate starting point to introduce some basic capabilities of well-known tools like Simbad, Vizier and Aladin.
- Tutorial 2: *“Discovery of brown dwarfs mining the 2MASS and SDSS databases”*. This is a tutorial with a quite simple workflow, to learn how to perform basic operations (filtering, cross-matching) in Aladin and TopCAT and how to exchange information between these tools using the SAMP VO-protocol.
- Tutorials 3,4: *“Classifying the SEDs of Herbig Ae/Be stars”* and *“Determination of stellar physical parameters using VOSA”*. While tutorials #1 and #2 cover the management in the VO framework of astronomical images and tables, these tutorials explore how to handle other types of astronomical data like spectra or spectral energy distributions (SEDs).
- Tutorial 5: *“Multi-instrument, multi-wavelength study of high energy sources with the Virtual Observatory”*. This tutorial covers Aladin and TopCAT capabilities not described in tutorials #1 and #2 and focuses on how to handle high-energy data in the Virtual Observatory, a topic of particular interest for one of the ESFRI partners (CTA).
- Tutorial 6: *“Advanced functionalities in TopCAT”*. Specifically targeted at intermediate / advanced users, this tutorial shows capabilities not described in the previous ones.
- Tutorial 7 *“Treasure Hunt”*. This tutorial was based on a series of challenging questions, each of them to be answered by the participants in 5-7 minutes using the knowledge acquired with the previous tutorials.

Three tutors were assigned to each tutorial; a main tutor to conduct the case and two backup tutors to provide on-the-fly support to participants. This ensured that the tutorial was carried out without interruptions and within the allocated time and, at the same time, that the participants had a personalized support to solve the questions that may arise during the execution of the tutorial. It was decided that, in this first school, tutors came from the VO teams involved in DADI while the representatives sent by the ESFRI teams involved in DADI attended as participants.

The third session was devoted to develop the science cases proposed by participants. The goal of this session was to allow the participants to use the tools and services and the knowledge acquired during the previous sessions for their own scientific projects. This is always a tricky session as participants often propose cases not always closely related to the Virtual Observatory. Lessons learned from previous schools demonstrated that this had been the weakest point in the programme. It was, therefore, decided to contact the participants well in advance of the school to check if the proposed cases can be accomplished in the VO framework and, if so, to identify the best approach to conduct them. This proved to be an efficient approach.

In order to properly set up this session, a questionnaire was sent to participants two weeks before the school. The questionnaire included the following questions:

- Which type of data are you interested in? (Catalogues, images, spectra, other (specify))?
- Which wavelength range are you interested in? (Radio, infrared, optical, ultraviolet, X-ray, high energies)?
- If you know, tell us the name of the archives/catalogues you want to work with.
- Which type of operations do you want to perform with the data (cross-correlation, filtering, image visualization and analysis, spectral energy distribution building and fitting, other (specify))?
- Other topics related to your science cases (data management and publication)?

Once we received the participants' responses we initiated an individual interaction with them to define the science cases in a way as detailed as possible. This was a time consuming (with dozens of emails exchanged with the participants) but a compulsory activity to guarantee the success of the session. One of the success indicators was, doubtlessly, the fact that, unlike previous schools, most of the participants submitted a science case. For the sake of efficiency, a guide describing the participant science cases (Figure 2) as well as a list with the participants assigned to each tutor (Figure 3) was distributed among the tutors before the school. At the end of the session devoted to the science use cases, a selected group of participants made a short presentation summarizing the progress achieved during the school and how the VO tools helped them to carry out their science projects in an easier and more efficient way.

The last session was allocated to discuss the answers provided by the participants to the questions proposed in the feedback form. This was an important session, as one of the main objectives of the school was to gather requirements from the community. The questionnaire, available on the website and filled on-line during the morning session of the last day, included questions about the knowledge of VO before the school, the plans to use VO-tools after the school and on different aspects of the organization and structure of the school (see Annexes I and II for more information on this).

