

Open Universe Initiative

A Capacity Building Initiative

Ulisses Barres de Almeida, CBPF

With thanks to Paolo Giommi, INAF

61st COPUOS STSC - Vienna - 2024

ORIGINS AND MOTIVATION

Original Open Universe
Proposal at 59th COPUOS:
A/AC.105/2016/CRP6

Committee on the Peaceful
Uses of Outer Space
Fifty-ninth session
Vienna, 8-17 June 2016

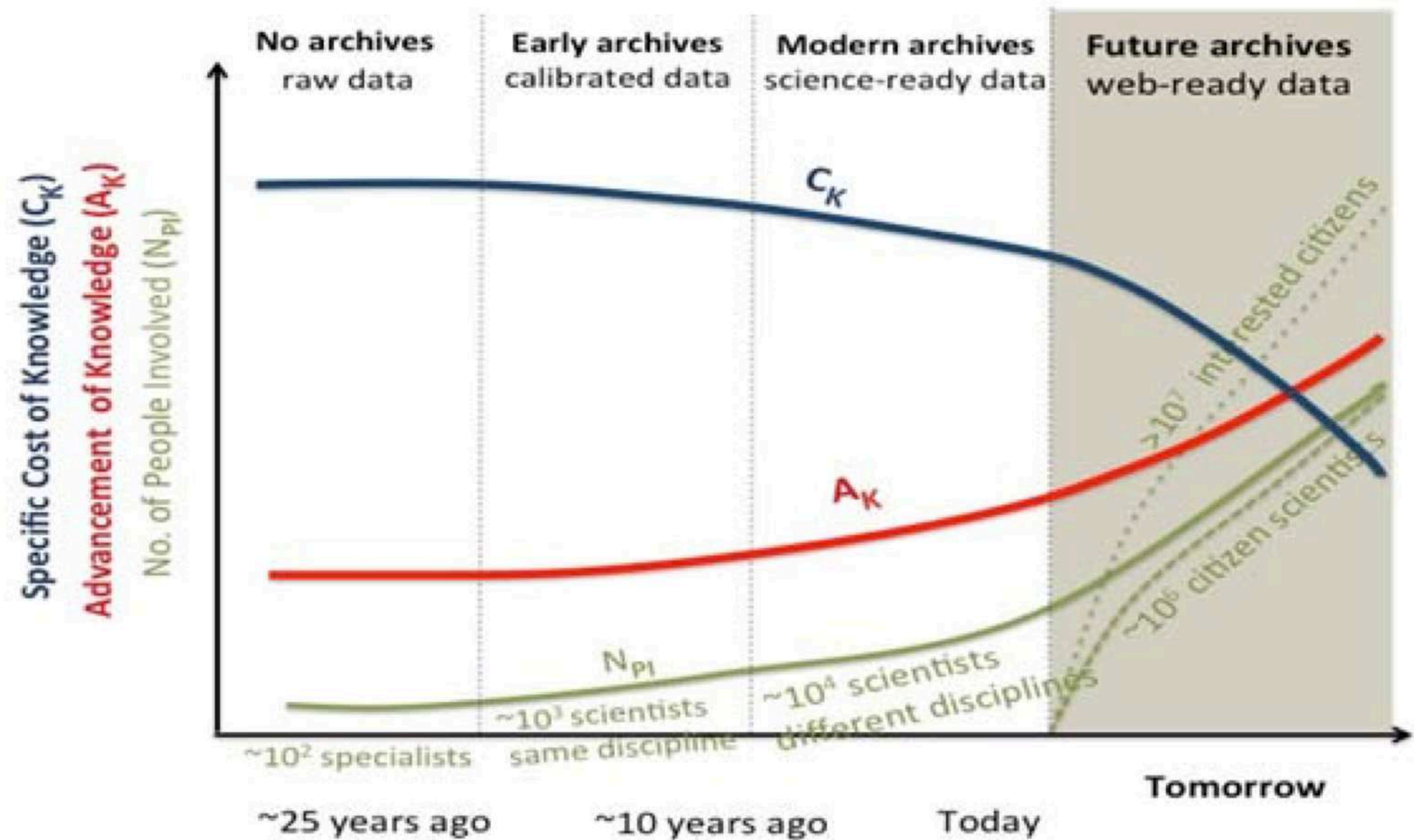
“Open Universe” proposal, an initiative under the auspices of the Committee on the Peaceful Uses of Outer Space for expanding availability of and accessibility to open source space science data.

Proposal by Italy

The ‘Open Universe’ was originally proposed by Italy at COPUOS (A/AC./105/2016/CRP.6) in 2016, in the context of the preparation for UNISPACE+50.

- **Aimed** at expanding the availability and access to open source space science data, to deliver capacity-building for the data-driven XXI Century Society worldwide.
- **Motivated** by the (i) increasing rate of scientific data production in space sciences, and the responsibility to convert into knowledge accessible to all, and (ii) the possibilities provided by new technologies, which open up new ways for knowledge dissemination and inclusion.

