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MINISTÉRIO DA  
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INOVAÇÕES E COMUNICAÇÕES

MCTIC

# THE OPEN UNIVERSE INITIATIVE: ACCESS TO SPACE FOR ALL

**Ulisses Barres de Almeida<sup>1</sup>, Paolo Giommi<sup>2</sup>**

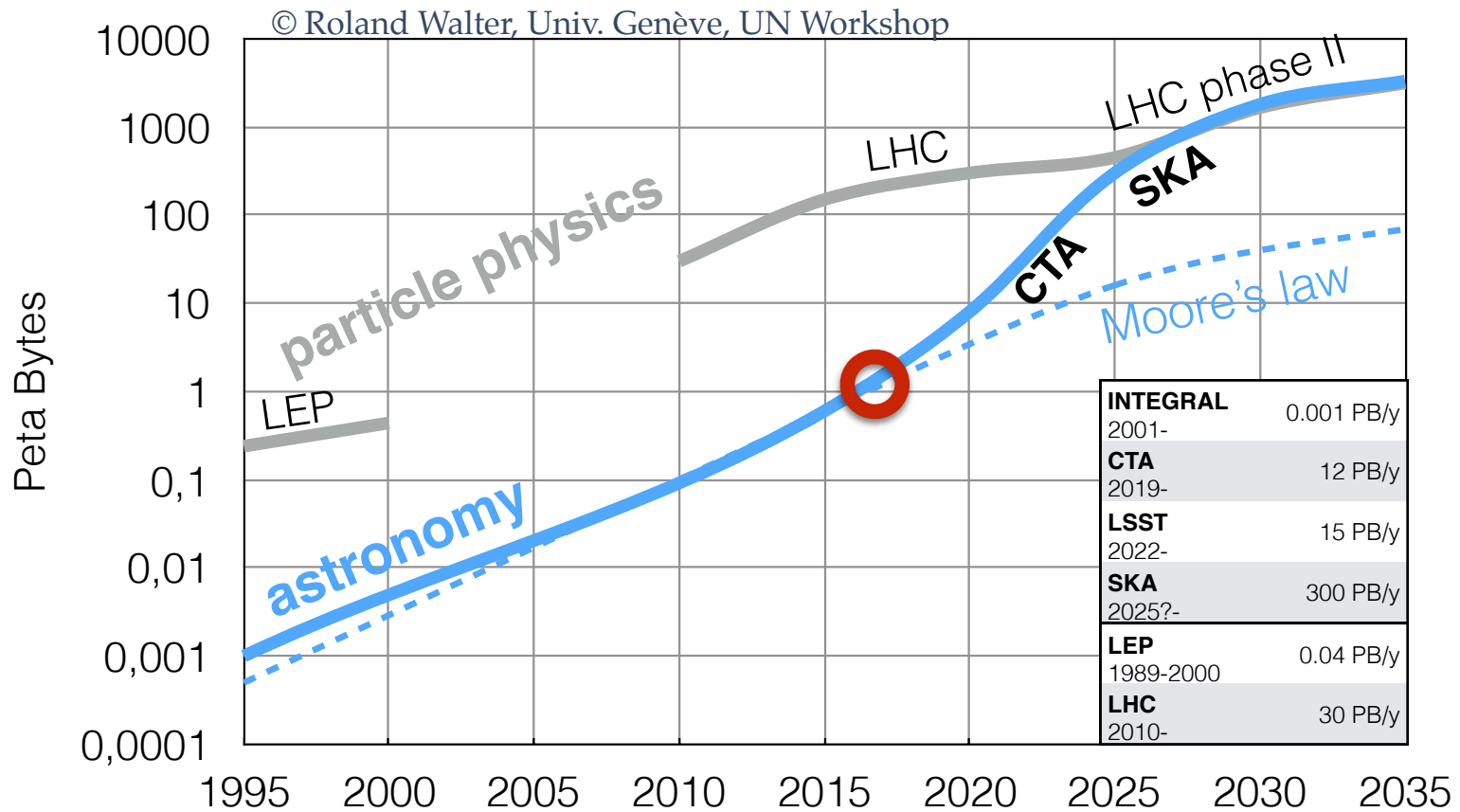
<sup>1</sup> Brazilian Center for Research in Physics (CBPF)

<sup>2</sup> Italian Space Agency (ASI)

