Progress on the technical development and on the establishment of the Open Universe Initiative

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Italian Space Agency

Space Science data for everyone

Open UNiverse. Main principles

Space science data is the end product of scientific space missions
It holds the potential for the production of knowledge

Space science data resulting from public funding should be considered a public good and should become openly available*

*at an appropriate time and taking into account of fair scientific return and intellectual property rights

High-level data products should be *transparent* and usable by all

Transparency and accessibility are key factors for

- The efficient conversion of data into knowledge
- Achieve equal opportunity in the access to scientific information.

Open UNiverse, an Italian initiative

Open Universe was proposed by Italy at the 2016 COPUOS 59th session where the initiative was welcomed and included among the activities to be carried out in preparation of UNISPACE+50, in line with the thematic priority “Capacity Building”.

Today, Open Universe is being developed with the contribution of several institutions in a number of member states.

Formal support from Italy, Brazil, Armenia and Argentina.
Uruguay co-sponsored yesterday’s side event on Open Universe, other countries expressed inrerest.

Open UNiverse: Discussion phase

Encouragement, criticism, recommendations

Main criticism : high cost, risk of duplication of efforts
Recommendations : A/AC.105/1175

Open UNiverse Vs Big data and data-driven science

From Wikipedia

Big data refers to data sets that are too large or too complex for traditional data processing application software

Today's Space Science data is
multi-frequency (radio to high-energy γ-ray)
multi-temporal (1960's – today… and tomorrow, with simulated/extrapolated data)
multi-messenger (Gravitational-Waves, Astrophysical Neutrinos,
Ultra-High-Energy Cosmic Rays)

No scientist can be expert in every domain

but theory must take into account of data in every domain

Open UNiverse: Preliminary Objectives

INCREASE TRANSPARENCY of already accessible resources: including promoting FAIR (Findable, Accessible, Interoperable, Reusable) guiding principles, promoting adoption of widely-used standards, processing from raw data to web-ready products, interfacing and facilitating cooperation between data providers and data centres and archives…

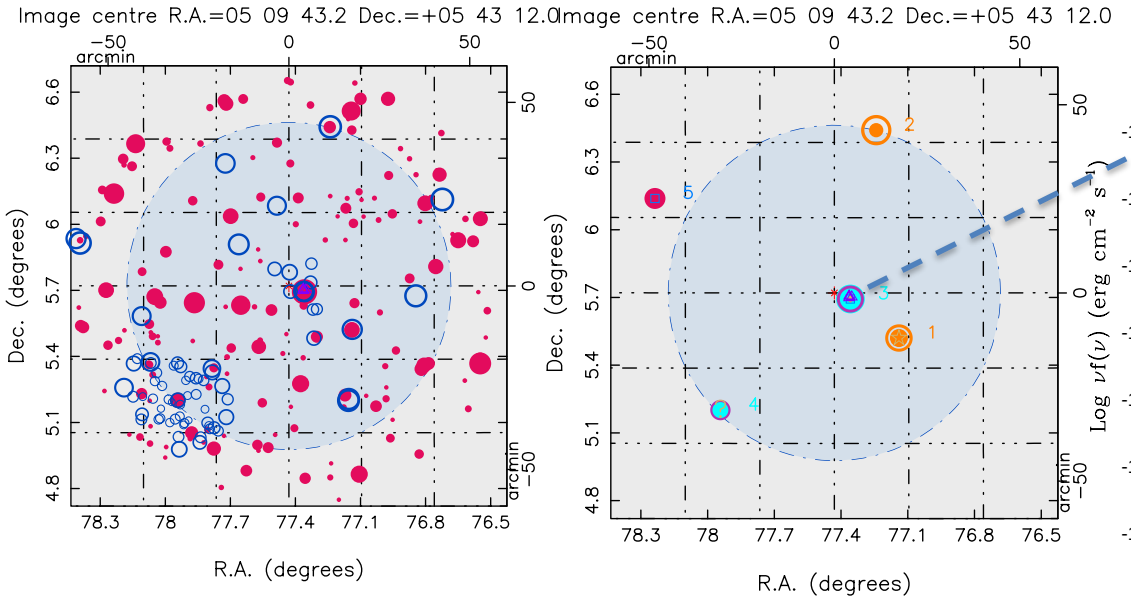
RESURFACE DATA and other hidden or otherwise hardly accessible resources: by identifying inaccessible data and working with national and regional entities to solve the challenges to make them public, as well as bringing new main players and actors in the international space science arena into the Initiative and in contact with other public data access solutions.