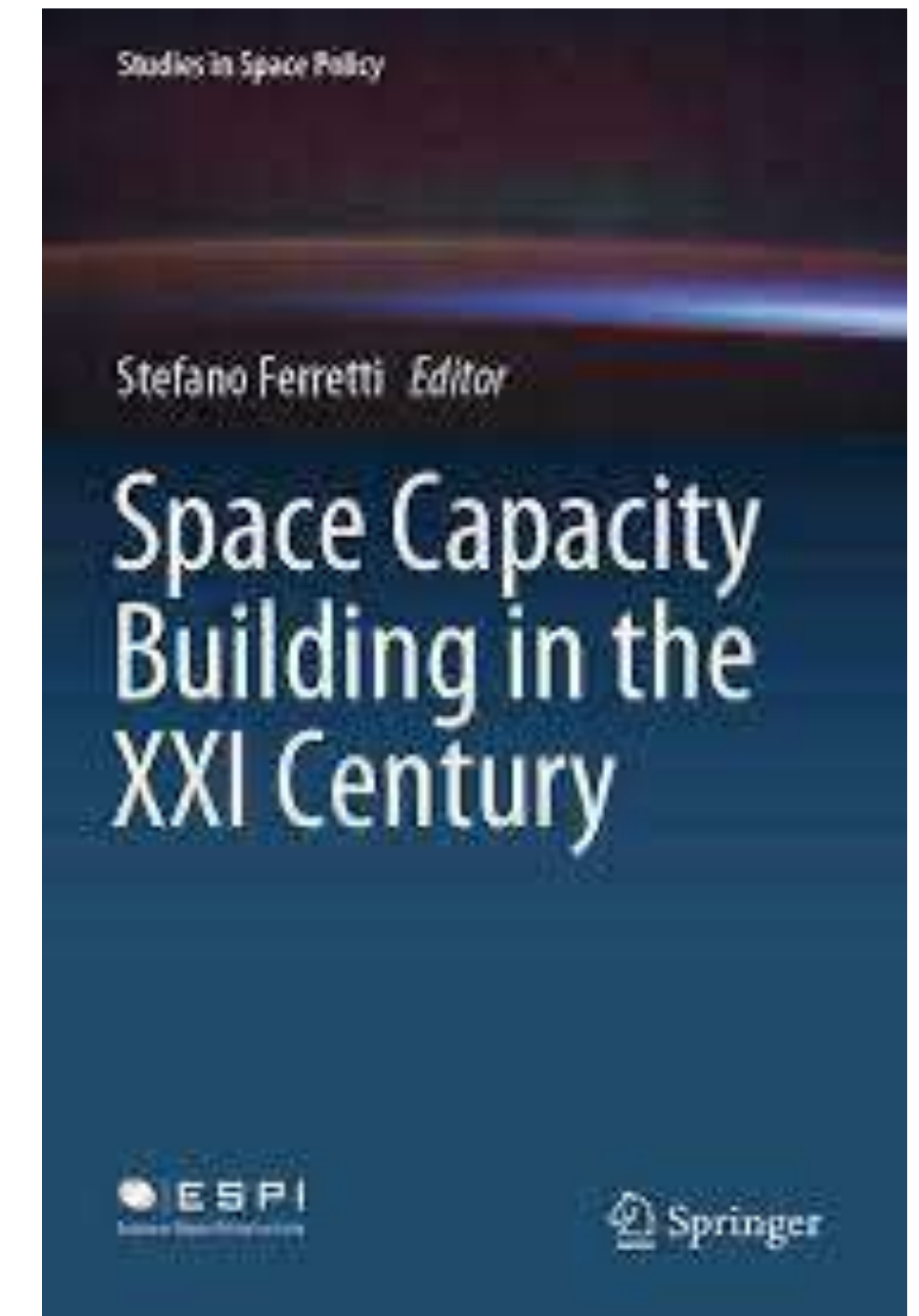
ORIGINS AND MOTIVATION



PREPARATORY STEPS

It was developed through various activities between 2017 and 2019, and taken up by UNOOSA in September 2020 as a Capacity-Building activity in partnership with Brazil, as part of an MoU signed between MCTI and UNOOSA (for 10 years).

- **Open Universe Expert Meeting**, 11-12 April 2017, ASI, Rome, Italy
- **Open Universe Workshop**, 20-22 November 2017, Vienna, Austria
- **UN/Germany High-Level Forum**, 13-16 November 2018, Bonn
- **UN/Austria World Space Forum**, 18-22 November 2019, Vienna
- **COPUOS-STSC Open Universe Side Event**, 57th Session, 2020, Vienna



<https://arxiv.org/pdf/1805.08505.pdf>

CURRENT STATUS

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- Open Universe Workshop, 20-22 November 2017, Vienna, Austria
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- COPUOS-STSC Open Universe Side Event, 57th Session, 2020, Vienna

In 2021, it finally figures in the 'Space 2030 Agenda', ¶ 25

as an initiative to enhance access to astronomical and space science data.

Seventy-sixth session

Agenda item 30

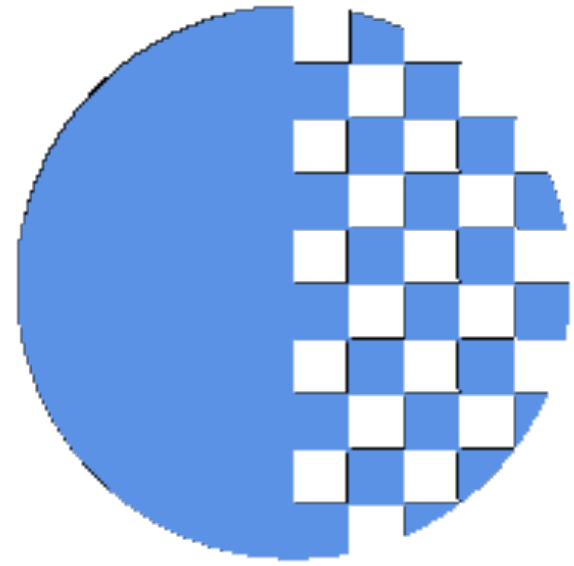
Space as a driver of sustainable development

**Resolution adopted by the General Assembly
on 25 October 2021**

[without reference to a Main Committee (A/76/L.3 and A/76/L.3/Add.1)]

76/3. The “Space2030” Agenda: space as a driver of sustainable development

OBJECTIVES



INCREASE TRANSPARENCY of already accessible resources: including promoting FAIR (Findable, Accessible, Interoperable, Reusable) guiding principles, promoting the adoption of widely-used standards, processing from raw data to web-ready products, enhanced data-mining and integration solutions, 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, including legacy data, 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.