# PREMISES

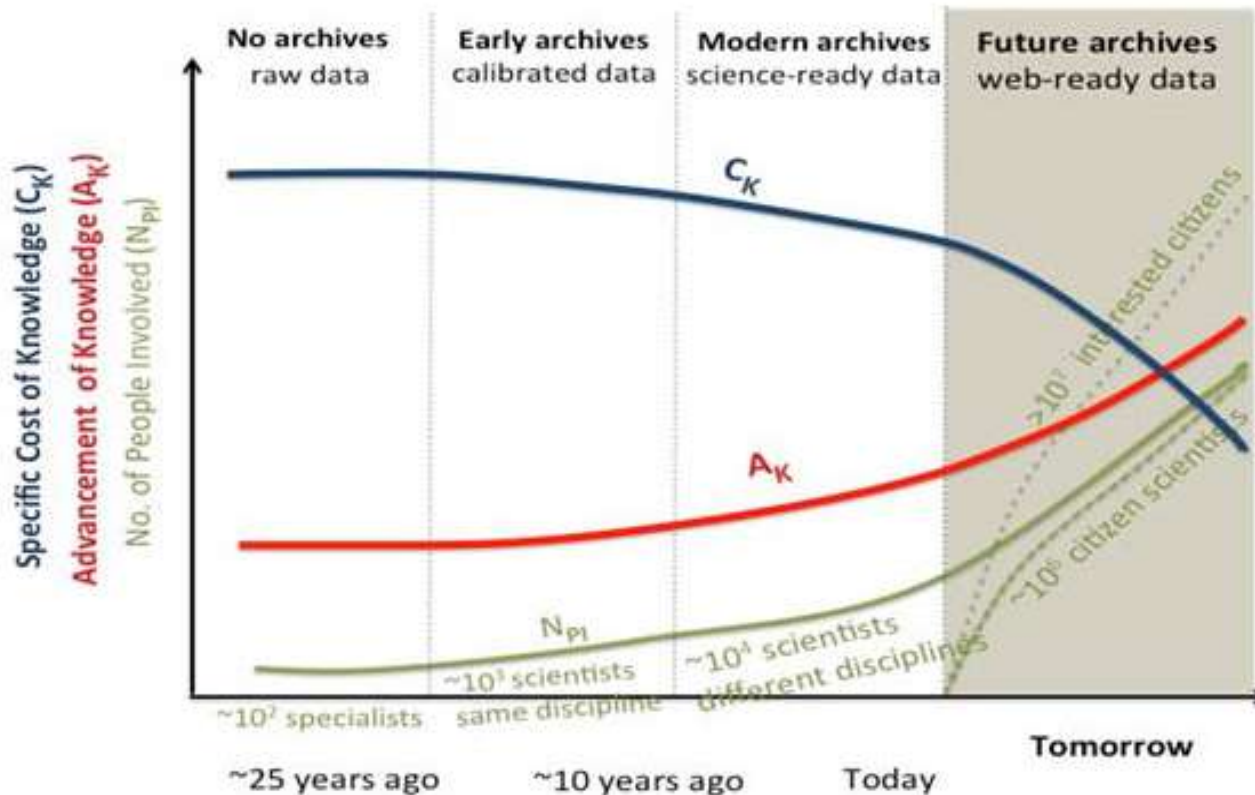


## I - Dramatic increase in the volume of data produced in astronomy and space sciences



# PREMISES

## II - Evolution of information technology opens new opportunities for data sharing, accessibility, and utilisation.



From the original COPUOS proposal by Italy

# ORIGINS OF THE INITIATIVE



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

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

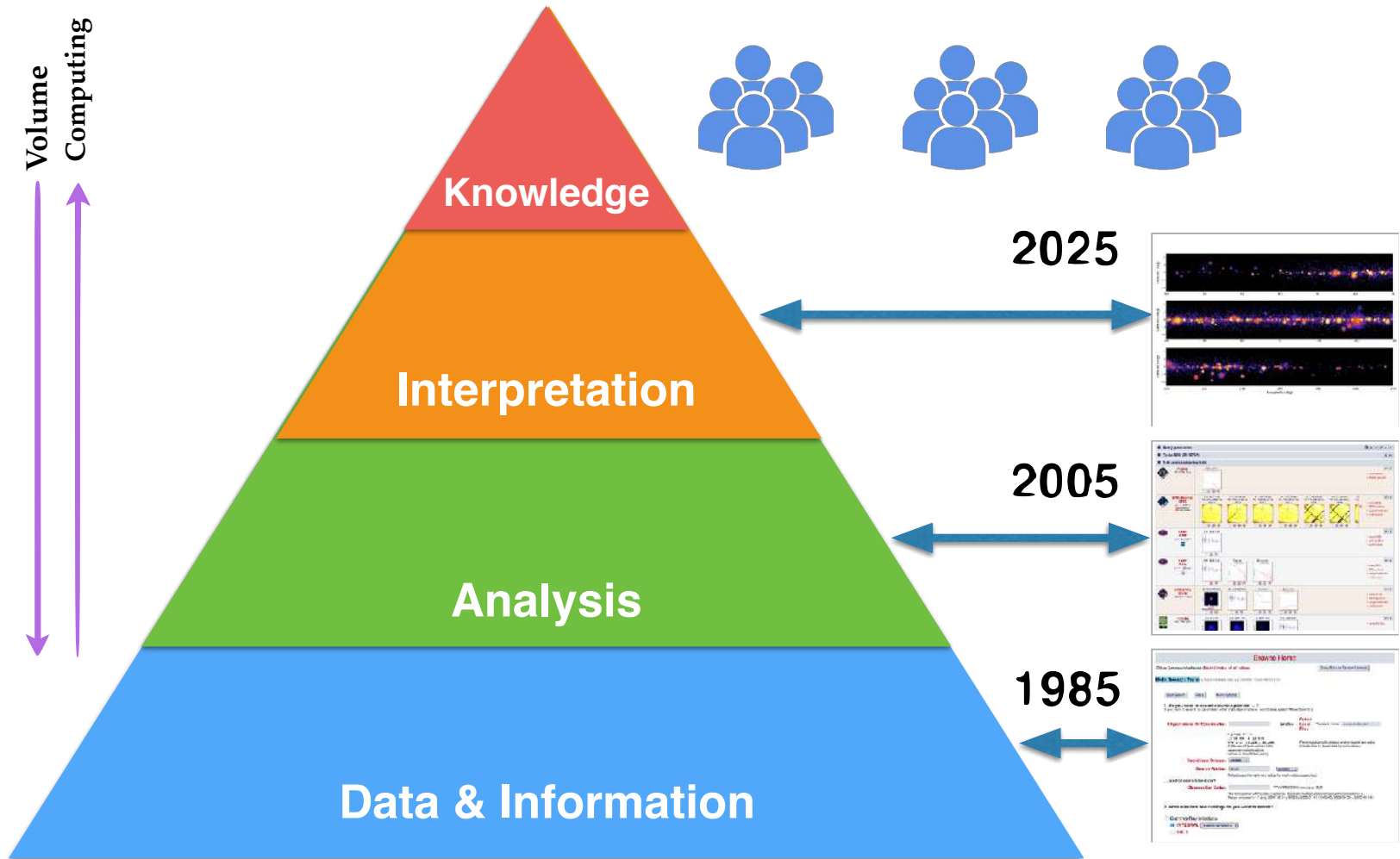
**“Open Universe” proposal, an initiative under the auspices  
of the Committee on the Peaceful Uses of Outer Space for  
expanding availability of and accessibility to open source  
space science data.**

**Proposal by Italy**

**“Open Universe” was originally proposed by Italy as an initiative under the auspices of COPUOS, during the preparations for UNISPACE+50.**

- **Main goal is** to dramatically expand the availability and access to space science data, responding to the growing demands of transparency on the use of public resources and of the societal returns of science.
- **Motivated by** (i) from one side, the evidence of the increased rate of production of scientific data in all fields, including space science, and the responsibility to convert such data into effective knowledge; (ii) on the current context in which technological barriers to data sharing and access have been dramatically reduced, opening up new opportunities for knowledge dissemination and inclusion.