The meeting programme can be found at:

<https://www.asterics2020.eu/dokuwiki/doku.php?id=open:wp4:here>

- **Name:** Etkoras Pouliasis
- **Field:** Extragalactic
- **Research:** I am a first year doctoral student at the University of Athens, working under the supervision of Prof. Tsinganos, Dr. Georgantopoulos and Dr. Bonanos at IAASARS, National Observatory of Athens, in the framework of the ESA project "Hubble Catalogue of Variables". My PhD thesis is dedicated to identifying and characterizing extended sources, especially AGN by variability selection with observations from the Hubble Space Telescope. Additionally, comparing the properties of the optical variability with those derived in the IR and X-rays, it will result to have important information about the AGN's structure.
- **Type of data:** HLA images
- **Wave. Range:** optical & IR
- **Archives of interest:** Hubble Legacy Archive
- **Operations on data:**
 - **Step I:** As I have mentioned in my application, my first priority is to study **images from the Hubble Legacy Archive** (Optical, IR, GOODS-South,North - deep fields,) and **do my own photometry**, in order to check for variability properties. This means filtering the images, calibration (if needed), PSF/Aperture photometry etc.
 - **Step II:** Furthermore, I would like to **cross-match the sources I am interested from HLA with other already existed catalogues in X-rays, micro, radio.**
 - **Step III:** Finally to **build a spectral energy distribution, do fitting with theoretical models** and derive the redshift. I would like to use models-templates for elliptical/spiral galaxies, starburst, quasars and generally AGN objects. Probably, **it would be useful as well, to use stellar SEDs for low (~zero)spectroscopic redshifts to reject the stars in my sample.**
- **Experience with VO tools:**
 - Beginner Vizier and TOPCAT
- **Tutors:**
 - Steps I-II: CDS
 - Step III: Francisco Jiménez.

Figur 2 Screenshot of the document describing the participant's science cases.

- **Francisco Jiménez**
 - Maialen Arrieta
 - Fernando Buitrago
 - Luciano Cerrigone
 - Helen Hermak
 - Etkoras Pouliasis
 - Emilio Trigueros
- **Hendrik Heint**
 - Malgorzata Bankowicz
 - Gopal Bhatta
 - Manuele Gangi
 - Agnieszka Kurcz, Magdalena Krupa
 - Sauras Mikolaitis
- **INAF (Marco Molinaro & Giulia Iafrate)**
 - Mirko Curti
 - Simone Dichiara
 - Ilaria Pagotto
 - Bikram Pradhan
 - Milena Ratajczak
 - Zoi Spetsieri
 - Giacomo Venturi
- **CDS (Ada Nebot, Caroline Nebot, F-X. Pineau)**
 - Josselin Desmars
 - Farhang Habibi
 - Helen Hermak
 - Etkoras Pouliasis
 - Daniel Reverte
 - Rameshan Thimmappa
 - Tarik Zegmott
- **Enrique Solano**
 - Aurelia Gallego, Eulalia Gallego, Francisco Nogueras
 - Myriam Pajuelo
 - Pedro Sarmiento
- **Carlos Rodrigo**
 - Manuele Gangi
 - Farhang Habibi
 - Daniel Reverte
- **Mark Taylor**
 - Nils Gottschling
 - Julien Lefaucheur
- **José Manuel Alacid**
 - Sarunas Mikolaitis
 - Ilaria Pagotto

Figuur 3 Tutor-student assignment.

5. Analysis

The school started the ASTERICS WP4 activities towards the science community. It was also an occasion for WP4 partners, in particular the newcomers and the projects, to become familiar with the current VO tools and to be able to use and demonstrate them.

The impact analysis of the school was mostly done on the basis of the answers provided by the participants in the questionnaire form, which allowed us to identify topics of interest for the participants and for the ESFRIs.

The most important conclusions drawn from the feedback form are the following (see also Annexes I and II):

- There was a clear bi-modal distribution in the school participants: 22 participants had used VO tools before the school, while 21 had never used them previously. This has a clear impact on the definition of the school programme as it must include both tutorials focused on beginners and on intermediate/advanced users as well.
- Tutorials #1-5 were judged to be of an average difficulty. As expected, tutorials #6 and #7 were found to be more difficult. Tutorial #6 was deliberately oriented towards intermediate and advanced users, whereas in tutorial #7 participants had to deal with real science cases without the tutor's guidance and to get an answer in a very short time (5-7 minutes per question).
- All tutorials were judged useful to very useful, which clearly reflects how successful the selection of VO tools and science topics was.
- Participants considered that enough time was allocated to each tutorial to properly work with them, except for tutorials #6 and #7 for which more time was demanded. This will be taken into account for future editions of the school.
- The school was rated as “very good” and “excellent” by 14 and 20 participants, respectively (81%). The individual comments were extremely positive, stressing the usefulness of the school, its friendly atmosphere and the good interaction between participants and tutors.
- Thanks to the large number of science and technical tutors (11) with respect to the number of participants (42), there was constant interaction between participants and tutors during the three days of the school, a fundamental aspect to guarantee the success of a hands-on workshop like the ASTERICS VO School.