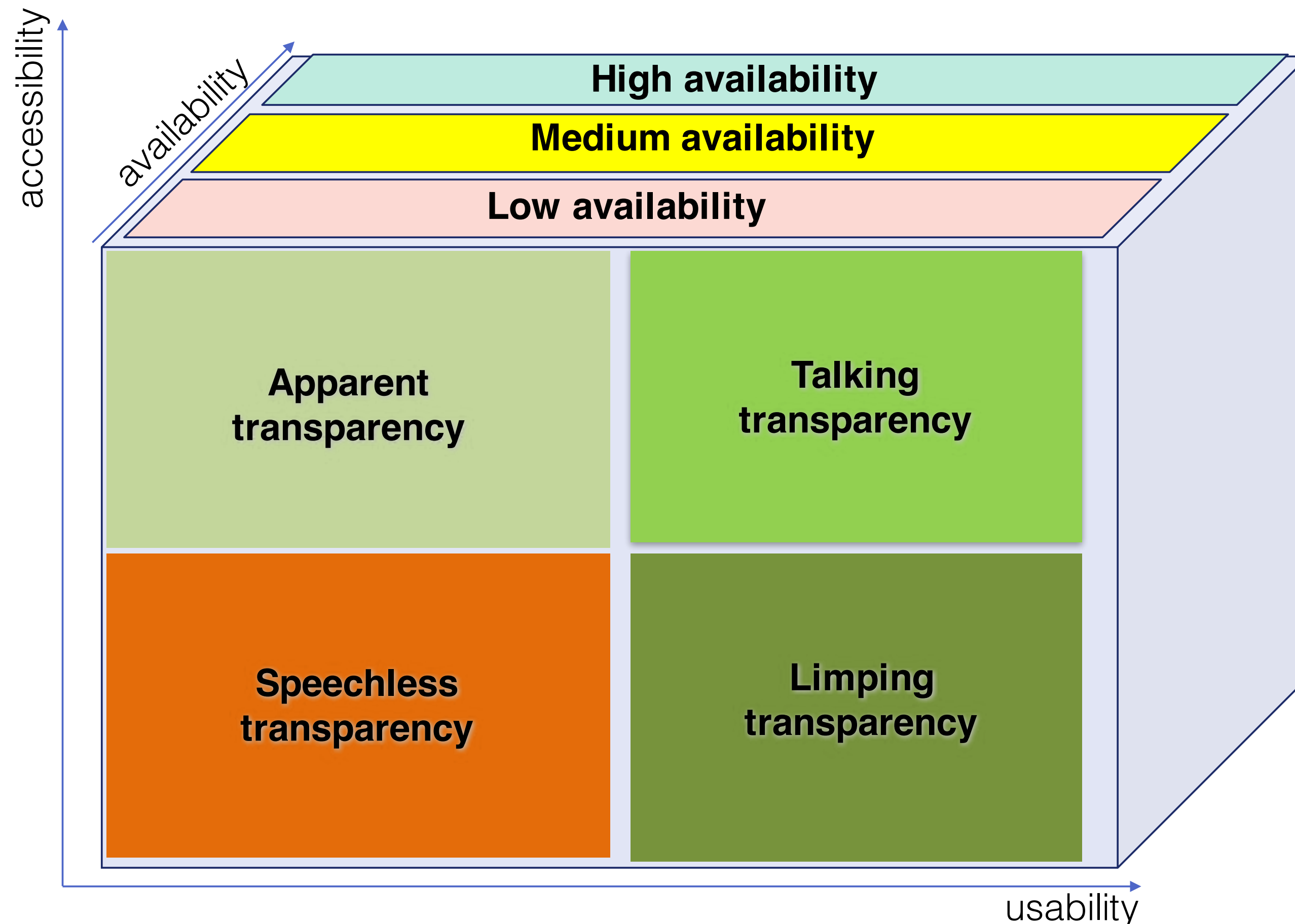


BROADEN THE USER-BASE of astronomy and space science data: to include as well the rapidly growing community of citizen scientists, by providing the necessary tools to use astronomy and space science data for a range of target groups, including educators and students, planetariums, amateur scientists or other potential end-users; and by promoting STEM education, particularly among women and youth in developing countries.

RESOURCES FOR OPEN DATA

"TRANSPARENCY"

Massimo de Angelis, ASI



Mute Transparency: Open data have no transparency;

Apparent Transparency: Open data have low usability level, even if accessibility is high;

Partial Transparency: Open data have a high usability level, even if accessibility is low;

Communicative Transparency: Open data have good quality level and accessibility. At this stage effective transparency is reached.

INFRASTRUCTURE & PARTNERSHIPS

The Open Universe team in countries such as Argentina, Armenia, Brazil, China, Germany, Italy, UAE and the UK, has developed various infrastructures to enhance access and use of space science data, in particular Astronomy.

The screenshot shows the top navigation bar of the Open Universe website. On the left is the 'Open UNiverse' logo. To its right is the URL openuniverse.asi.it. Further right are the logos for the United Nations Office for Outer Space Affairs and the Agenzia Spaziale Italiana (ASI). Below these are several menu items: 'OU for blazars', 'OU for GRBs', 'Space Astronomy', 'Ground Astronomy', 'Planetary Science', 'Solar data', 'ISS', 'VO and General services', 'Bibliography', 'Cosmic Rays', and 'Astronomical tools'. A secondary row of links includes 'Image galleries', 'Open software', 'Other Initiatives', and 'Educational contents'. At the bottom of this section are buttons for 'Help & video tutorials', social media icons for Facebook and Twitter, a 'Feedback' button, a 'VO inside' logo, a 'Login' button, and a 'Reset all' button.

This screenshot shows the left sidebar of the Open Universe website. It features a '▼ OU Parameters' dropdown menu. Below it are two image-based categories: 'Astronomy' with a galaxy image and 'Planetary Science' with a solar system diagram.

The screenshot displays the homepage of the Center for Astrophysics and Space Science. The top navigation bar includes 'HOME', 'DATA ACCESS', 'RESOURCES', 'MEDIA', 'TUTORIALS', and 'FEEDBACK'. The URL firmamento.hosting.nyu.edu is prominently displayed. The main content area features the center's logo and name in English, along with its Arabic name 'جامعة نيويورك أبوظبي' and 'NYU ABU DHABI'.

This screenshot shows the homepage of the Markarian Multiwavelength Data Center (MMDC). The URL mmdc.am is at the top. The navigation menu includes 'Home', 'About', 'Data access', 'Theoretical Modeling', 'Articles', 'Team', and 'Contact'. The main heading is 'WELCOME TO MMDC', followed by a descriptive paragraph: 'Markarian Multiwavelength Data Center (MMDC): a platform for building and analyzing multiwavelength SEDs.'