# DEMOCRATISING KNOWLEDGE



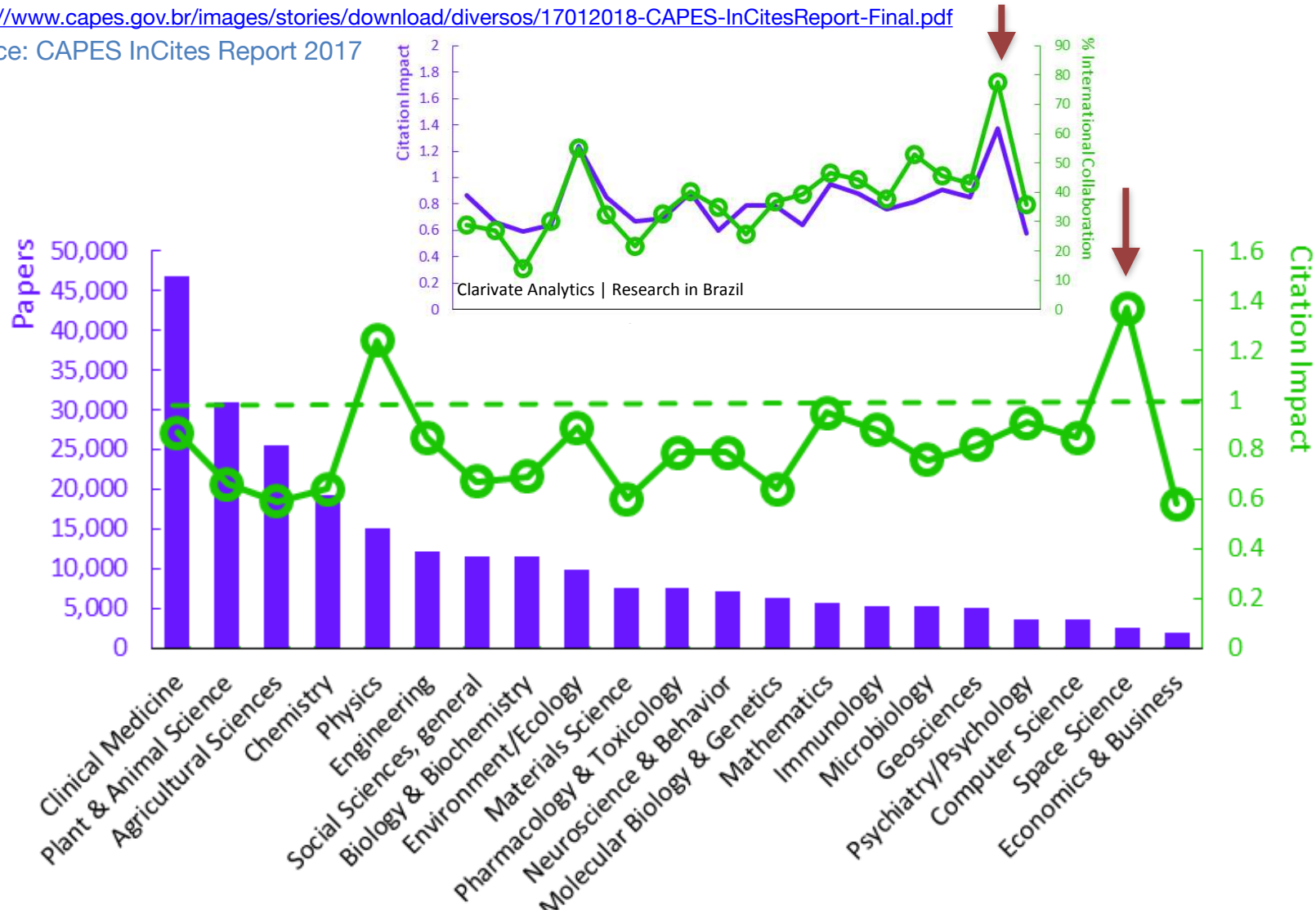
© Roland Walter, Univ. Genève, UN Workshop

# THE APPEAL OF SPACE SCIENCE: STRENGTH OF INTERNATIONAL COOPERATION



<https://www.capes.gov.br/images/stories/download/diversos/17012018-CAPES-InCitesReport-Final.pdf>

Source: CAPES InCites Report 2017



# CONTEXT



**Space accessibility is one of the four pillars (others being space economy, space society and space diplomacy) supporting a Space 2030 Agenda, as established after UNISPACE+50.**

- The Agenda envisions strategies and activities to strengthen the contribution of the **space sector to the achievement of global targets**, such as the SDGs.
- In particular, **space accessibility** responds to the underlining fundamental goal of sharing the benefits of space exploration amongst all nations.
- Reduction of inequality of opportunities in the growing and diversifying space sector, and enhancement of international cooperation in space, are at the basis of efforts to build a peaceful future of outer space.

UNISPACE  
+50



# DATA AS AN ENTRY DOOR TO SPACE



Data is specially relevant for space accessibility, and the distribution of the benefits of space exploration today.



Among the different avenues for space accessibility, data stands out as

- a most sustainable entry point,
- providing a cheap and secure starting level,
- based on education and capacity building



# DATA AS AN ENTRY DOOR TO SPACE



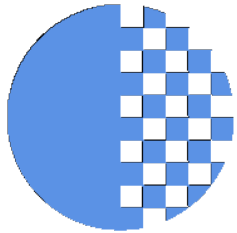
**Data is specially relevant for space accessibility, and the distribution of the benefits of space exploration today.**

It also offers a

- **cost-effective avenue for international co-operation for development,**
- **whereby local groups and new players can be quickly welcomed into the global arena,**
- **and impactful “south-south” co-operation can quickly be initiated.**



# PILLARS OF THE OPEN UNIVERSE INITIATIVE



**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...



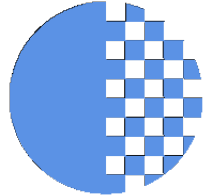
**RESURFACE DATA and other hidden or otherwise hardly accessible resources:** by identifying inaccessible data and working with national and regional entities to solve the challenges to make them public, including legacy data, as well as bringing new main players and actors in the international space 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.