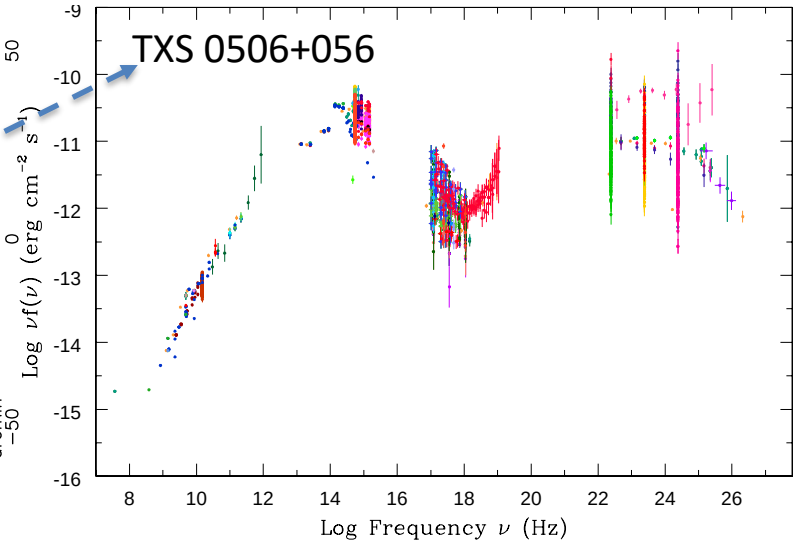
BROADEN THE USER-BASE of astronomy and space science data: to include as well the rapidly growing community of citizen scientists, by providing the necessary tools to use astronomy and space science data for a range of target groups, including educators and students in universities, schools, planetariums or any amateur scientists or other potential end-user

Open UNiverse for blazars

The VOU-Blazars tool

Based on IVOA protocols (data from > 70 catalogues/sites in one click or command)





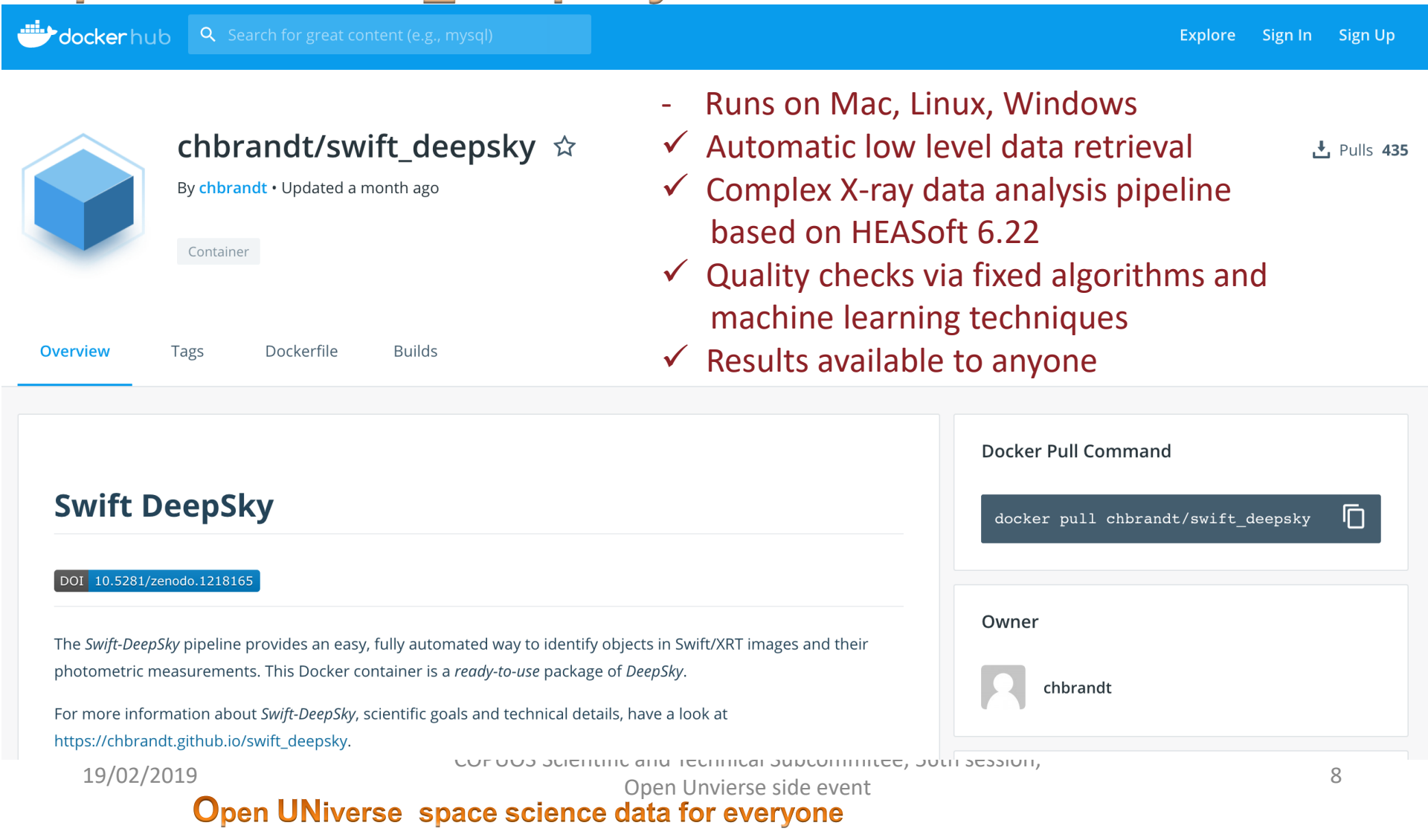
Dissecting the region around IceCube-170922A: the blazar TXS 0506+056 as the first cosmic neutrino source