OPEN UNIVERSE PRODUCTS

Data-Intensive Tools



MNRAS **000**, 1–13 (2020) Preprint 7 June 2021 Compiled using MNRAS L^AT_EX style file v3.0

Deep Learning Blazar Classification based on Multi-frequency Spectral Energy Distribution Data

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A&A 642, A141 (2020)
<https://doi.org/10.1051/0004-6361/202037921>
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AI-based analysis

Astronomy & Astrophysics

Open Universe survey of *Swift*-XRT GRB fields: Flux-limited sample of HBL blazars*

P. Giommi^{1,2,3}, Y. L. Chang⁴, S. Turriziani⁵, T. Glauch¹, C. Leto^{6,7}, F. Verrecchia^{7,8}, P. Padovani⁹,
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Astronomy & Astrophysics

A&A 631, A116 (2019)
<https://doi.org/10.1051/0004-6361/201935646>
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Open Universe for Blazars: a new generation of astronomical products based on 14 years of *Swift*-XRT data*

P. Giommi^{1,2,3}, C. H. Brandt^{3,4}, U. Barres de Almeida^{5,3}, A. M. T. Pollock⁶, F. Arneodo⁷, Y. L. Chang³,
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DRAFT VERSION JANUARY 23, 2024
Typeset using L^AT_EX default style in AASTeX631