Outcomes from the UN Open Universe Workshop, 2017

# A KEY ROLE TO BE PLAYED BY UNOOSA



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**UNOOSA**

**UNOOSA, through its mandate from UNISPACE III, to increase scientific knowledge of near and outer space by promoting cooperative activities in astronomy and space sciences, is in a unique position to bring together all relevant stakeholders to achieve these proposed goals.**

# STEPS TOWARDS THE OPEN UNIVERSE INITIATIVE



Experts Meeting @ ASI, Feb 2017  
[http://www.openuniverse.asi.it/documents/ou\\_documents.php](http://www.openuniverse.asi.it/documents/ou_documents.php)

United Nations Workshop, Nov 2017  
[http://www.unoosa.org/oosa/en/ourwork/psa/schedule/2017/workshop\\_italy\\_openuniverse.html](http://www.unoosa.org/oosa/en/ourwork/psa/schedule/2017/workshop_italy_openuniverse.html)

UNOOSA Report on Open Universe:  
[http://www.unoosa.org/oosa/oosadoc/data/documents/2018/aac.105/aac.1051175\\_0.html](http://www.unoosa.org/oosa/oosadoc/data/documents/2018/aac.105/aac.1051175_0.html)

"Zero Draft" 2030 Agenda:  
[http://www.unoosa.org/oosa/oosadoc/data/documents/2019/aac.105c.22019crp/aac.105c.22019crp.24\\_0.html](http://www.unoosa.org/oosa/oosadoc/data/documents/2019/aac.105c.22019crp/aac.105c.22019crp.24_0.html)

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UNOOSA Report on Open Universe:  
[http://www.unoosa.org/oosa/oosadoc/data/documents/2018/aac.105/aac.1051175\\_0.html](http://www.unoosa.org/oosa/oosadoc/data/documents/2018/aac.105/aac.1051175_0.html)

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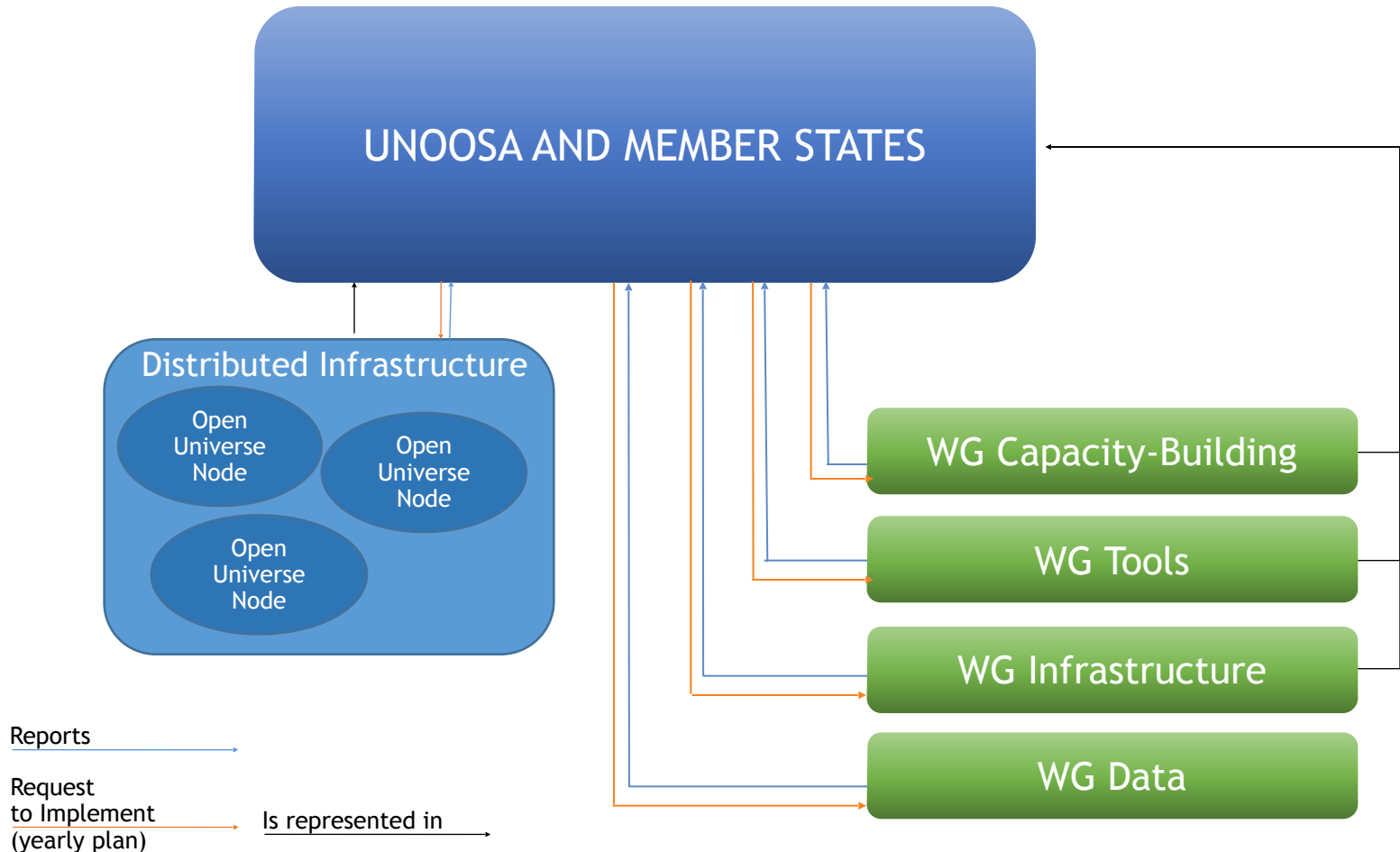
## Next steps will involve:

- a kick-off meeting, to happen in 2019, to formally start the initiative within UNOOSA;
- a first meeting of the steering board, already planned to take place in Brazil in 2020, to outline the first activities and goals of the initiative.

