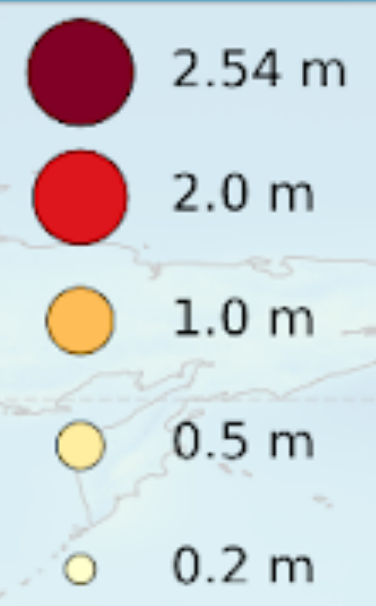


ACME

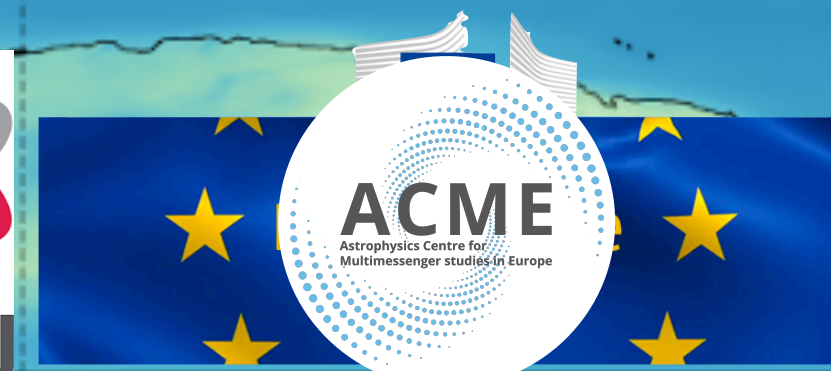
Astrophysics Centre for
Multimessenger studies in Europe

Łukasz Wyrzykowski
(pron. *Woo-cash Vi-zhi-kov-ski*)



