The Brazilian Science Data Center

A web-based infrastructure for Astrophysics & Space Science data in Brazil, developed in cooperation with the Italian Space Agency ASDC, and supportive of the COPUOS “Open Universe” initiative proposed by Italy.

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The ASI Science Data Center Model

The ASDC model for a space science data center is based on:

- large-scale multi-source data center integration from a number of archives and providers
- a “science-ready” repository, whereby final science data products are provided
- a “web-ready” platform, easily and freely accessible online
- it offers tools for data query, visualisation and analysis online.

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Thanks to Paolo Giommi / ASI
A simple example: The study of active galaxies

About 10% of galaxies are peculiar, active galaxies, whose emission is highly variable and extends through the entire electromagnetic spectrum, from radio-waves to gamma-rays.

No single instrument or observatory or research group can alone study these objects in detail, requiring great collaboration efforts.
To study a well-known AGN such as Mkn501 or Mkn 421:

- Timing variability
- Spectral Energy Distribution
- Cross-matching maps with multi messengers
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Naked eye view of an Active Galaxy

Mkn 501

Mkn 501 Ra=253.46757 deg Dec=39.76017 deg (NH=1.6E20 cm^-2)

+ web based catalogues such as NED

Creation date: 03-Feb-2017 14:37:36(UTC)
- Data from over 10 satellites and 12 catalogues
- Over 500 pointed observations
- About 20 years of data collection and archival
Access to state-of-art instruments
Coordination of dozens of specialists

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At present, the ASCD hosts data of the most important current high energy astrophysics missions as Fermi, AGILE, NUSTAR, SWIFT and supports at different levels other missions like, GAIA and the astroparticle experiments AMS and PAMELA. Data of past experiments like HERSCHEL, PLANCK and BeppoSAX are also hosted while the possibility to perform queries to external catalogs make possible a complete study of the SED of a specific source through the web-based SED builder tool.

The TeGeV Catalog

The TeGeV Catalog is a catalog of VHE sources observed by ground-based Cherenkov telescopes. The TeGeVcat is collecting all the information publicly available about TeV sources observed by the past generation and current generation of imaging Cherenkov telescopes (Fig. 1).

The catalog contains the public light curves data as well as the spectral information that are automatically available in the ASDC SED builder tool (see sec. 4).

Figure 1: Home page of the TeGeV catalog at ASDC servers - http://www.asdc.asi.it/tgevcat/.

The TeGeV catalog currently contains information of 155 VHE sources divided by class types. Default visualization provides information on source name, coordinates and types. Furthermore, threshold energy ($E_{\text{th}}$), integral flux above $E_{\text{th}}$, distance, name of experiment performing the observation and starting time are provided.

Several other information are optionally available for the visualization by selecting them at the bottom of the web page. Most of them are again extracted from the literature, like:

- the statistical and systematic errors on the TeV centroid position in the sky derived by a 2D-gaussian fit of the TeV excess;
- the differential flux normalization, the normalization energy of the power law differential spectrum, the power-law spectrum spectral index;
- source extension (if present) and orientation;

GLOBAL DEMOCRATIC ACCESS
(education, citizen science, ...)

IMPROVED SCIENTIFIC OUTPUT OF ALL DATA AVAILABLE

INCREASE VISIBILITY OF DATA PROVIDERS INTEGRATION
A Space Science Data Center for Brazil

The Brazilian Science Data Center (BSDC) is being developed at CBPF in cooperation with the ASI Science Data Center.

It is currently being studied by a Committee of the Brazilian Astronomical Society as a solution for an integrated astronomical data base for Brazil.

The development of BSDC is supported by the Brazilian Space Agency (AEB) and the ICRANet.

Through cooperation with ASDC it is supportive of the “Open Universe” initiative.

url: http://bit.ly/2jwaULx
The WD catalogue in BSDC is accessible via ASDC portal tools, whereby the interactive table links each star to a set of DB and analysis tools. The position of each object is resolved to allow for external analysis tools.
1WHSP: an IR-based sample of ~1,000 VHE γ-ray blazar candidates

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The blazar catalogue in BSDC is accessible via ASDC portal tools, whereby the interactive table links each star to a set of DB and analysis tools. The position of each object is resolved to allow for external analysis tools.
UNDER DEVELOPMENT ARE:

- Construction of a complete database for VHE gamma-ray astronomy, currently gathering data from the VERITAS and MAGIC collaborations.
- Tools for online visualisation, manipulation and analysis of polarisation data.
- Set up of a GRB classification database in collaboration with ICRANet.
BSDC first presented at the BRICS2016 Astronomy workshop, at Ural Federal University, Ekaterinburg. 

Discussions are ongoing with some institutions from BRICS countries to expand the initiative beyond Brazil.
Panorama of Brazilian Astronomy

thanks to Bruno Castilho, LNA.

Brazil numbers today c. 450 PhDs in A&A, distributed over 20 institutions.

It has access to a large, state-of-the-art optical astronomy infrastructure both in Brazil and Chile, and is involved in the construction of two new optical telescopes, like the GMT and the LSST.

It possesses a network of radio telescopes and observatories.

Associated to international cosmic-ray physics and high-energy astrophysics facilities such as CTA and Pierre Auger Observatory.
...and astrophysics data infrastructure.

- Despite having the most powerful supercomputer in Latin-America (Santos Dumont), with Petaflop processing capacity, as well as an integrated national network of high-performance data-processing centres (CENAPADs);

- And a number of individual data centres dedicated, among others, to specific astrophysics and space science objectives...

No integrated data centre infrastructure exists for astrophysics and space science, and much of the scientific data produced is never revisited for additional work.

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The impact of BSDC

By building BSDC as a national data center infrastructure, in collaboration to other international platforms, we aim to give **global insertion and expand accessibility** to Brazilian astrophysics & space science data.

Also, we improve national access to global data and **foster growth of space data science** in Brazil, in scientific research and education, as well to the interested citizen.
• CBPF is the National Institute for Physics, founded in 1949, and located in Rio de Janeiro.

• With 55 staff researchers and c. 40 technicians, it is active in theoretical and experimental physics, from high-energy physics and astrophysics to applied complex systems, quantum information and nanotechnology.

• Home to one of the top physics graduate programmes in the Country, with over 100 graduate students (30% from abroad).

• It is the 1st institute in Brazil in scientific citations, according to Scimago/SCOPUS/2013

• It is also the operational segment of Rio’s research and education IT network (Rede-Rio), involving over 145 institutions.
Thank you very much

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