P. Padovani[1], P. Giommi[2,3,4], E. Resconi[5], T. Glauch[5], B. Arsioli[6,7], N. Sahakyan[8], M. Huber[5]

[1] European Southern Observatory, Karl-Schwarzschild-Str. 2, D-85748 Garching bei München, Germany
[2] Agenzia Spaziale Italiana, ASI, via del Politecnico s.n.c., I-00133 Roma Italy
[3] Institute for Advanced Studies, Technische Universität München, Lichtenbergstrasse 2a, D-85748 Garching bei München, Germany
[4] ICRANet, Piazzale della Repubblica,10 - 65122, Pescara, Italy

Open UNiverse for Blazars

Removing the need for data analysis expertise: Swift_deepsky



- Runs on Mac, Linux, Windows
- ✓ Automatic low level data retrieval
- ✓ Complex X-ray data analysis pipeline based on HEASoft 6.22
- ✓ Quality checks via fixed algorithms and machine learning techniques
- ✓ Results available to anyone

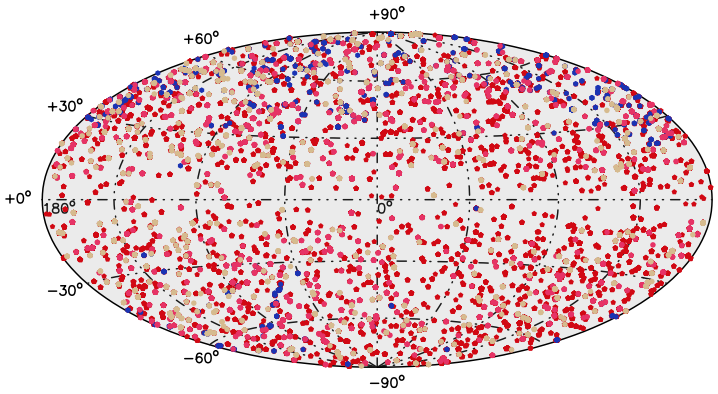
Open UNiverse for blazars

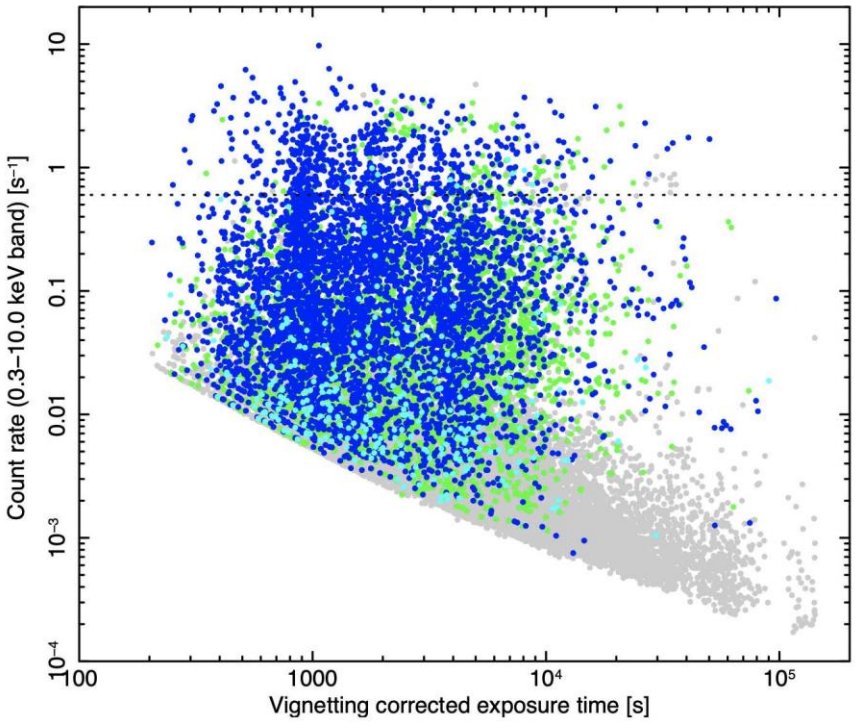
1OUSXB, a high-transparency Swift-XRT results database

P. Giommi[1,2,3], C.H. Brandt[3,4,9], U. Barres De Almeida[5], A.M.T. Pollock[6], M. Perri[7,8], V. D'Elia[7,8], M. De Angelis[1], S. Turriziani[10], S. Di Pippo[11], J. Del Rio Vera[11], N. Sahakyan[12], A. V. Penacchioni[13], and O. Civitarese[13,14]

To be submitted to Astronomy & Astrophysics

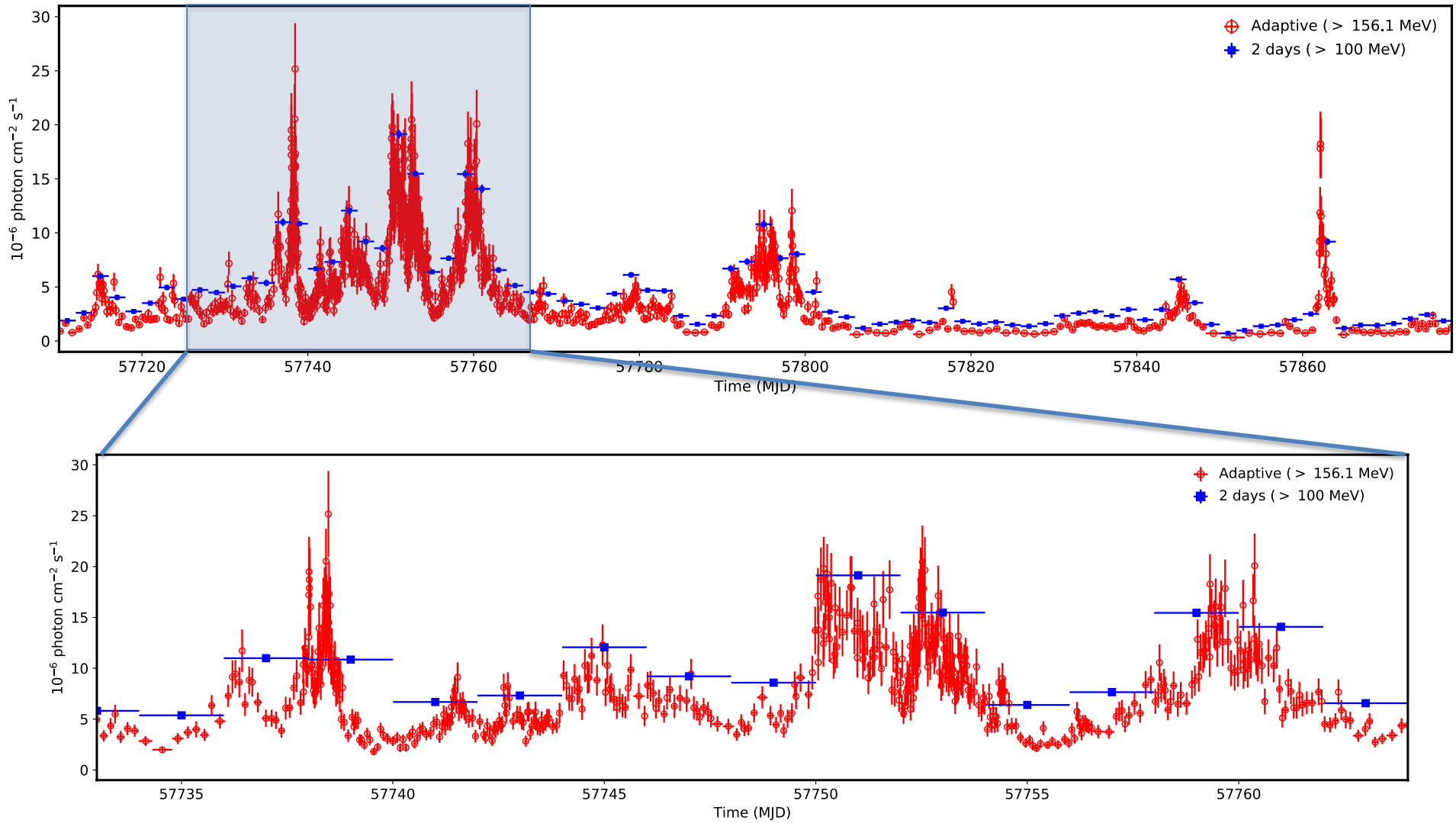
Swift_deepsky run on all
Swift 11,000 observations of blazars