Astronomical Observatory,
University of Warsaw, Poland

National Centre for Nuclear
Research, Warsaw, Poland



ACME.IN2P3.FR



LUKASZ.WYRZYKOWSKI@NCBJ.GOV.PL



ACME: ASTROPHYSICS CENTRE FOR MULTI-MESSENGER STUDIES IN EUROPE

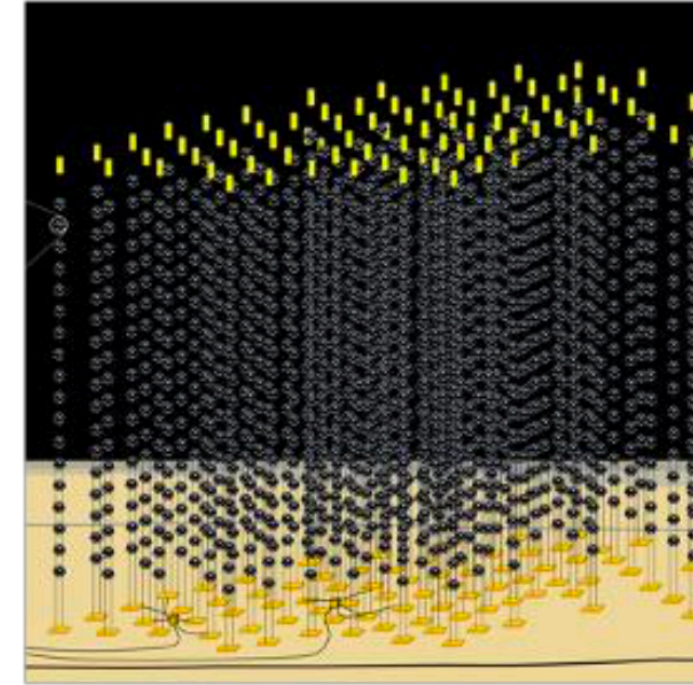
September 2024 - August 2028



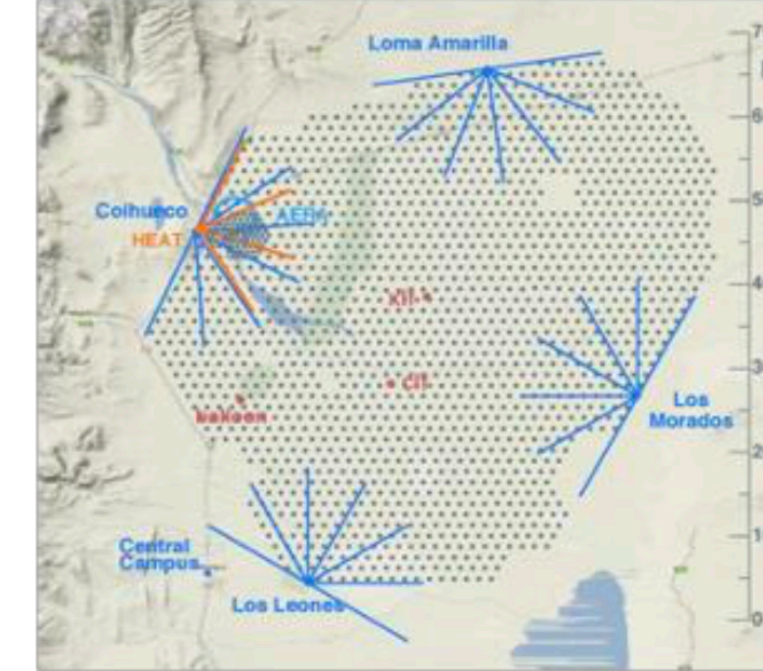
ACME GOALS

- ▶ trans-national and virtual access to world-class Multi Messenger research infrastructures
- ▶ centres of expertise to enable easier access for more researchers
- ▶ improve the usability of MM data archives and science data products
- ▶ improve systems for rapid reaction and studies of astrophysical events
- ▶ optimize MM follow-up observations
- ▶ training for a new and broader generation of scientists and engineers

KM3NeT (neutrino)



Auger Prime (UHECR)



VIRGO (gravitational waves)



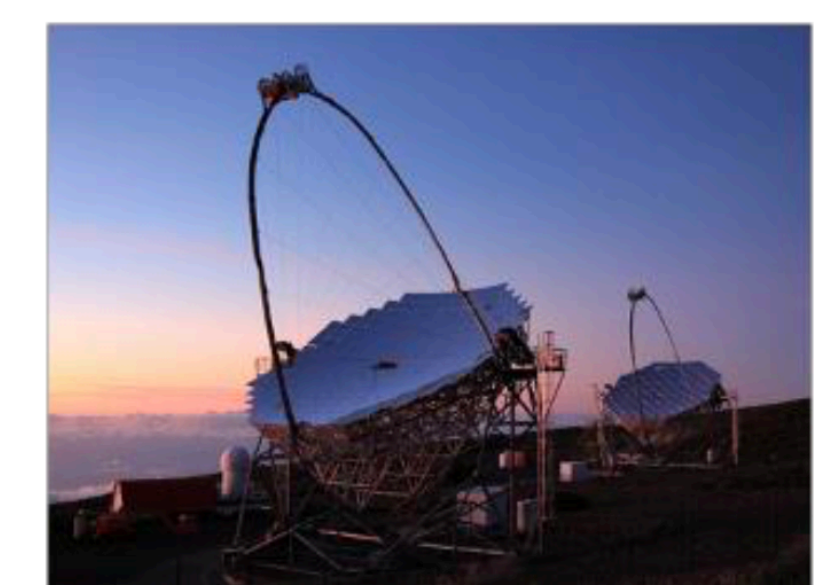
LOFAR (radio band)



INTEGRAL (hard X-ray)



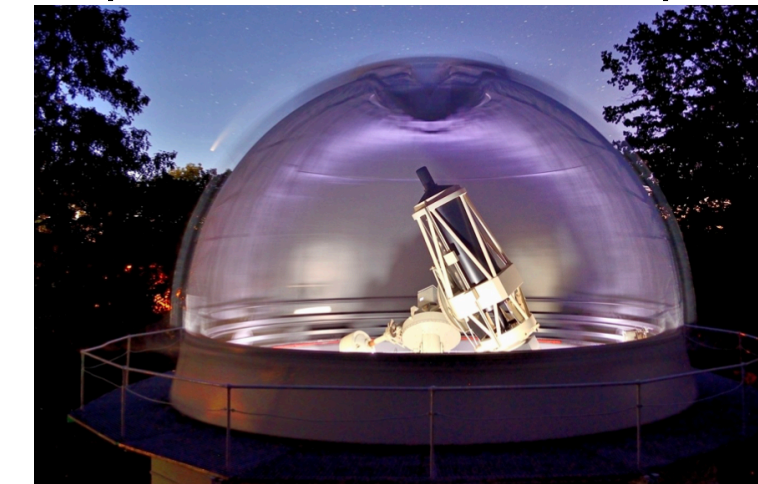
MAGIC (gamma-ray band)



