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The Centre de Données astronomiques de Strasbourg - a science driven data centre

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Abstract. The Centre de Données astronomiques de Strasbourg (Strasbourg Astronomical Data Centre, CDS) provides a number of reference astronomy services: SIMBAD, VizieR, the Aladin interactive sky atlas, the CDS fast cross-matching service, and an integrated CDS portal. The CDS booth at ADASS provides live demonstrations of these services, and also practical advice on accessing the CDS services via different interfaces. This proceedings outlines CDS highlights of 2015-2016.

1. Introduction

The Centre de Données Astronomiques de Strasbourg (CDS) is an astronomy data centre that provides added value to published and reference data, enabling scientific research with the data through innovative services and tools. SIMBAD is the reference database for the identification and bibliography of astronomical objects (outside the solar system); VizieR is a catalogue service for large sky surveys, tables published in academic journals, and increasingly for other types of data "attached to publications"; The Aladin interactive sky atlas provides an interactive portal for access to collections of images and data available in the Virtual Observatory; The CDS fast cross-matching service provides capabilities for positional cross-matching of very large catalogues, and the CDS Portal provides a simplified single entry point to the services.

The CDS work is carried out by an integrated team of scientists, software engineers and documentalists (highly specialised librarians) with a deep level of interaction and coordination between the different types of activities.

2. Highlights 2015-2016

2.1. Gaia in the CDS services

The CDS is a partner data centre for the publication of the Gaia Data Release 1. Following many months of preparations, on September 14, 2016 the Gaia DR1 was made available in the CDS services Vizier, Aladin and the CDS catalogue cross matching service. The inclusion of these data into the CDS makes them interoperable with all of the CDS reference data including more than 14000 catalogues and hundreds of image surveys. Aladin and Aladin Lite visualisers provide an all-sky hierarchical view of the entire GDR1 data set, using the capabilities of CDS HiPS (Hierarchical Progressive Surveys (Fernique et al. 2015a)) technologies. Gaia DR1 is also made available from

the CDS via Virtual Observatory protocols (IVOA Cone Search, and Table Access Protocol). Some 3 million queries have been made in the first month since the data release. The top level page¹ for access to Gaia data in the CDS services, provides the direct links to the VizieR query pages for the catalogues, and the TAP query interface, as well as links to the cross-match service and the HiPS version of the DR1 catalogue in Aladin Lite. The Aladin Desktop tool was also updated with a tab for direct access to the Gaia DR1 catalogues.

