

CBPF Centro Brasileiro de Pesquisas Físicas

Brazilian Center for Physics Research

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.

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

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Naked eye view of an Active Galaxy



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- 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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Benefits of the data center model

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

IMPROVED SCIENTIFIC OUTPUT OF ALL DATA AVAILABLE

INCREASE VISIBILITY OF DATA PROVIDERS INTEGRATION

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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: <u>http://bit.ly/2jwaULx</u>





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Early products of the BSDC

New white dwarf stars in the Sloan Digital Sky Survey Data Release 10

S. O. Kepler^{1*}, I. Pelisoli¹, D. Koester², G. Ourique¹, S. J. Kleinman³, A. D. Romero¹, A. Nitta³, D. J. Eisenstein⁴, J.E.S. Costa¹, B. Külebi^{5,6}, S. Jordan⁷, P. Dufour⁸, Paolo Giommi⁹, and Alberto Rebassa-Mansergas¹⁰

ASDC Data Explorer

SDSS J000116.3p000204.4 00 01 16.3

SDSS 1000216 0p120309 2 00 02 16 0

2 🔽

¹Instituto de Física, Universidade Federal do Rio Grav

²Institut für Theoretische Physik und Astrophysik, Un

³Gemini Observatory, Hilo, Hawaii, 96720, USA

- Nov 2014 ⁴Harvard Smithsonian Center for Astrophysics, 60 Ga
- S ⁵Institut de Ciències de L'Espai, Universitat Autònom ⁶Institute for Space Studies of Catalonia, c/Gran Cap ⁸Astronomisches Rechen-Institut, Zentrum für Astrono

SR D-69120 Heidelberg, Germany ⁸Département de Physique, Université de Montréal, C ⁹ASDC Agenzia Spaziale Italiana, Via del Politecnico

C

¹⁰Kavli Institute for Astronomy and Astrophysics, Pek

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

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White dwarf stars in the Sloan Digital Sky Survey DR-10



+00 02 04.4 18.87 18.78 18.9 19.04 19.23 5.46

22

+12 03 09 2 22 88 22 02 21 97 22 2

11107

Early products of the BSDC

& Astrophysics manuscript no. 1WHSParxiv Astr April 14, 2015

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1WHSP: an IR-based sample of \sim 1,000 VHE γ -ray blazar candidates

B. Arsioli^{1,2,4}, B. Fraga^{1,2,4}, P. Giommi^{3,4}, P. Padovani^{5,6}, and P.M. Marrese³

Help

Sapienza Università di Roma, ICRA, Dip Université de Nice Sophia Antipolis, Nice $\mathbf{2}$ e-mail: bruno.arsioli@asdc.asi.it e-ma ASI Science Data Center, ASDC, Agenzia ICRANet-Rio, CBPF, Rua Dr. Xavier Sig European Southern Observatory, Karl-Sch $\mathbf{5}$ ⁶ Associated to INAF - Osservatorio Astror

Accepted: April 10, 2015

pr 2015

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

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1WHSP: an IR-based sample of

B. Arsioli, B. Fraga, P. Giommi, P. Pag ovani and P. Marrese, 2014, A&A sul 3 February 2015

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Entry number Selection mode: Include Z All		Source name 1WHSP name	BZcat name	R.A. hh mm ss.d 🗘	Dec dd mm ss.d O	NVSS/FIRST flux density Radio flux d.	Redshift C	Log(Vpeak) Log(vpeak)	Log(peak flux) Log peak flux	γ-ray counterpart ↑↓	Blazar type type 😋	TEV FOM
1 🔽 Select	ASDC Data Explorer	1WHSP J000116.3+293534		00 01 16.3	+29 35 34.6	4	0	>17	>-12.8		Candidate blazar	0.03
2 🔽 Select	ASDC Data Explorer	1WHSP J000132.7-415525		00 01 32.7	-41 55 25.1	13.2	0	15.8	-11.7	2FGL J0001.7-4159	Candidate blazar	0.4
3 🔽 Select	ASDC Data Explorer	1WHSP J000213.7-103816		00 02 13.7	-10 38 16.0	1.9	0	16.6	-13.1		Candidate blazar	0.02
4 🔽 Select	ASDC Data Explorer	1WHSP J000319.5-524727		00 03 19.5	-52 47 27.3	65.3	0	15.4?	-12.4?	3FGL J0003.2-5246	Candidate blazar	0.08
5 🔽 Select	ASDC Data Explorer	1WHSP J000513.7-261438		00 05 13.7	-26 14 38.1	37.4	0	15.4	-12.6		Candidate blazar	0.05
6 🗹 Select	ASDC Data Explorer	1WHSP J000835.3-233927	5BZB10008-2339	00 08 35.3	-23 39 27.7	36.3	0.147	>17	>-11.8	2FGL J0008.7-2344	In WISE extended source catalog	0.32



Early products of the BSDC

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.





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ASTRONOMY WORKSHOP 2016



ASTRONOMICAL DATA AND COMPUTATION

BSDC first presented at the BRICS2016 Astronomy workshop, at Ural Federal University, Ekaterinburg. http://astro.brics.urfu.ru/en/astrodata2016/

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

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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.



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...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.





41,000 Tflops in total 7,500 TB RAM 2.14 M TB disc

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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. <u>F</u>





• 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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