6. Conclusion and next steps

The main conclusion that can be drawn from the analysis made in the previous section is that the school completely fulfilled its objectives: Virtual Observatory dissemination among

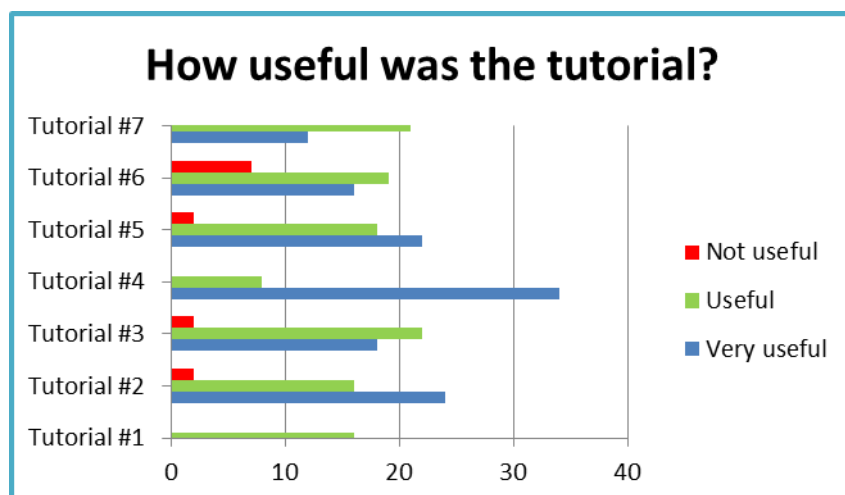
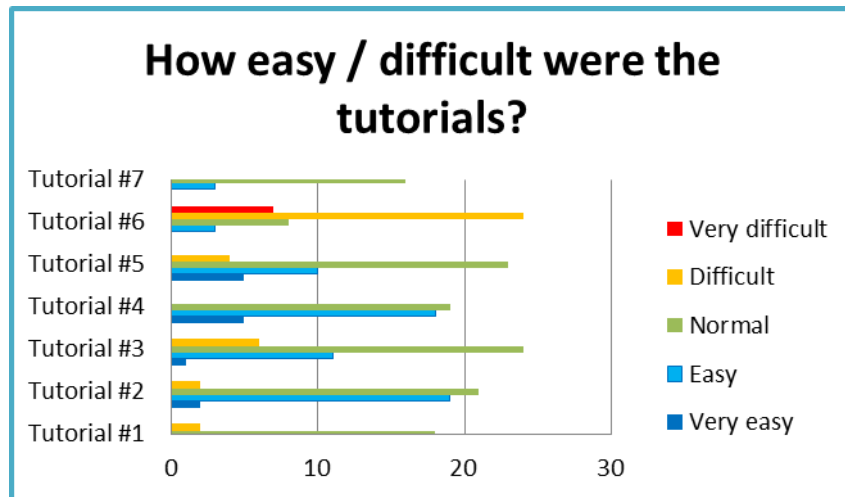
the astronomical community and the ESFRI partners and gathering feedback and requirements.