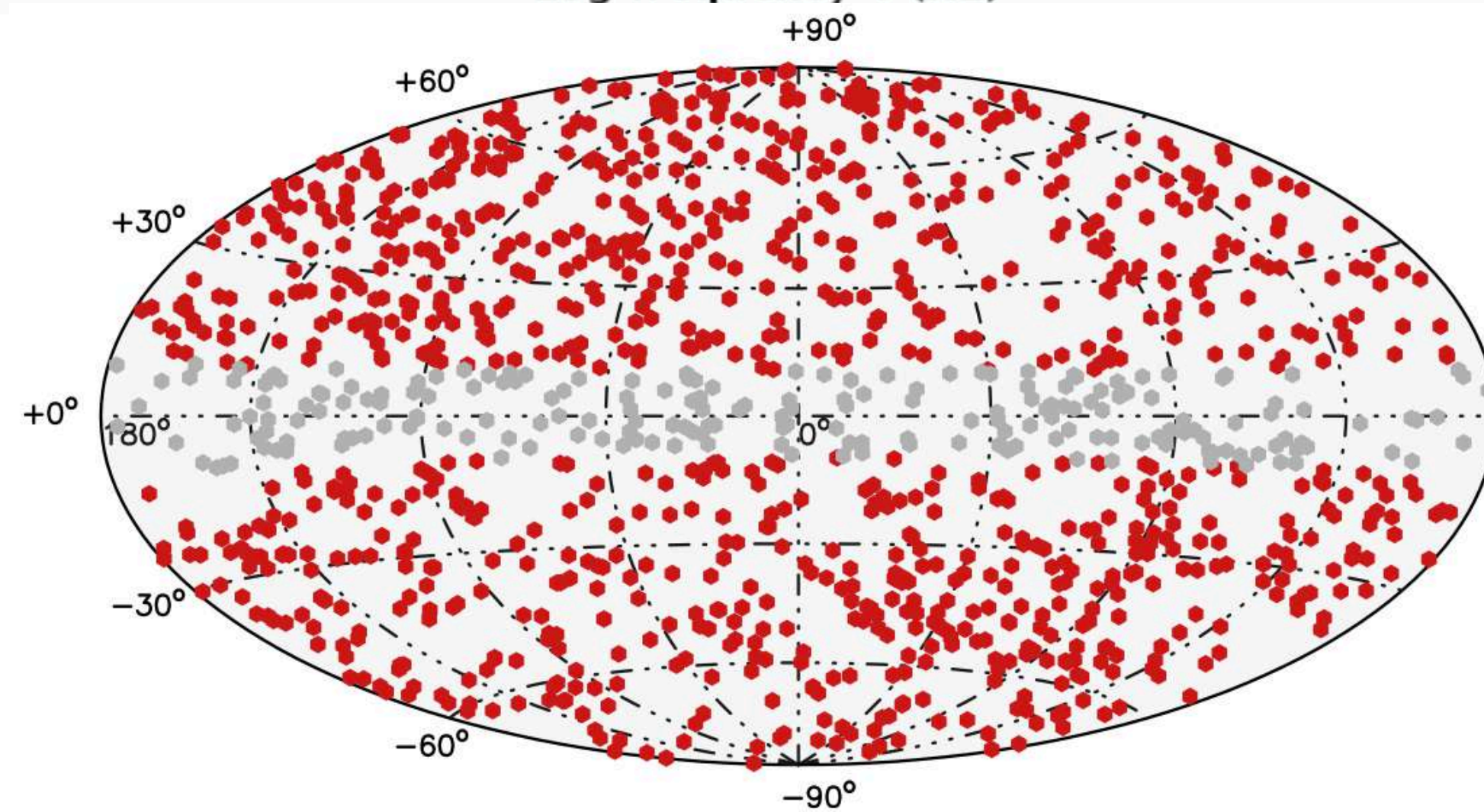
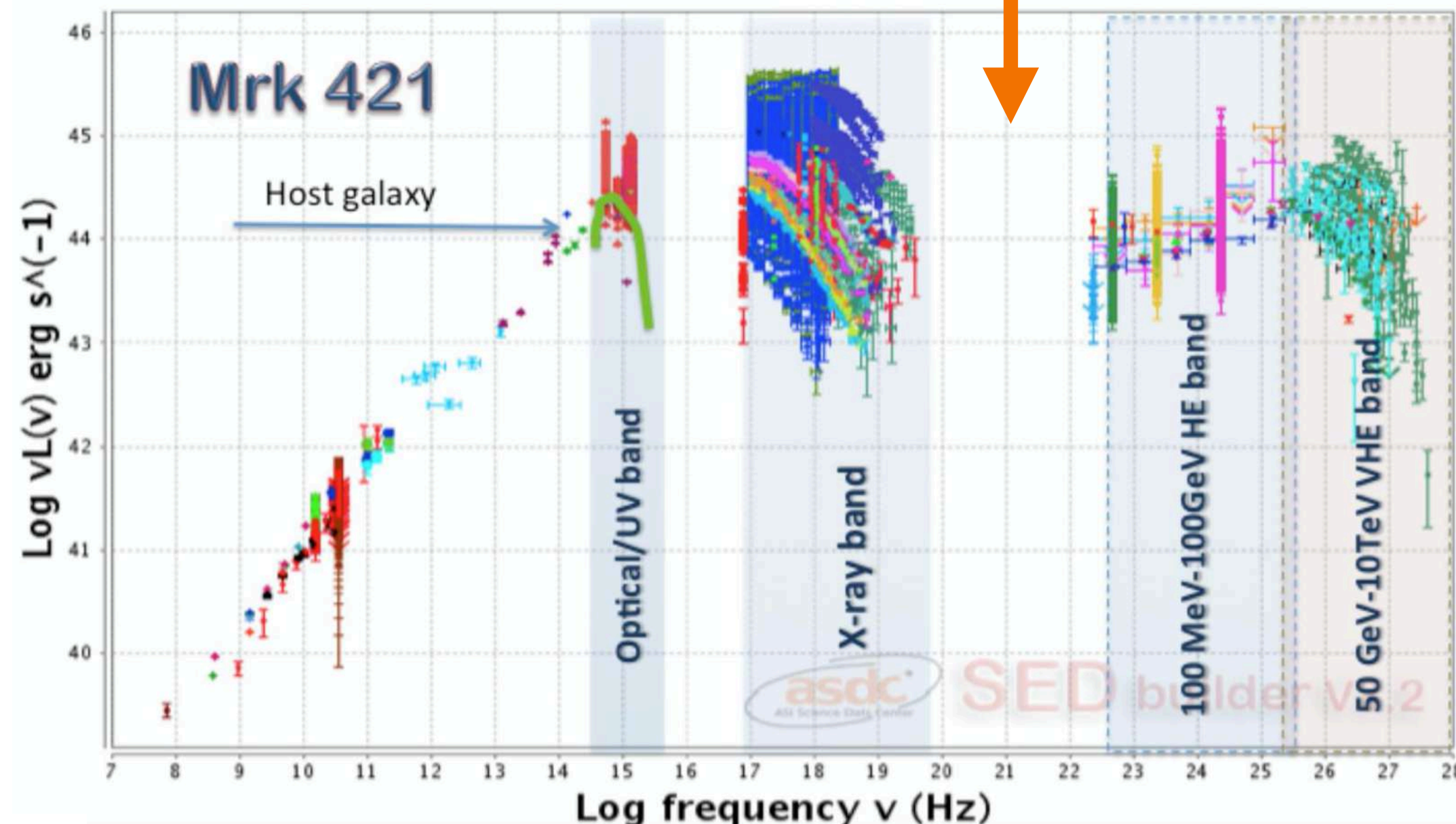
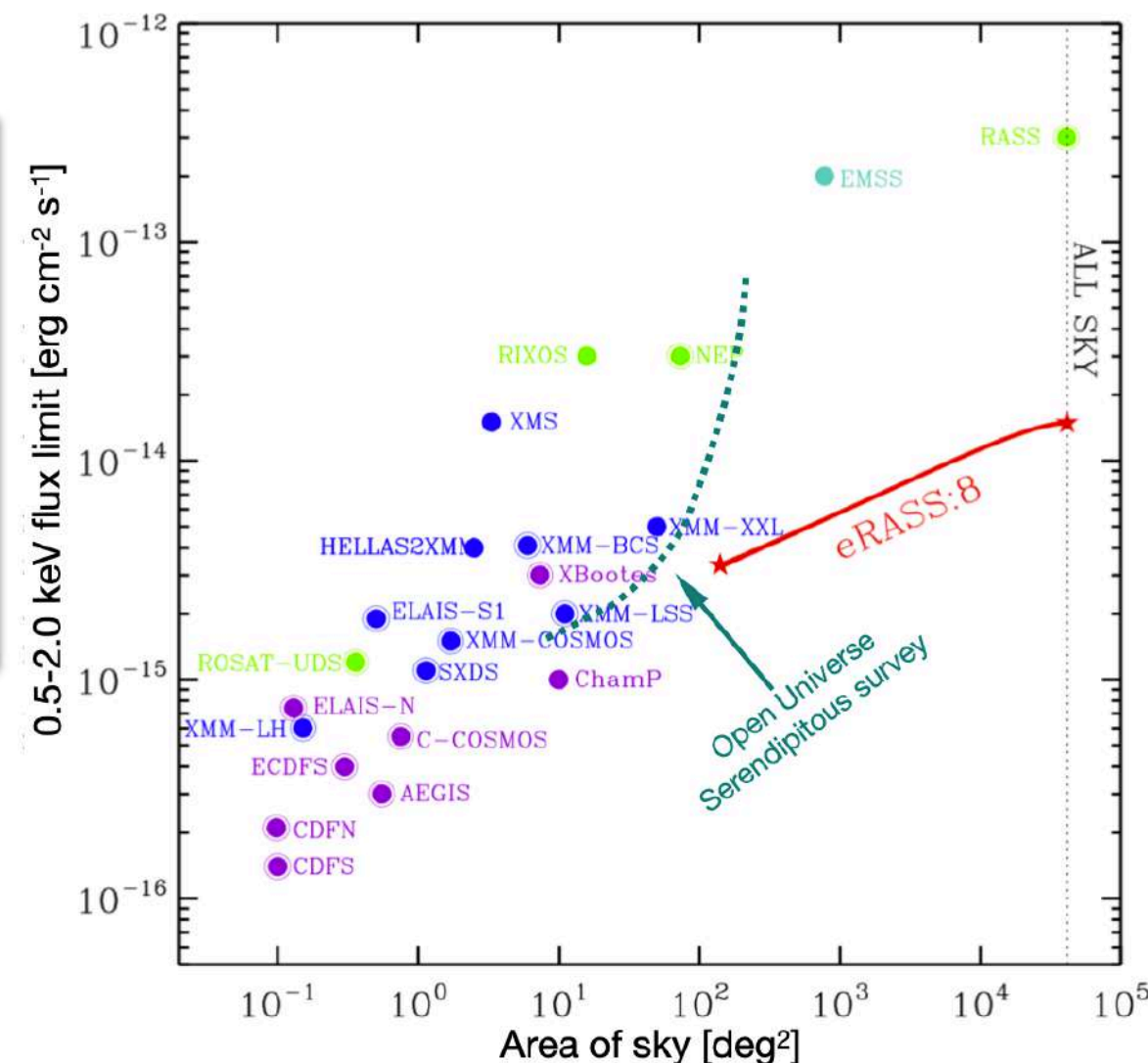
Firmamento: a multi-messenger astronomy tool for citizen and professional scientists