# PROPOSED STRUCTURE OF THE INITIATIVE



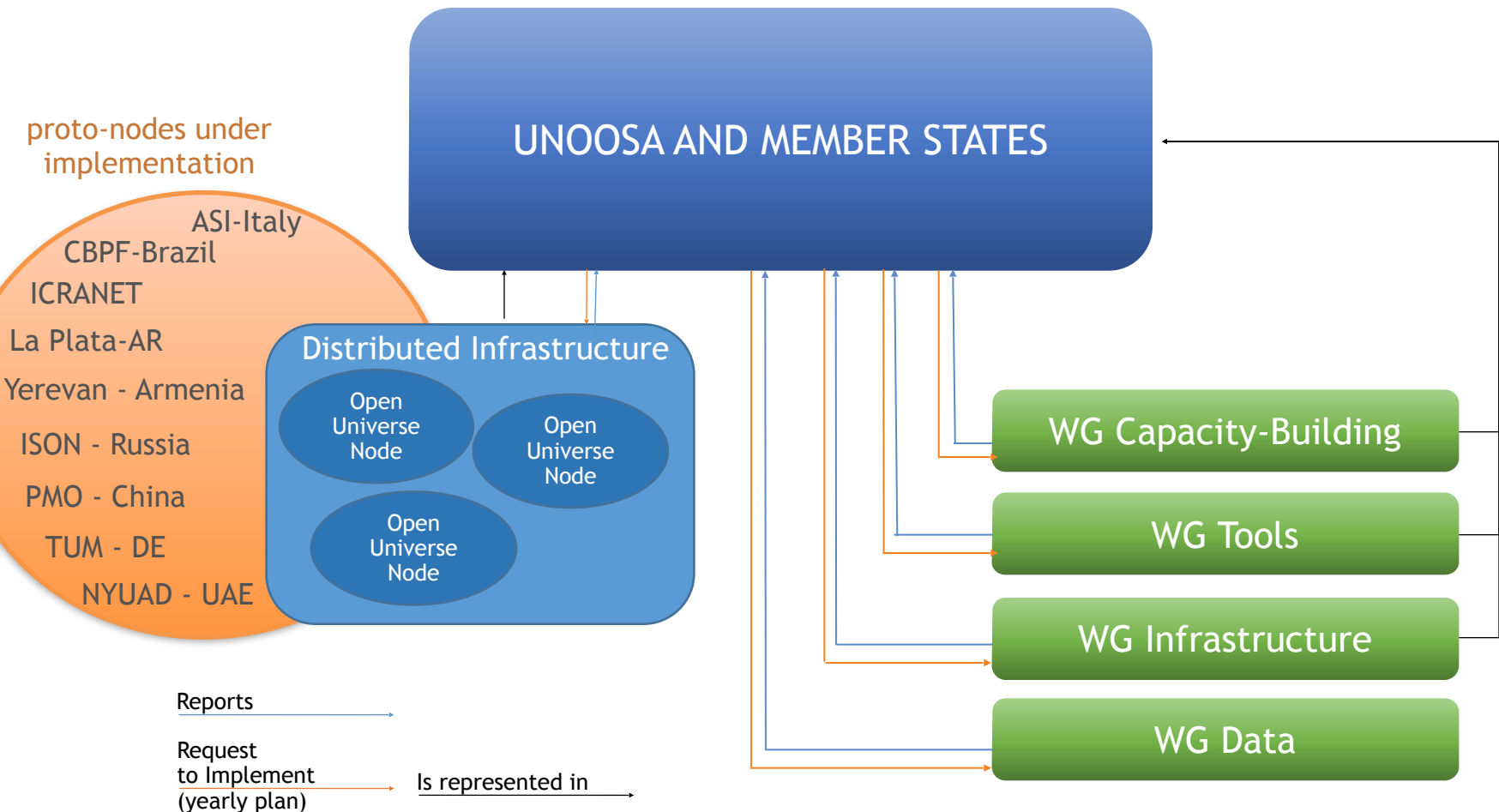
## IMPLEMENTATION PHASE



# PROPOSED STRUCTURE OF THE INITIATIVE



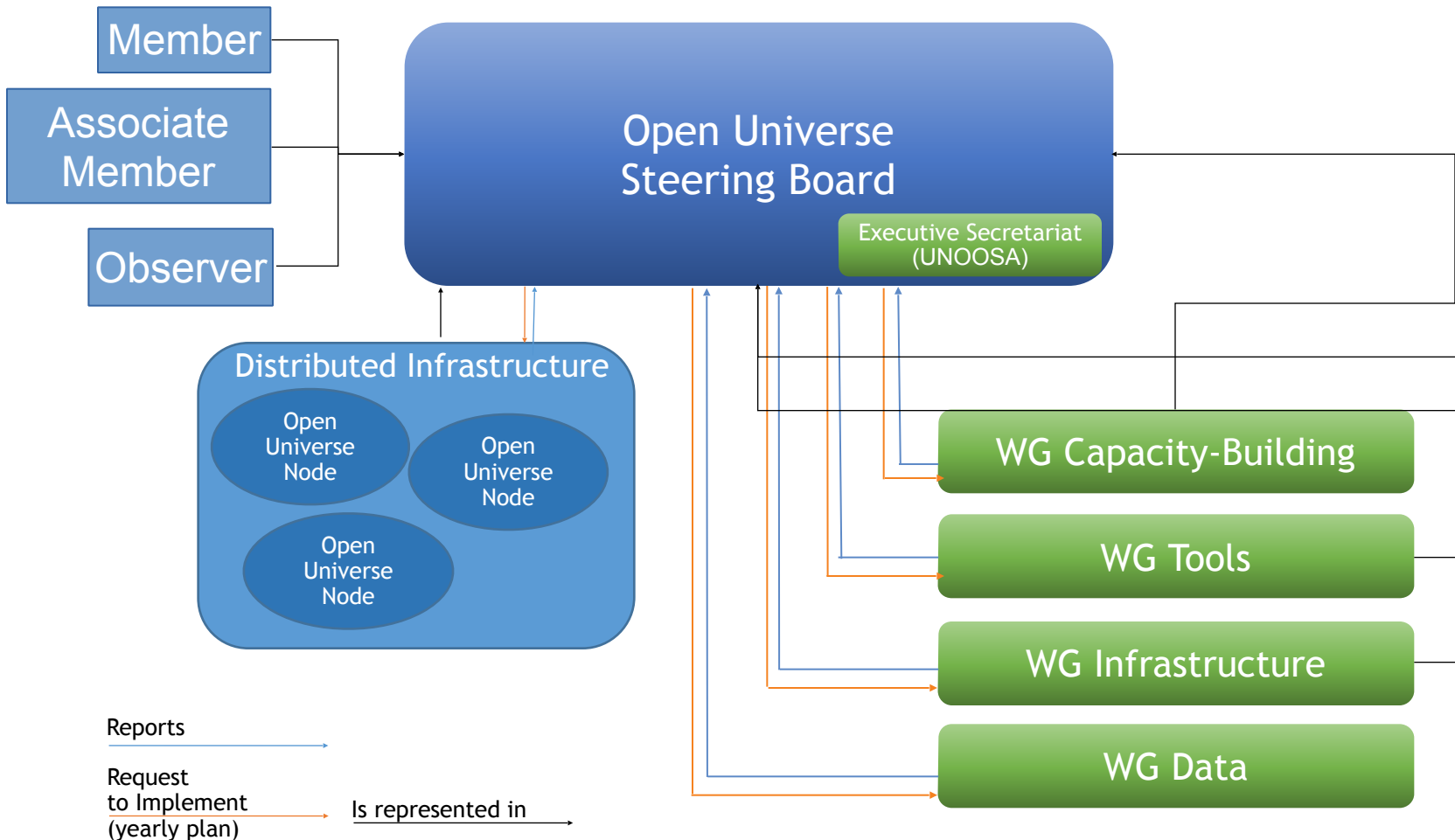
## IMPLEMENTATION PHASE



# PROPOSED STRUCTURE OF THE INITIATIVE



## OPERATIONAL PHASE after the first few years





# CURRENT STATUS OF ACTIVITIES

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Open Universe is already operational, with the support of UNOOSA, through a number of activities involving the three pillars of the Initiative

- **Data transparency** : A data portal is maintained by ASI, with support data and software services from the proto-nodes around the world.
- **Data accessibility** : New software is being developed to produce enhanced data products from satellite missions; data provision from a suit of BRICS observatories is being organised.
- **Capacity Building** : Schools and training activities using Open Universe resources and services are being organised; e.g. at the New York University in Abu Dhabi.

# CURRENT STATUS OF ACTIVITIES

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Open Universe is already operational, with the support of UNOOSA, through a number of activities involving the three pillars of the Initiative

**NEW SCIENTIFIC COLLABORATIONS AND  
CUTTING-EDGE SPACE SCIENCE RESEARCH  
UNDER DEVELOPMENT AS A RESULT OF THESE  
ACTIVITIES**

# THE OPEN UNIVERSE PORTAL



OPENUNIVERSE.ASI.IT

## Open UNiverse



[OU for blazars](#) [OU for GRBs](#) [Space Astronomy »](#) [Ground Astronomy »](#) [Planetary Science »](#) [Solar data »](#) [ISS »](#) [VO and General services »](#) [Bibliography »](#) [Cosmic Rays »](#) [Astronomical tools »](#) [Image galleries »](#)  