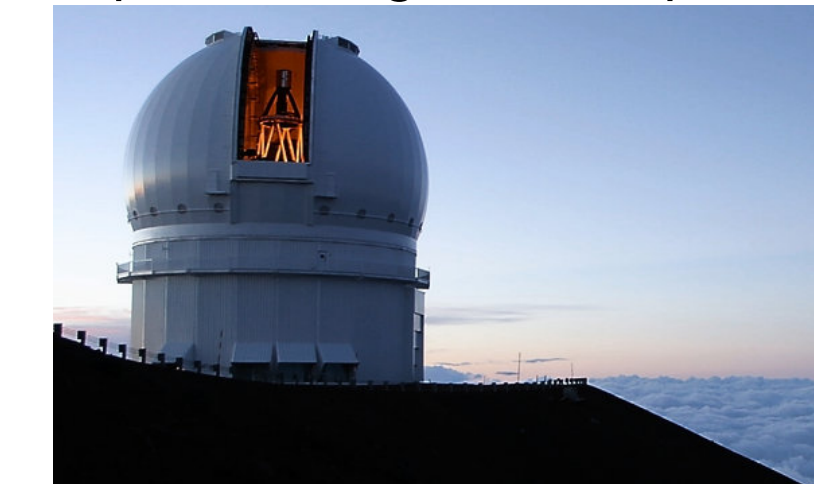
Radio-telescope networks



Optical - small telescopes



Optical - large telescopes





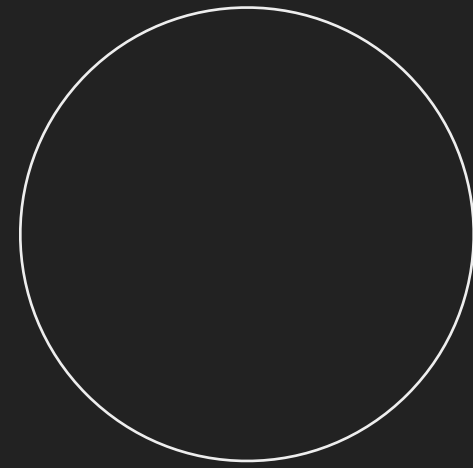
ACME IN NCBJ



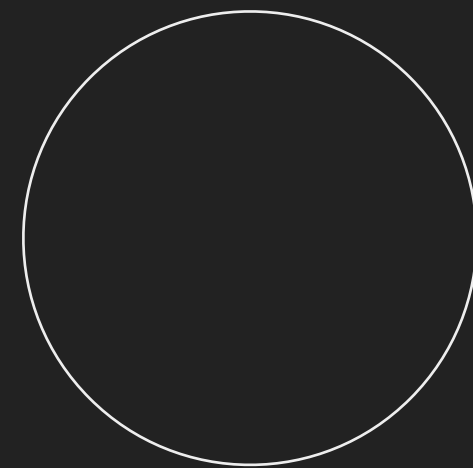
Łukasz Wyrzykowski
(staff)



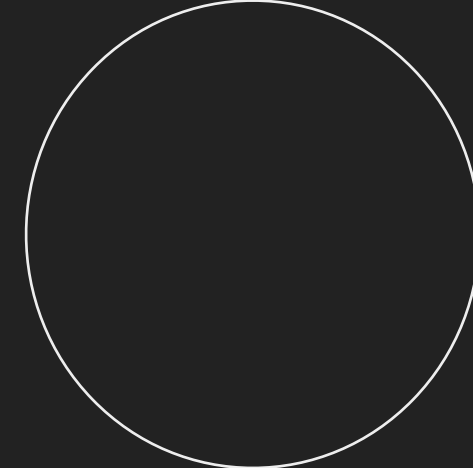
Agnieszka Pollo
(staff)



new hire (2025)
(postdoc)



new hire (2025)
(postdoc)



Part-time
(PhD student)

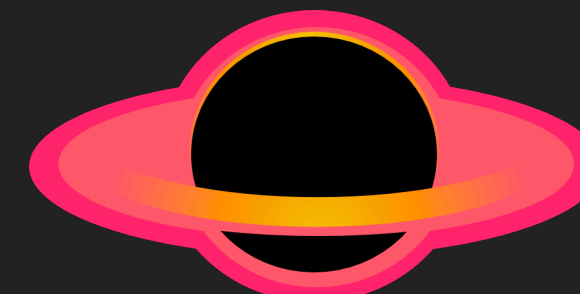


Przemek Mikołajczyk
(Contractor)

ARCHIVES IN ACME:

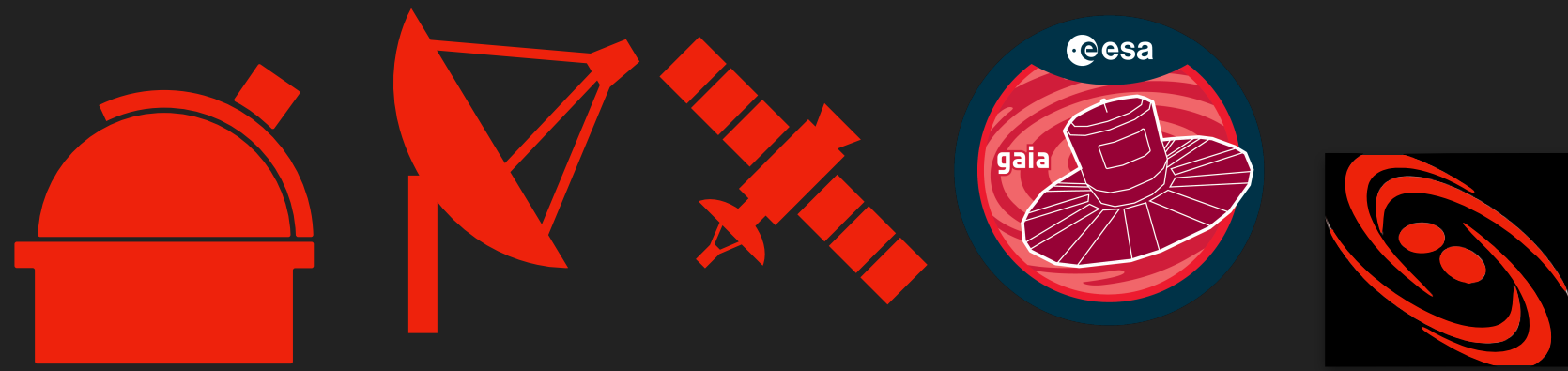
- BHTOM
- ISDC
- UNIGE
- JupyterHub
- KM3NeT
- ANTARES
- CosmoHub
- DLC3-MAGIC
- Auger
- ASTRI-SSDC
- SSDC
- GWOSC+
- Cosmosim
- LOFAR LTA
- MMODA
- UTR-2
- EVN
- PAO
- IRAM
- MAGIC
- MPG (Effelsberg, APEX)
- GammaPy
- EUAD
- SLOW data access
- STATix (ESAC)
- SVOM

- ▶ improve the usability of MM data archives and science data products
-> **WP co-lead: ŁW**
- ▶ improve systems for rapid reaction and studies of astrophysical events
-> **Maintaining optical follow-up platform BHTOM.space**



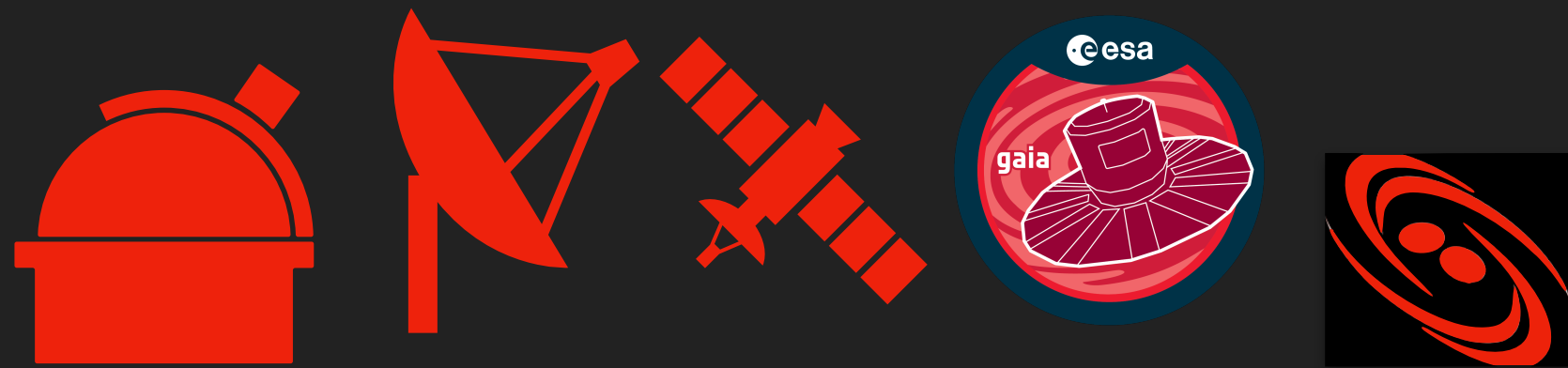
Surveys

- Gaia
- ZTF
- LSST
- IceCube
- GW

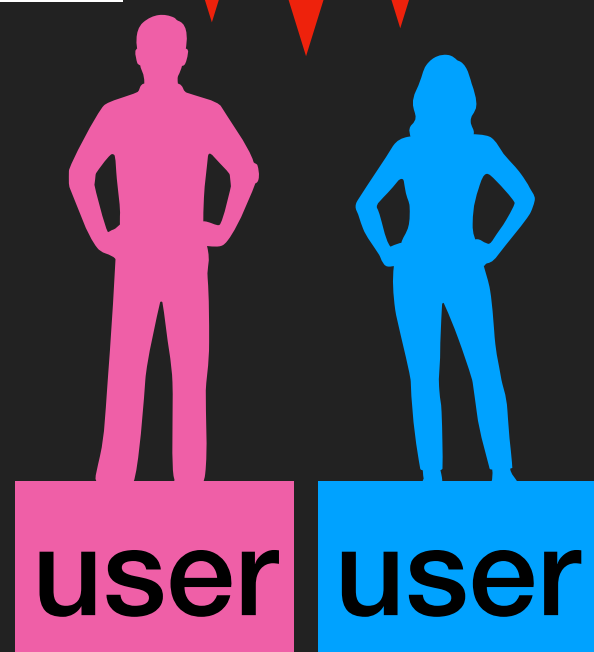
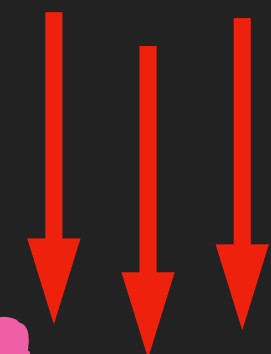