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All-Sky surveys and catalogues



RECENT ACTIVITIES

Two pilot training programmes were performed in partnership with the New York University Abu Dhabi “Center for Astrophysics and Space Sciences” in 2022 and 2023.



Open Universe Training Event, NYUAD, 2022

Firmamento Workshop, NYUAD, 2023



CITIZEN SCIENCE

Quattro ragazzi del liceo Morin di Mestre scoprono le nuove “sorgenti dell’universo”



Brando Mazzon, Laura Fronte, Francesco Metruccio e Nicolò Munaretto



Fermi ID	Ra	Dec	LSSUM ID
4FGL J0000.7+2530	0.188	25.515	LSSUM J0001.2+2546
4FGL J0026.1-0732	6.540	-7.543	LSSUM J0006.9-0752
4FGL J0045.8-1324	11.472	-13.403	LSSUM J0115.1-1341
4FGL J0055.7+4507	13.940	45.124	LSSUM J0139.2+4512
4FGL J0152.9-1109	28.237	-11.162	LSSUM J0283.0-1111
4FGL J0154.6+0051	28.661	0.862	LSSUM J0287.5+0831
4FGL J0159.8-2234	29.951	-22.576	LSSUM J0299.4-2255
4FGL J0231.0+3505	37.775	35.100	LSSUM J0378.0+3508
4FGL J0249.2+1652	42.303	16.882	LSSUM J0422.6+1688
4FGL J0251.1-1830	42.784	-18.509	LSSUM J0427.9-1852
4FGL J0357.7-6808	59.440	-68.134	LSSUM J0593.8-6816
4FGL J0420.6-4802	65.173	-48.048	LSSUM J0651.6-4795
4FGL J0438.0-7329	69.524	-73.485	LSSUM J0696.5-7349
4FGL J0539.2-6333	85.055	6.917	LSSUM J0847.3-6354
4FGL J0625.5+7029	96.392	70.497	LSSUM J0963.9+7049
4FGL J0641.4+3349	100.356	33.820	LSSUM J1004.2+3382
4FGL J0751.2-0029	117.812	-0.488	LSSUM J1178.3-0046
4FGL J0800.9+0733	120.226	7.551	LSSUM J1202.4+0754
4FGL J0815.5+6554	123.880	65.900	LSSUM J1239.1+6583
4FGL J0838.5+4013	129.629	40.224	LSSUM J1297.6+4026
4FGL J0903.5+4057	135.899	40.962	LSSUM J1358.1+4093
4FGL J0914.5+6845	138.647	68.751	LSSUM J1386.2+6875
4FGL J0944.6+5729	146.090	-9.192	LSSUM J1461.3+5759
4FGL J1047.2+6740	161.820	67.674	LSSUM J1617.7+6763
4FGL J1118.1+5857	169.542	58.965	LSSUM J1692.9+5898
4FGL J1146.0-0638	176.502	-6.638	LSSUM J114601-063855
4FGL J1155.2-1111	178.820	-11.189	LSSUM J115515-111123
4FGL J1158.8-1430	179.709	-14.501	LSSUM J115817-143057
4FGL J1403.7+2429	210.936	24.495	LSSUM J140350+243305
4FGL J1409.8+7921	212.464	79.351	LSSUM J141046+792414
4FGL J1441.4-1934	220.350	-19.578	LSSUM J144128-193552
4FGL J1452.0-4148	223.017	-41.804	LSSUM J145225-414948
4FGL J1519.7+6727	229.943	67.458	LSSUM J152000+673224
4FGL J1544.9+3218	236.239	32.304	LSSUM J154433+322149
4FGL J1554.2+2008	238.553	20.148	LSSUM J155424+201125
4FGL J1626.5+6257	246.644	62.959	LSSUM J162646+630049
4FGL J1628.2+4642	247.063	46.715	LSSUM J162755+464249
4FGL J1658.5+4315	254.646	43.254	LSSUM J165832+431615
4FGL J1706.4+6428	256.606	64.475	LSSUM J170623+642725
4FGL J1727.1+5955	261.776	59.926	LSSUM J172711+5955
4FGL J1923.0-4746	290.752	-47.769	LSSUM J192300-4746
4FGL J1928.5+5339	292.139	53.653	LSSUM J192850+5339
4FGL J2012.1-5234	303.039	-52.570	LSSUM J201211-5234
4FGL J2020.7-4536	305.198	-45.614	LSSUM J202070-4536
4FGL J2022.3+0413	305.598	4.222	LSSUM J202230+0413
4FGL J2028.8-0010	307.215	-0.171	LSSUM J202880-0010
4FGL J2030.3-5038	307.590	-50.634	LSSUM J203030-5038
4FGL J2038.7-3655	309.686	-36.925	LSSUM J203870-3655
4FGL J2142.5-2029	325.642	-20.497	LSSUM J214250-2029
4FGL J2144.8-1600	326.216	-16.010	LSSUM J214480-1600
4FGL J2201.0-3228	330.257	-32.477	LSSUM J220100-3228
4FGL J2207.1+2222	331.791	22.374	LSSUM J220710+2222
4FGL J2217.0-6727	334.255	-67.453	LSSUM J221700-6727
4FGL J2237.2-6726	339.304	-67.437	LSSUM J223720-6726
4FGL J2237.8+2430	339.458	24.511	LSSUM J223780+2430