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Astronomy



Planetary Science



Cosmic Rays



Atmospheric Physics

Version 2.0

Enter object name or coordinates:

e.g. 3C279 or 194.04625, -5.789167 or 12 56 11.1, -05 47 21.0

## Open UNiverse Space science data for everyone

### Open Universe documents

- [Open Universe paper](#)
- [Original proposal A/AC.105/2016/CRP.6](#)
- [Open Universe Expert Meeting, 11-12 April 2017, ASI-HQ, Rome, Italy](#)
- [Report on the Open Universe Expert Meeting](#)
- [Open Universe Workshop, Vienna 20-22 November 2017](#)
- [Report on the Open Universe workshop](#)

### Open Universe Technical presentations

- [June 2016 - COPUOS, 59th session](#)
- [June 2017 - COPUOS, 60th session](#)
- [February 2018 - COPUOS-STSC, 55th session](#)
- [November 2018 - United Nations/Germany High Level Forum](#)
- [February 2019 - COPUOS-STSC, 56th session](#)



# NEW SOFTWARE AND DATA PRODUCTS

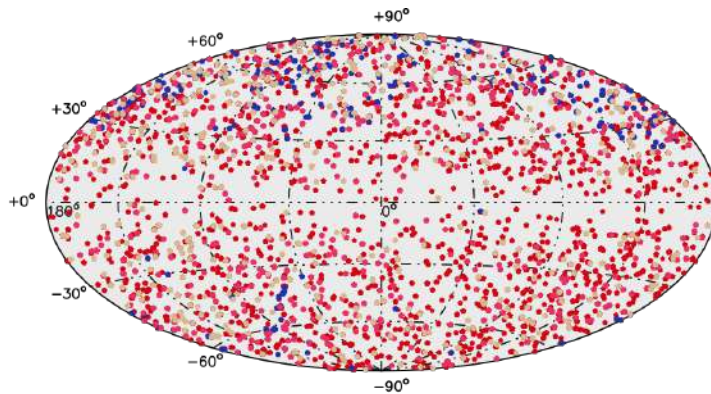


## “SWIFT DEEP SKY”

REMOVING THE NEED FOR DATA ANALYSIS EXPERTISE IN X-RAY SATELLITE MISSIONS

**Open Universe for Blazars: a new generation of astronomical products based on 14 years of Swift-XRT data.**

P. Giommi<sup>1,2,3</sup>, C.H. Brandt<sup>3,4</sup>, U. Barres de Almeida<sup>5,3</sup>, A.M.T. Pollock<sup>6</sup>, F. Arneodo<sup>7</sup>, Y. L. Chang<sup>3</sup>, O. Civitaresè<sup>8,9</sup>, M. De Angelis<sup>1</sup>, V. D’Elia<sup>10,12</sup>, J. Del Rio Vera<sup>11</sup>, S. Di Pippo<sup>11</sup>, R. Middei<sup>13</sup>, A. V. Penacchioni<sup>8</sup>, M. Perri<sup>10,12</sup>, R. Ruffini<sup>3</sup>, N. Sahakyan<sup>14</sup>, and S. Turriziani<sup>15</sup>