Surveys

- Gaia
- ZTF
- LSST
- IceCube
- GW



Brokers

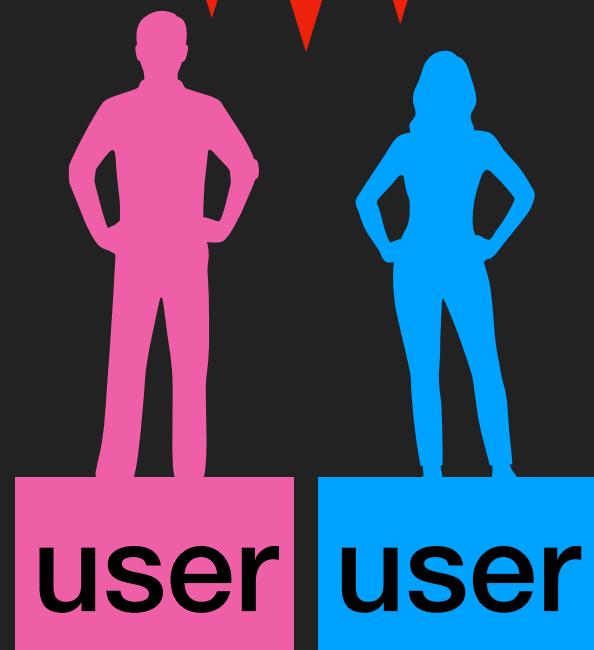
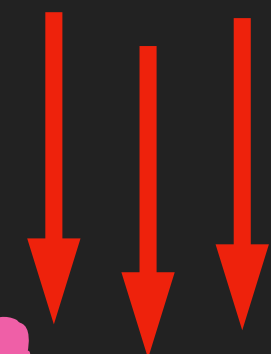