Open UNiverse for blazars

Fermi γ-ray light curve of CTA 120 (bright blazar).
Led by N. Sahakyan and the Yerevan team



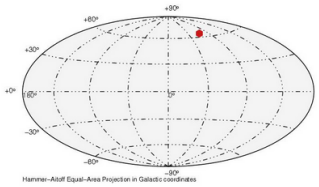
Open UNiverse space science data for everyone

Open UNiverse for astronomy

Open Universe @ ASI | Space Astronomy » | Ground Astronomy » | Planetary Science » | Solar data » | ISS » | VO and General services » | Bibliography » | Cosmic Rays » | Astronomical tools » | Image galleries » | Open software » | Other Initiatives » | Educational contents »

Help & video tutorials | Feedback | VO inside | Login | Reset all

OU Parameters



Aitoff coordinates type: **Galactic** - *Equatorial*

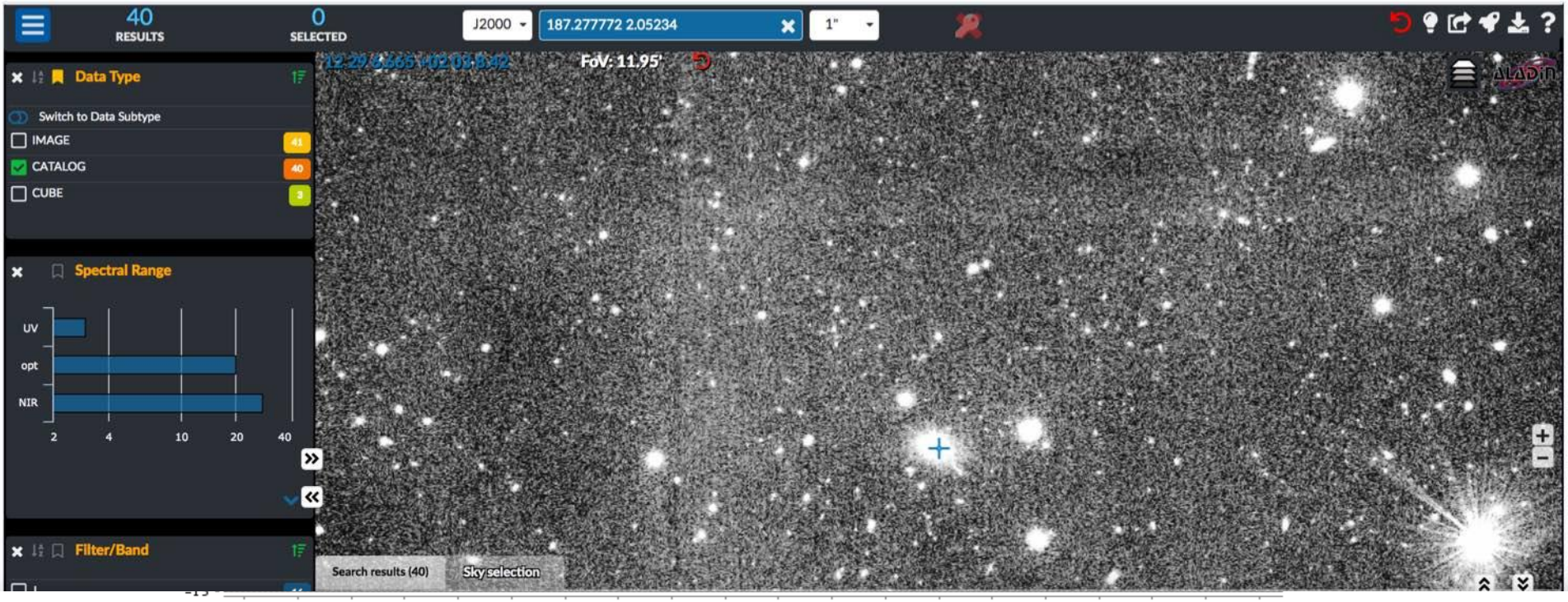
Source Name(s) : **3C273**
R.A.(J2000) = **12 29 06.66 (187.277772 deg)**
Dec.(J2000) = **+02 03 08.42 (2.05234 deg)**

