**Volume Title**
ASP Conference Series, Vol. **Volume Number**
**Author**


# The Gran Telescopio Canarias and Calar Alto Virtual Observatory compliant archives

J.Manuel Alacid[1,2], Enrique Solano[1,2], Francisco Jiménez Esteban[1,2], Almudena Velasco[1,2]

[1]*Centro de Astrobiología (INTA-CSIC), Departamento de Astrofísica, PO Box 78, E-28691, Villanueva de la Cañada, Madrid, Spain*

[2]*Spanish Virtual Observatory*

**Abstract.** The Gran Telescopio Canarias[1] and Calar Alto[2] archives are the result of the collaboration agreements between the Centro de Astrobiología and two entities: GRANTECAN S.A. and the Centro Astronómico Hispano Alemán (CAHA). The archives have been developed in the framework of the Spanish Virtual Observatory and are maintained by the Data Archive Unit at Centro de Astrobiología.

The archives contain both raw and science ready data and have been designed in compliance with the standards defined by the International Virtual Observatory Alliance, which guarantees a high level of data accessibility and handling.

In this paper we describe the main characteristics and functionalities of both archives.

## 1. Introduction

Astronomical infrastructures are expensive. Scientists and funding bodies have the responsibility of maximizing the scientific return of these costly investments. In this context, astronomical archives play a fundamental role.

The Virtual Observatory (VO) is the international initiative that is working not only in giving access to distributed computational resources, but also permitting operations on the data and return of the results. Spain takes part in the VO initiative since 2004 through the Spanish Virtual Observatory (SVO[3]) whose core team is located in the Data Archive Unit at Centro de Astrobiología (CAB, INTA-CSIC).

Having an archive perfectly integrated in the VO framework constitutes an added value of enormous importance for an astronomical project. This was clearly understood by the Gran Telescopio Canarias (GTC[4]) and Calar Alto Observatory (CAHA[5])

[1]http://gtc.sdc.cab.inta-csic.es/gtc/

[2]http://caha.sdc.cab.inta-csic.es/calto/

[3]http://svo.cab.inta-csic.es

[4]http://www.gtc.iac.es

[5]http://www.caha.es

board committees who selected the SVO group at CAB for the design, development, implementation and maintenance of their VO-compliant archives.

GTC is the largest telescope in the world (10.4m segmented primary mirror) in the optical-infrared regime. It is located in the Observatorio del Roque de los Muchachos (La Palma, Spain) and started scientific operations in the Spring of 2009. GTC has two Day One instruments: OSIRIS, an optical camera and multi-object spectrograph, and CANARICAM, a thermal infrared camera and spectrograph with polarimetry and coronography capabilities. The archive is in operation since November 2011.

CAHA is the largest astronomical observatory in continental Europe. Located in Sierra de los Filabres (Almería, Spain), it was built in 1973. It presently consists of three telescopes (1.23m, 2.2m, 3.5m) with a suite of imagers and spectrographs operating in the optical and infrared regime. The archive is in operation since September 2011.

## 2. Data transfer and ingestion

Once the proprietary time is over, data are transferred through a secure connection from GTC and CAHA to CAB. At their arrival, a number of control tests are performed to assure data integrity and metadata coherence. Problematic files are inspected and remedial actions are suggested in agreement with GTC and CAHA staff.

After passing the tests, the metadata information is extracted from the FITS headers and stored in a database, whereas the FITS files are moved into the data storage system. Once the data and metadata have been successfully ingested, they are automatically available to the general public through the web and VO interfaces.

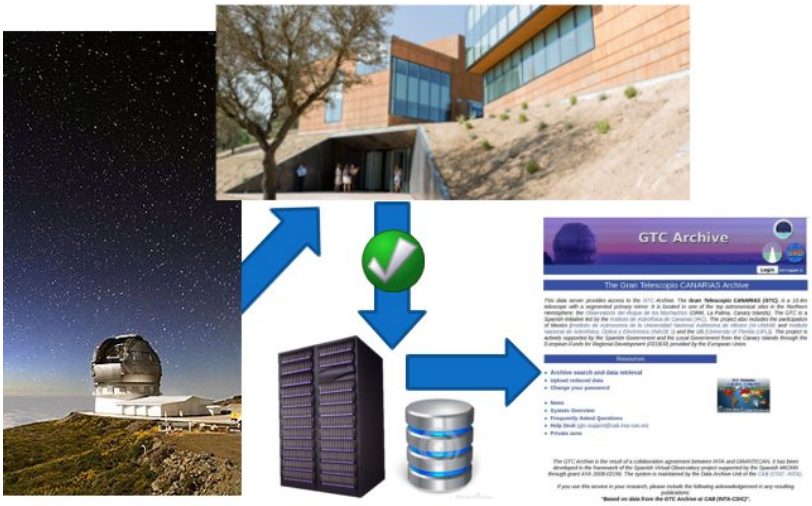


Figure 1. Data transfer and ingestion

## 3. Web Interface

Both the GTC and CAHA archive web interfaces are friendly enough to be potentially used by a wide variety of users. The archives can be consulted by typical parameters

(lists of names or coordinates and search radius, observing date, instrumental configuration, ...). They also incorporate a name resolver allowing queries by any of the names provided by the SIMBAD database. Multi-order coverage maps have been implemented to help users in the identification of the sky regions covered by the GTC and CAHA observations.

In the table of results, each raw scientific file has associated its corresponding calibration files, which permits an easy identification and retrieval of the necessary datasets to perform an off-line data reduction. Apart from the list of results that meet the criteria, the systems incorporate a number of functionalities to help users in the selection of the information of interest.

- Metadata preview
- Data visualization using Virtual Observatory tools (Aladin)
- Multidownload capabilities: data can be retrieved individually or in groups from the result page. Multiple-file download generates a file in ZIP format.


Figure 2. CAHA and GTC search web pages

## 4. High Level Data Products (HLDPS)

Reduced and high-level data products are of fundamental importance for archives as they enhance their use by the community and provide a higher visibility of the project results.

We have envisaged three ways in which HLDPS can be incorporated for GTC and CAHA archives. These products are available through the web interface, linked to the associated raw data and with functionalities for visualization and massive download:

- HLDPS provided by the projects (e.g. GTC/CANARICAM).


Figure 3. CAHA and GTC result web pages

- HLDPS provided by the community: CAB Data Center has implemented a procedure for the community to return GTC reduced data to the archive. When a refereed publication using GTC data is identified, the first author is contacted and invited to share the reduced data with the community through the GTC archive. Reduced data are accessible both from the web page and from VO tools.
- HLDPS provided by the Data Centre:
  1. Astrometrically corrected images.
  2. Source catalogues.

## 5. Interoperability: Virtual Observatory Service

The Virtual Observatory is the framework which guarantees an efficient linkage among astronomical archives. The implementation of VO services (ConeSearch, SIAP, SSAP) in the GTC and CAHA archives represents an important added value and facilitates research projects that would be extremely difficult to perform outside VO.

## 6. Acknowledgments

The GTC and CAHA archive are supported by the Spanish MINECO through grant AyA2011-24052.