Swift\_deepsky run on a 11,000 Swift-XRT observations of blazars

Spectral information on dozens of sources with over 100 pointings by Swift

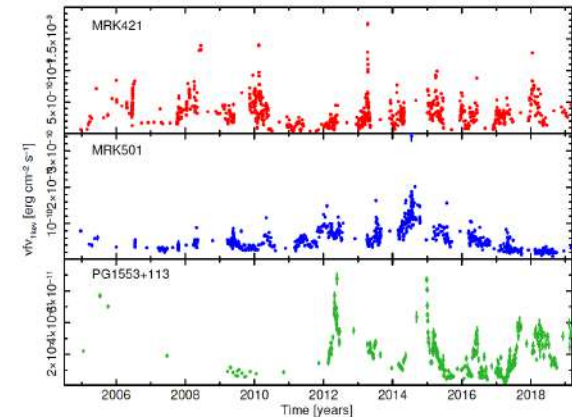
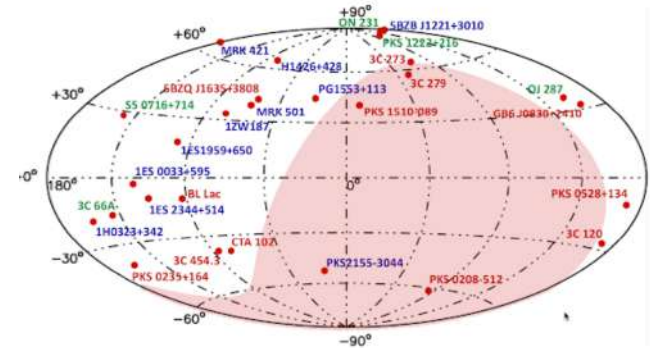


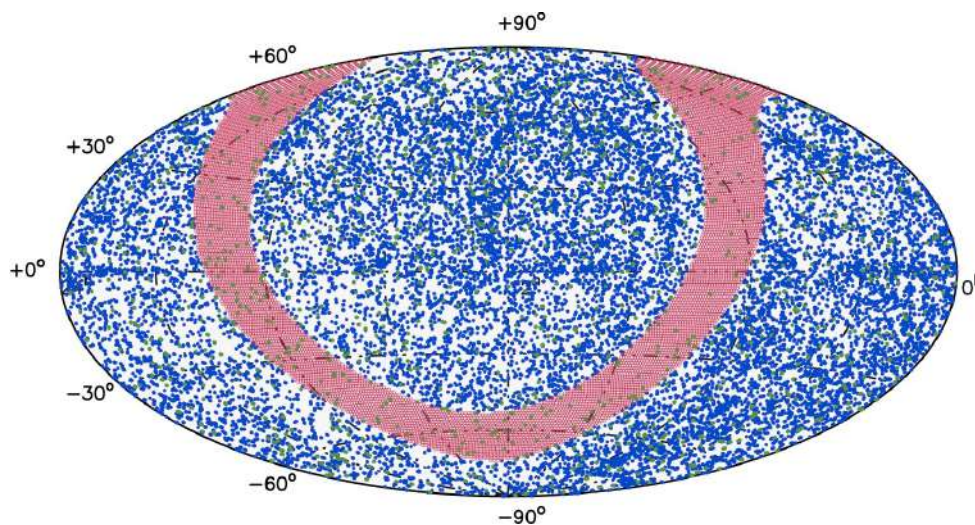
Fig. 5. Examples of 1KeV light curves of HBL blazars built