Version 1.5
Object name or coordinates: 3C273 (SSDC)

3C273

W General | W Source | NED | SIMBAD | CDS

ESASky | SKY-MAP.ORG | Google Sky | SDSS SkyServer | Aladin Lite | ESO Products | Legacy Surveys | Super Cosmos | Radio Surveys | SSDC Catalogs | SSDC R-X-O
VizieR X-R-G | VizieR IR-Opt | HEASARC Browse | VAO Data Scope | SkyMapper | MAST Archive | CADC Archive | ESO Archive | NOAO Survey Data | NRAO Archive | ALMA Archive
ISDC HEAVENS | SSDC Archive | Radio Telescope DC | INAF IA2 | Multi-freq. Explorer | VOU-Blazars | VOU SED | SED Builder | SED Movie | ADS Bibliography | NED Bibliography
CDS Bibliography



THE SUSTAINABLE COST OF DATA FOR SPACE ACCESSIBILITY

Centro Brasileiro de Pesquisas Físicas

- Gathering the full force of existing infrastructure and data services : fundamental technologies and services (e.g., IVOA) are already in place and must have their full potential extracted through new use concepts.

- Push for PI-quality, high-level data provision : attainable with only small modification of agencies' cost-to-implementation models, can have a large impact in the democratisation of space accessibility.

- Achieve global coordination and cooperation : can actually reduce costs, avoiding duplication of efforts by organising the collaboration between data centres and data providers worldwide.

- Develop new technological paradigms and innovative tools : can bring a revolution in the software level, being inclusive to new players, with impact in education, capacity building and citizen science.

Open UNiverse: training courses

ANNOUNCEMENT OF OPPORTUNITY

Training Course on

Remote Sensing, Space Sciences and Space Policy

Organized by

The Italian Space Agency (ASI) in collaboration with Kenya Space Agency and with the support of United Nations for Outer Space Affairs (UNOOSA)

Hosted by

The ASI Broglio Space Centre (BSC)

Open UNiverse. Conclusions I

- Space science data for everyone: possible!
- Sustainable costs: yes!
- Big data: yes. Multi-frequency/temporal multi-messenger data can be handled in a uniform way
- Training courses based on Open Universe Data and services

- Minor modification of agencies cost-to-completion models
- Use of existing infrastructure (e.g. IVOA standards)
- New technologies (e.g. Linux Containers: Docker)
- New paradigms (e.g. living catalogue)

Open UNiverse. Conclusions II

Advantages

For space advanced countries

Data more widely used in different contexts, worldwide

Multi-frequency, multi-temporal, multi-messenger

For emerging countries

Possibility to contribute up start to space science at the forefront of research

Education, training, building local capacities

Coordinated by UNOOSA with formal support from Italy, Brazil, Argentina, Armenia