A catalog of new Blazar candidates with Open Universe by High School students

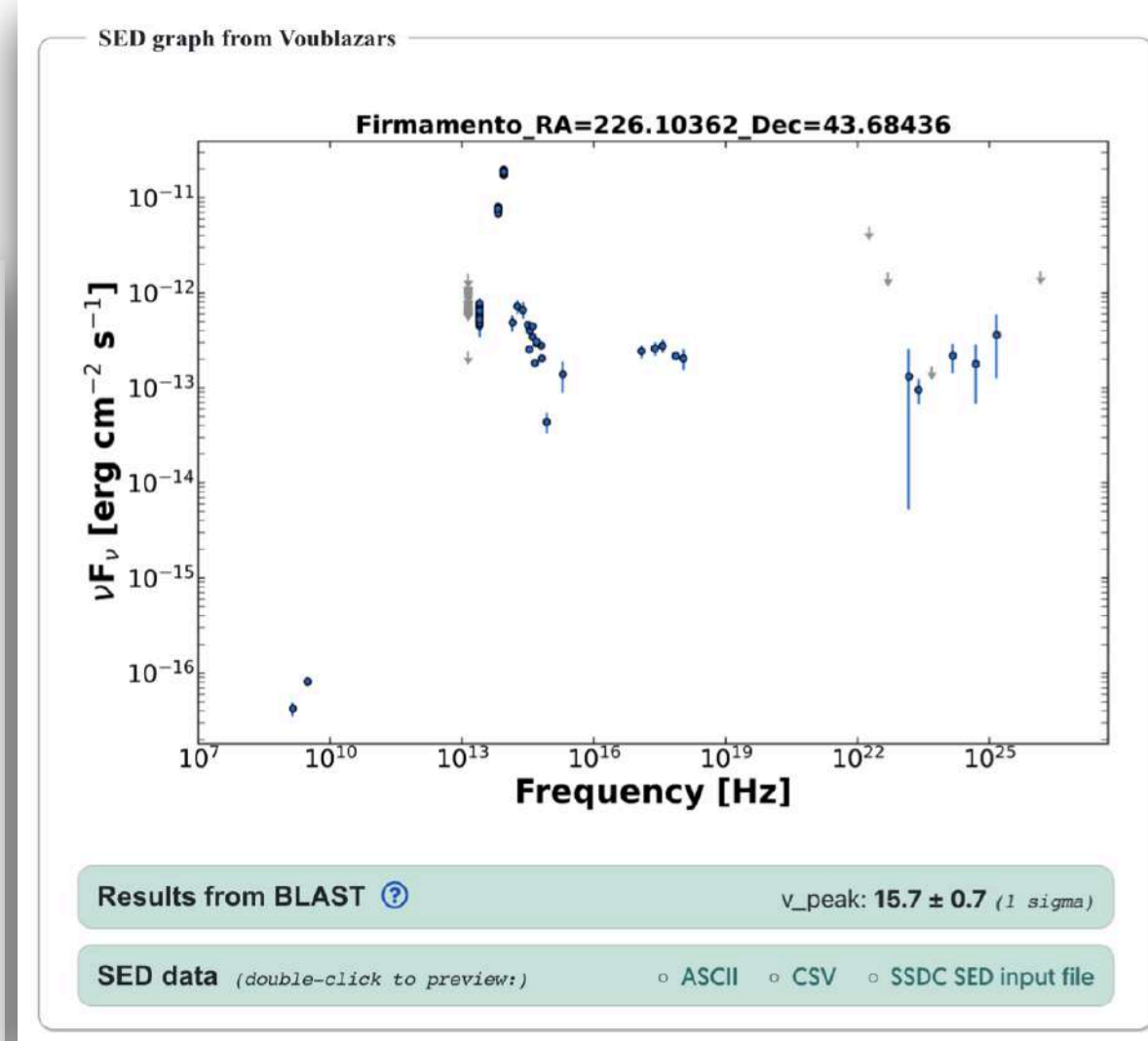
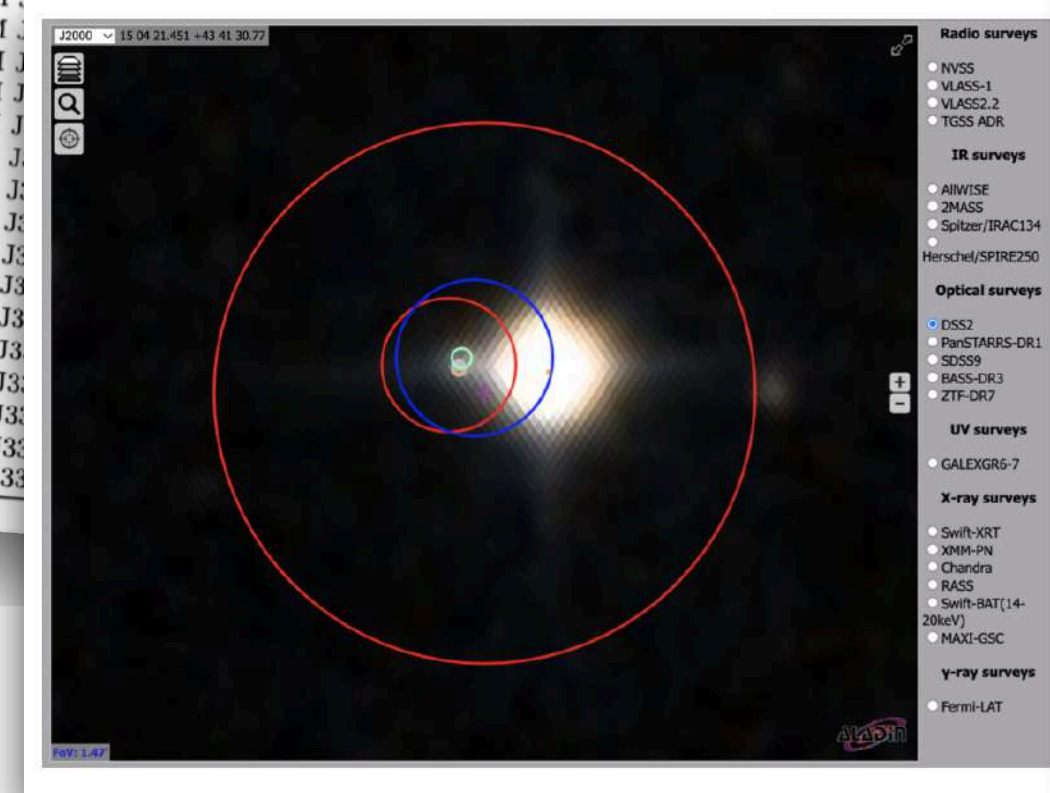
L. Fronte¹, B. Mazzon¹, F. Metruccio¹, N. Munaretto¹
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September 2022