Surveys

- Gaia
- ZTF
- LSST
- IceCube
- GW

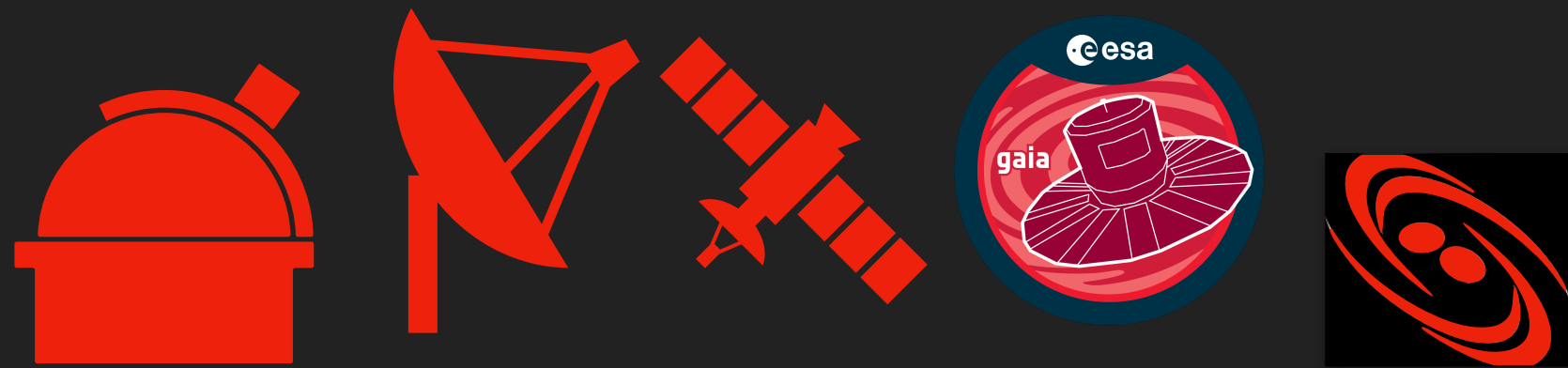


Brokers

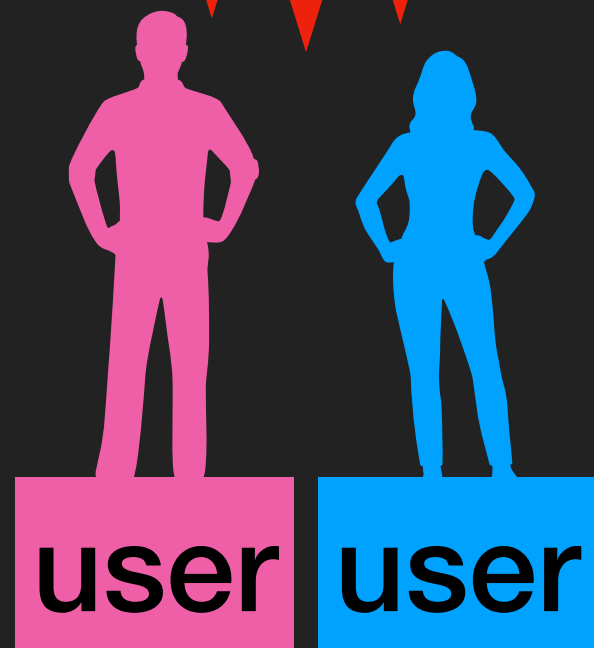
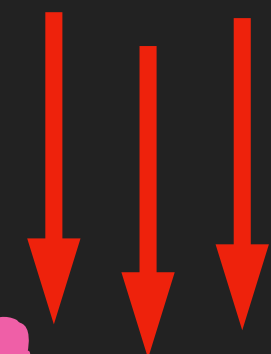