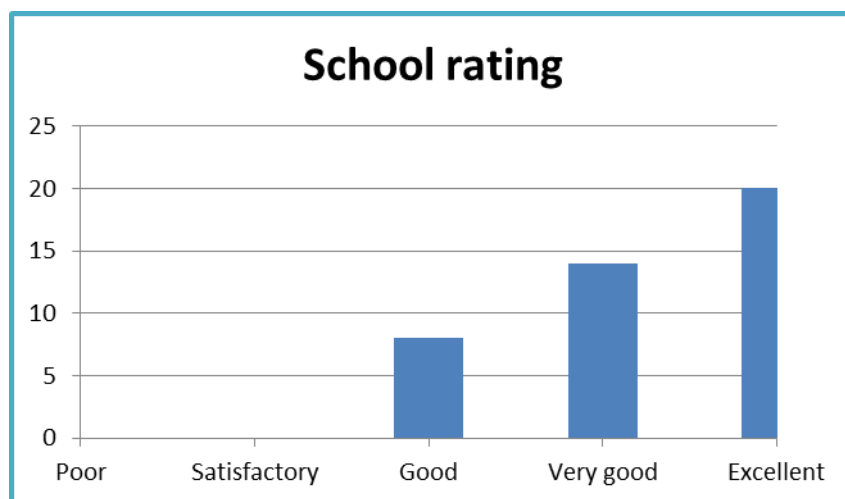
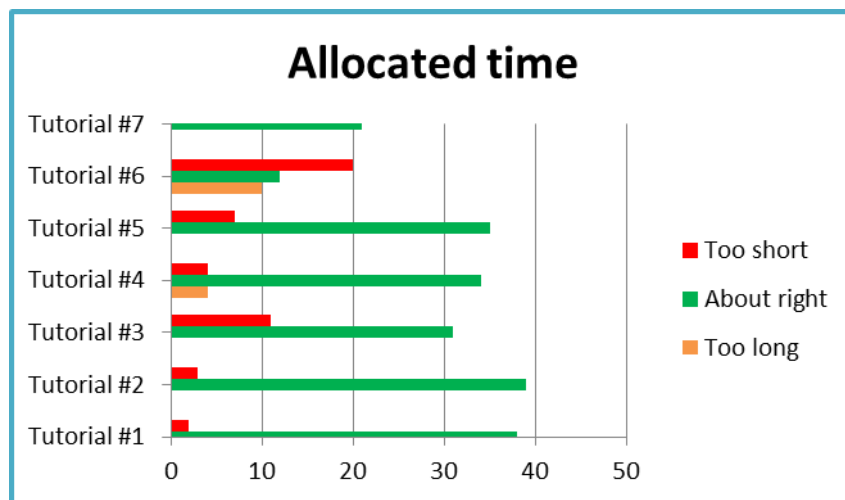
Overall, the school was a great success and it is expected to have a very positive impact on the utilization of VO tools to carry out astronomical research in Europe. It also provided the indispensable feedback on the VO tools and services from a wide range of scientific usages, which will be used by the tool and service developers to adjust them at best to the users' needs and to define new developments. In this regard it is relevant to mention that the requirements gathered during the school have already been passed to the tool and service developers.

During the wrap-up session of the school, the following next steps were defined:

- A close contact will be maintained with the school participants along the duration of ASTERICS. In particular, a questionnaire will be submitted to participants on a yearly basis until the end of the project with questions about the usage they are making of VO tools, the reasons why they gave up using VO tools (if they are not using them), if they have published a paper using VO tools and, according to their working experience, the capabilities of VO tools they would like to improve.
- Participants were encouraged to act as VO-ambassadors in their research institutes through informal talks with colleagues, seminars and scientific workshops and conferences. We set up two channels to send this information to the ASTERICS project: an email account and the #astericsvomadrid15 hashtag in Twitter. At present, two participants have reported that a VO seminar will be given in the Observatory of Athens on 2016, March 2nd and a similar presentation is foreseen for Master and undergraduate students at the University of Athens.
- The next major milestone in Task 4.2 ("Support to the astronomical community") within WP4 will be the organization of the next VO school to be held in fall 2016 in Strasbourg, France.

Annex I. Feedback analysis





Annex II. Participants' comments

- Comments on tutorial #1
 - *"A great introduction to Aladin and the CDS tools!"*
 - *"It was a good first approach to the course".*
 - *"Nice tutorial, maybe some introduction would have been nice and useful".*
- Comments on tutorial #2
 - *"Useful to know the basis of TOPCAT".*
 - *"You were too fast."*
 - *"Really very interesting and very well explained."*
- Comments on tutorial #3
 - *"Interesting exercise. Not in my field."*
 - *"You should clarify all the options for playing with this software."*
 - *"Some documentation was on the Web, so it was difficult to keep up changing between tabs."*
- Comments on tutorial #4
 - *"Useful and powerful tool."*
 - *"You were too slow".*
 - *"I was able to follow the tutorial perfectly. It was really useful."*
 - *"Very, very interesting. I find VOSA useful even for learning astronomy!!"*
- Comments on tutorial #5
 - *"I was able to learn many things from this tutorial. Doing the things by myself let me discover new functionalities that I did not know."*
 - *"I couldn't follow properly the tutorial but I found it very interesting."*
 - *"The flow of the tutorial was really good and covers many objectives at the same time."*
 - *"Excellent!!!"*
- Comments on tutorial #6
 - *"Very useful, but lacks of hands-on."*
 - *"Maybe too many things presented and no time to test functions."*
 - *"I discovered TOPCAT on Tuesday so I was lost."*
 - *"This was hard to follow along with; the tutorial was given at a fast pace. But it gave me an idea of the advanced functions that are available in TOPCAT."*
 - *"Nice to see subset selection."*
 - *"It was quite fast, but it was a good idea to show us what actually TOPCAT can do."*