Detailed time-variability information for tens of sources regularly monitored

# ... AND APPLICATIONS IN TRAINING SCHOOLS



First Open Universe Training School for undergraduate students of NYU - AD



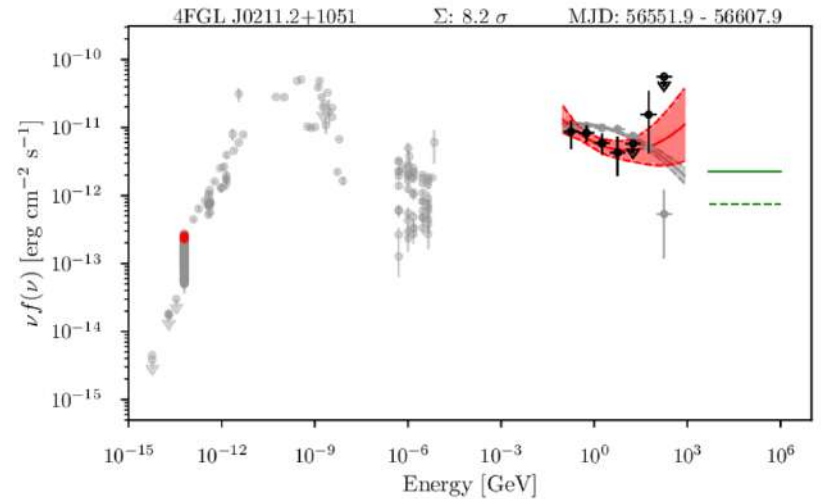
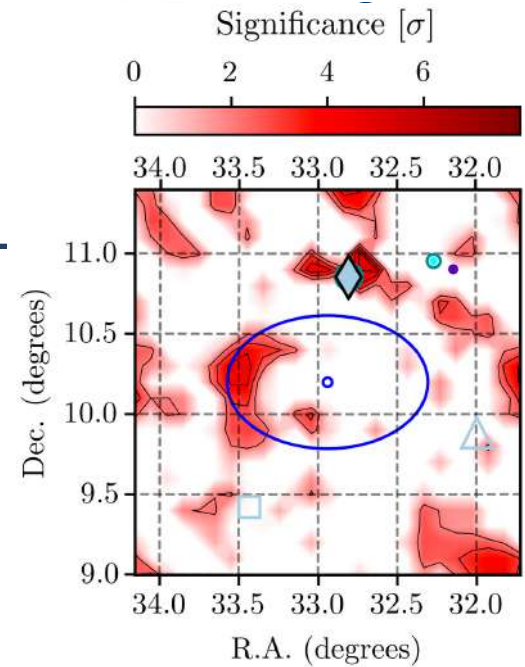
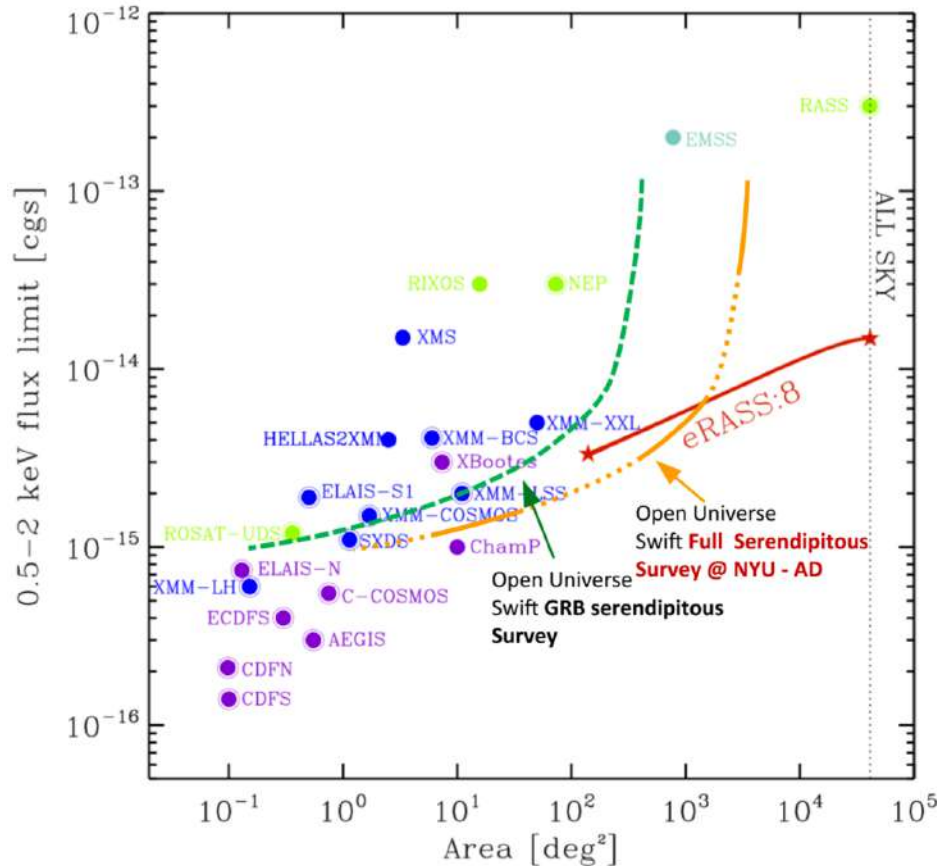
Full-sky survey in X-rays performed at NYU-AD using the data tools developed for Open Universe:

enabling top level research to be carried out by non-experts;

high-level data science training for space sciences.

# CUTTING-EDGE SCIENCE RESULTS

Deepest / broadest-ever survey of the X-ray in the 2-10 keV band from serendipitous GRB pointings.



Real-time identification of X-ray neutrino event counterparts in the sky

# BRICS ASTRONOMY 2019

## BRICS flagship project launched to create a BRICS Optical Telescope Network

The network is to be virtually enabled by data science technology provided by the Open Universe Initiative, where the data would also be available for scientific and capacity building activities.



PROTOTYPE NETWORK TO BE STARTED WITH  
CONTRIBUTIONS FROM THE ISON NETWORK IN RUSSIA  
AND THE PMO TELESCOPE NETWORK FROM CHINA

FOR ASTROPHYSICAL TRANSIENTS, SPACE DEBRIS  
AND SMALL SOLAR SYSTEM BODIES

[LNAPADRAO.LNA.BR/EVENTOS/BRICS-ASTRONOMY-  
WORKING-GROUP-2019](https://lnapadrao.lna.br/eventos/brics-astronomy-working-group-2019)

# ERICs ASTRONOMY 2019

## ERICs ASTRONOMY 2019



Multi-messenger and  
Multi-wavelength Astronomy

Ulisses Barres | World Space Forum 2019 | Wienberg Group (BAWG) and Workshop

RIO  
Brasil  
29 Sep 24





# CONCLUSIONS



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**THE OPEN UNIVERSE INITIATIVE**, ORIGINALLY PROPOSED IN 2016 HAS UNDERGONE A NUMBER OF FORMAL AND DISCUSSION STEPS WITHIN THE UN AND IN THE BROADER ACADEMIC COMMUNITY

**A number of preparatory activities** have been carried out in all fronts of the initiative to demonstrate its potentials and prepare its structure, with generally great success.

**Through its mandate from UNISPACE III** the UN-OOSA is ready to welcome the initiative to its formal start in the coming months.

**Various countries and groups / institutions** have manifested support and are already active in building the initiative, with new collaborations shaping up around Open Universe.

**OPEN UNIVERSE WILL  
LAUNCH SOON!**

# THANK YOU!

MINISTÉRIO DA  
CIÊNCIA, TECNOLOGIA,  
INOVAÇÕES E COMUNICAÇÕES



# Open Universe

Space science data for everyone

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