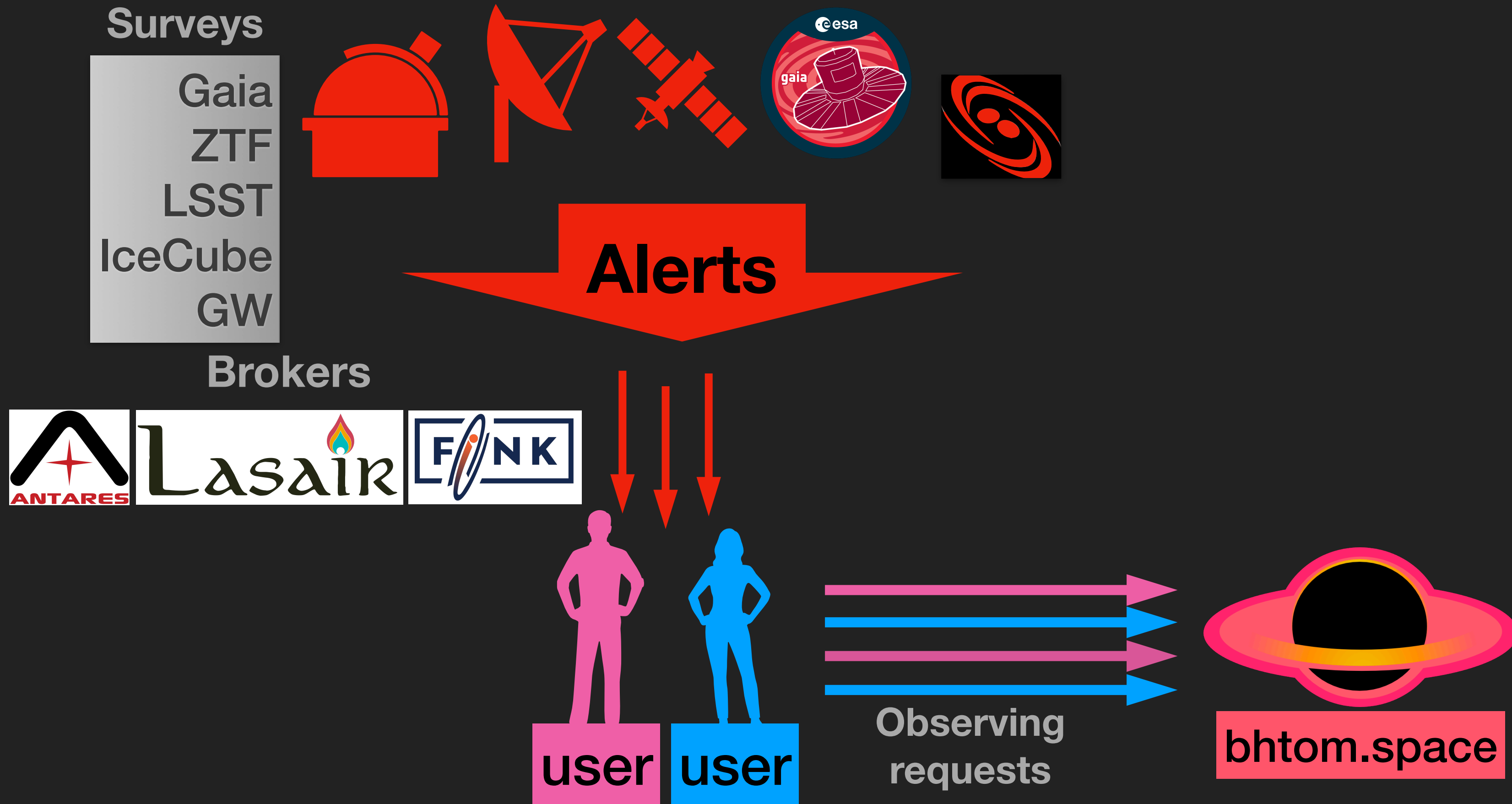
Surveys

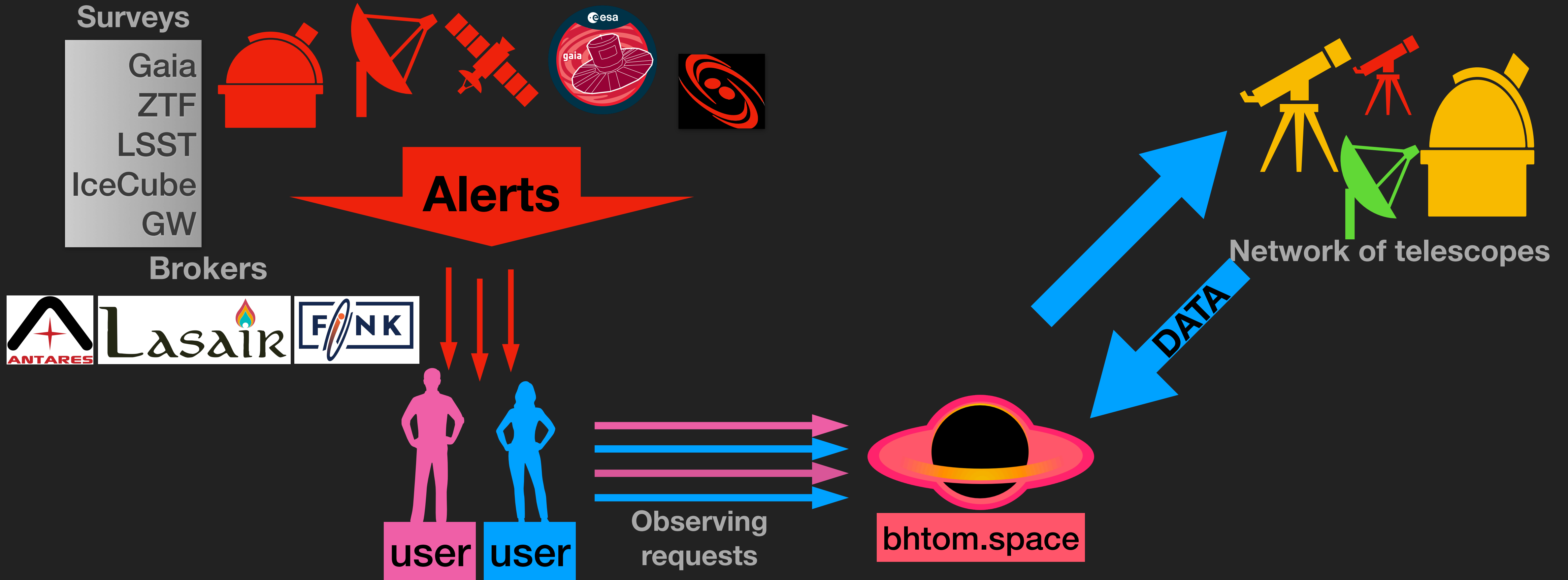
- Gaia
- ZTF
- LSST