Abstract. Blazars are active galactic nuclei whose ultra-relativistic jets are co-aligned with the observer direction. They emit throughout the whole e.m. spectrum, from radio waves to VHE gamma rays. Not all blazars are discovered. In this work, we propose a catalog of new highly probable candidates based on the association of HE gamma ray emission and radio, X-ray and optical signatures. The relevance of this work is also that it was performed by four high school students from the Liceo Ugo Morin in Venice, Italy using the open-source platform Open Universe in collaboration with the University of Padova. The framework of the activity is the Italian MIUR PCTO programme. The success of this citizen-science experience and results are hereafter reported and discussed.

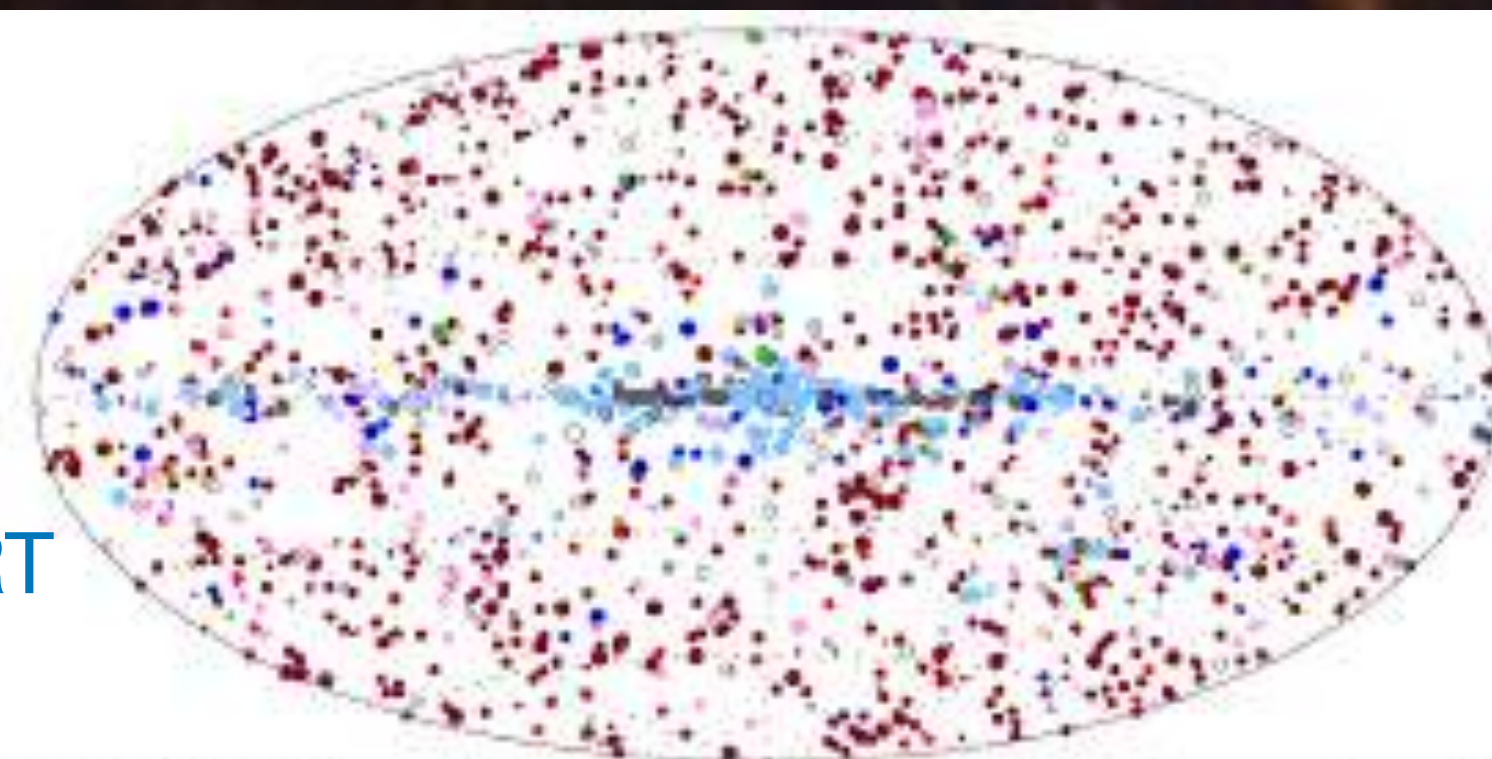


CAPACITY BUILDING & LEGACY

The first UN/Brazil Open Universe Event was proposed for November 2024

- **Training** of students and high-school teachers on the Open Universe and partner tools for analyzing and generating data-intensive space-science products
- **"Sciathon"** activities for citizen-generation of relevant scientific products based on open-source data, and support by the Open Universe tools
- **Production** of legacy data-sets by citizen-scientists for scientific use and education for all, as a demonstration of the power of knowledge-based societies

Swift-XRT
SkyMap



○ Unidentified ● Unknown AGN ● Seyfert Galaxies ● CVs/Stars ● X-ray Binaries
● LINER ● Galaxy Clusters ● Beamed AGN ● Pulsars/SNR



Swift Neil Gehrels
X-ray Mission

Thank You

Contact: ulisses@cbpf.br