- *"This tutorial was too quick for me. I think it would be useful to adapt some sort of example in it."*
- *"I think that the time allocated for this session was too short and it was difficult to do all the steps of the workflow in real time. Nevertheless it is very interesting."*
- *"Very useful for my analyzing work. I will use this tool for my analysis work."*
- *"A bit too fast, but having the HTML and PDF documentation is useful."*
- *"Actually it would be great to have a brief introduction about advanced functionalities of other VO software. This presentation was very useful. It seems, all the software is more powerful than it looks from the first sight."*
- **Comments on tutorial #7**
 - *"Not friend of time trial."*
 - *"Useful and very funny."*
 - *"A fun way to test all of the skills I have learnt over the past couple of days."*
 - *"It was not quite easy, because we did not have enough time to absorb all the previous tutorials, meaning that some time is needed to realize the entire capabilities VO tools offer."*
 - *"The times for the questions were a bit short, particularly when data had to be retrieved."*
 - *"I think that it would be more useful to give more time (like an hour, or half an hour) to solve an assigned science case. If you are not so familiar with some of the VO-tools and you learnt to use them at this School, I think that five minutes is a too little time."*
 - *"Important to try and remember what you learned, maybe allow more time per question."*
 - *"Really funny. Great way to use the knowledge acquired."*
 - *"It was very fun!!!!"*
- **Comments on the VO tools**
 - *"With VO tools I can do really fast and easy what before I was doing, consuming long time".*
 - *"During my work project, I had to cross-match objects of my catalogue to other surveys and catalogues. With VO tools this can be done so easy and in many different ways, according to my needs."*
 - *"I missed to use VO tools with solar system objects"*
 - *"I missed an example of SED fitting of AGNs".*
 - *"It would be desirable to include spectral fitting capabilities in tools like VOSpec and Splat-VO".*
- **Comment on the logistics**
 - *"The printable tutorial lets me to follow the lesson because sometimes the information was written too fast in the screen".*

- *"Hats off to the organizing committee. The structure of the workshop, the co-operation from the organizers is very nice".*
- *"Congratulations!! It was a great coaching and really pleasant".*
- *"Logistics was well organised."*
- *"Venue and hotel were nice. Transportation from Madrid to ESA was probably too long (but I understand it is difficult to do better)".*
- *"I don't like very much the Residencia, but the organization is much more than appropriate (and arranges the bus on that address is ideal). So comments are all positives!"*
- *"Everything was really well organized and the approach of learning the VO tools and their capabilities was interesting (treasure hunt, work on our own project)."*
- *"A bottle of water in the hotel would have been great- or a sign saying the tap water was drinkable. The restaurant in the hotel opened at 9pm which was really late for many people to eat. Maybe provide information about nearby eating places that are reasonably priced and open ~7-8pm."*
- *"Everything was perfect."*
- **Comments on the school**
 - *"In general, I think that the school duration was too short to properly assimilate the several functionalities of the VO tools."*
 - *"Regarding the duration of the School, I think that 5 days could be better than 3 to learn and assimilate better the capabilities of the VO-tools."*
 - *"More than easy/difficult, it is difficult to keep the right pace in the tutorials. Some were fast (which may be frustrating), some slow (which may become boring). Indeed, it is better to have tutorials where people are not just listening but doing something under guidance, with a previous introduction to the scientific meaning of what they are going to do."*
 - *"Thanks for organizing the school. It was quite useful."*
 - *"Thanks for giving me the chance of attending!"*
 - *"I thoroughly enjoyed the school; it was really useful being allowed to work on your own project at the end. The tutors are really knowledgeable and helpful, much better than doing group projects. A good tutor-to-student ratio."*
 - *"I would like to thank Enrique for inviting Master students. It has been a great experience and it will be very useful for me in my future work."*
 - *"I found the school really interesting. I think that it should be compulsory for all the PhD students."*
 - *"If i get opportunity, I would like to come back to this school, to learn many tools for my research."*
 - *"It was great to be here:) I learn a lot. Thank you! :)"*

Annex III. School pictures



Introductory talks



Tutorials



Support during the tutorial sessions



Support during the tutorial sessions



Group photo