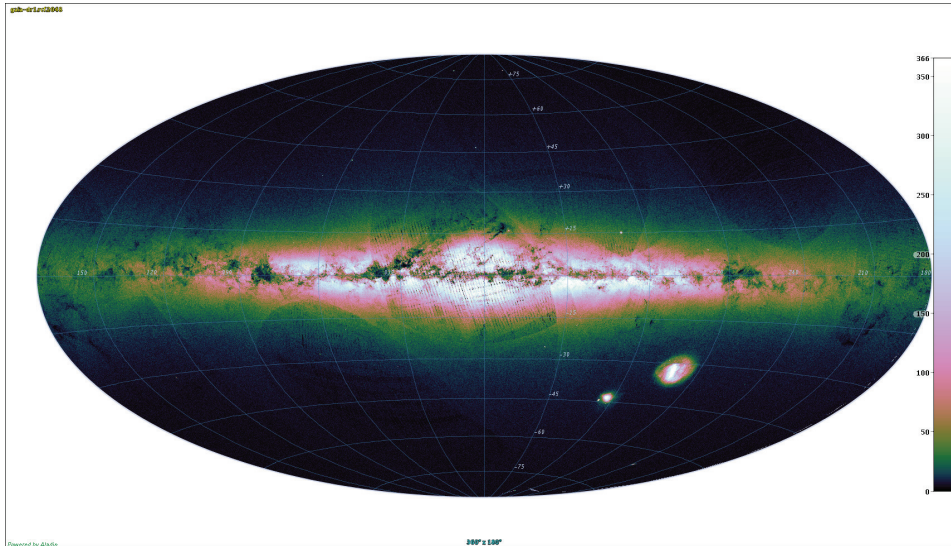


Figure 1. Density map of the billion sources in the Gaia DR1

2.2. VizieR Associated Data

The VizieR Associated Data service² has been released to provide easy and interoperable access to data associated with journal publications. These associated data (images, spectra, time series) have always been part of VizieR in addition to the catalogue collection, but they are now made much more easy to find and use. The new service includes a dedicated interactive data ingestion tool for authors, and uses standardised metadata from the IVOA ObsCore Data Model (Louys et al. 2011). The Saada³ database engine is used in collaboration with L. Michel (XMM-SSC). The data can be queried by an interactive interface and the service automatically publishes the data via VO protocols. Important data sets already in the system include 170,000 CoRoT time series and 2.4 million LAMOST DR1 spectra. The details of the mapping of the metadata for images and spectra to the IVOA ObsCore Data model are described in Landais (2017).

¹<http://cds.u-strasbg.fr/gaia>

²<http://cdsarc.u-strasbg.fr/assocdata/>

³<http://saada.unistra.fr/saada/>

2.3. Aladin Lite and HiPS

Developments based on HiPS and MOC (Multi-Order Coverage maps (Fernique et al. 2015b)) continue at a fast pace with many new areas being explored as hierarchical approach to large data sets (Allen et al. 2016) The Aladin Lite⁴ embeddable widget for visualising HiPS data sets has been implemented by some 33 professional astronomical data centres and projects. A major improvement has been made to Aladin Lite in 2016 relating to the accuracy of the image display computation. The drawing algorithm has been updated so that it now minimises distortions and allows for accurate overlay of catalogues. This was a critical issue for use of Aladin Lite for CDS applications in particular the CDS Portal, and also an essential improvement for ESA to make use of Aladin Lite as the basis of the image display for their new archive interface called ESASky⁵. Other CDS developments are exploring the potential of HiPS as a data structure that preserves the scientific properties, for example the conservation of photometric properties as described in Bonnarel, F. (2017).

The CDS has developed the use of MOC as a convenient way to manage sky coverage maps of surveys, and catalogues, and any information related to sky coverage. The MOC Server tool⁶ for fast retrieval of lists of astronomical data sets (catalogs, surveys) in a given region of the sky is becoming an important part of the integration of CDS services. Also, python library for the use of MOCs, called MOCpy is available - see Boch (2017).

2.4. ASTERICS

The ASTERICS cluster (Astronomy ESFRI and Research Infrastructure Cluster⁷) project started in May 2015 and is in full operations. CDS leads WP4, Data Access, Discovery and Interoperability (DADI), which gathers VO teams and teams from the large ESFRI and ESFRI-like projects to optimise the usage of the data through the Virtual Observatory. This builds on the long term efforts to build a European Virtual Observatory (Genova et al. 2015). One of the DADI highlights in the first year is the rapid up-take of VO and interoperable systems for handling the probability maps associated with gravitational wave events. This field came to prominence in 2016 with the announcement of the first detection of gravitational waves. The European gravitational wave community, partners of ASTERICS, and a representative from the US Laser Interferometer Gravitational-Wave Observatory (LIGO) came together to collaborate on sharing data, software and tools. The all-sky capabilities of Aladin Lite have been used to visualise the probability maps of the gravitational wave locations.

2.5. Portal and integration of CDS services

Following a general trend of increased integration of CDS services, more links were made between SIMBAD and Vizier. Object identifiers in SIMBAD are now linked to their catalogue of origin in Vizier. The links take you to the relevant Vizier catalogue

⁴<http://aladin.u-strasbg.fr/AladinLite/>

⁵<http://sky.esa.int>

⁶<http://alasky.unistra.fr/MocServer/query>

⁷<https://www.asterics2020.eu>

page. The SIMWATCH service⁸ was released. This is a monitoring service that sends notifications to subscribed users when their favourite object is cited in a new paper processed by SIMBAD. Work towards a new integrated portal has been undertaken and is expected to be released soon.

3. References

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⁸<http://simbad.u-strasbg.fr/tools/SimWatch/manage/>