- IceCube
- GW

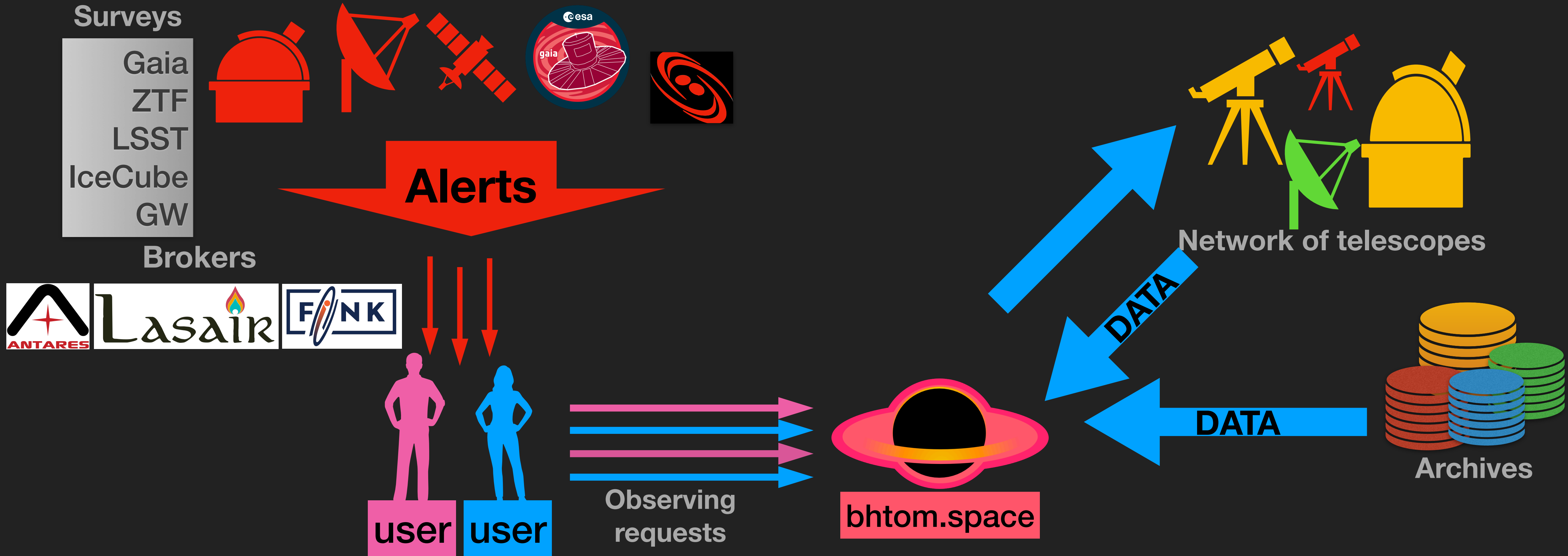


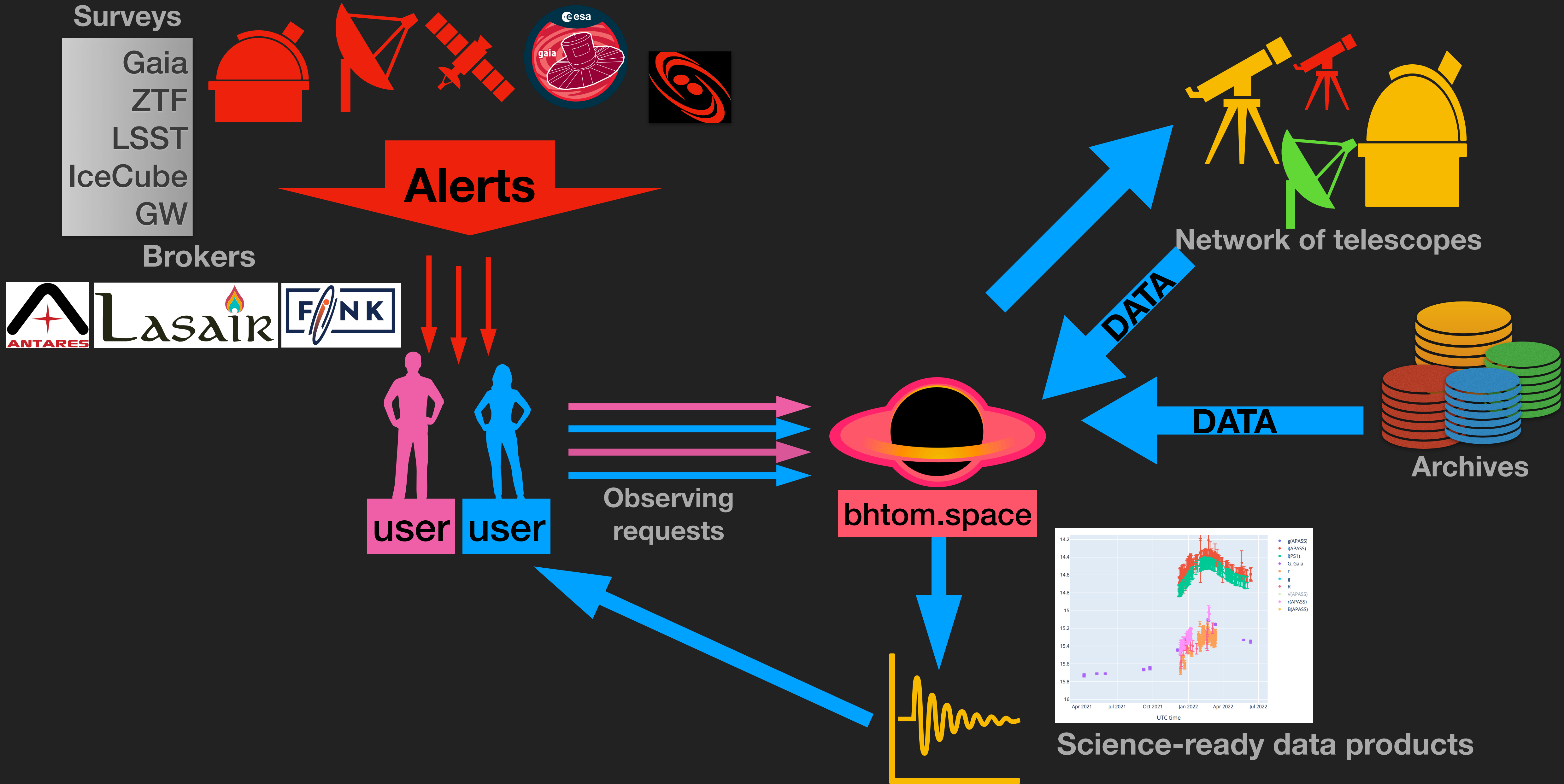
Brokers

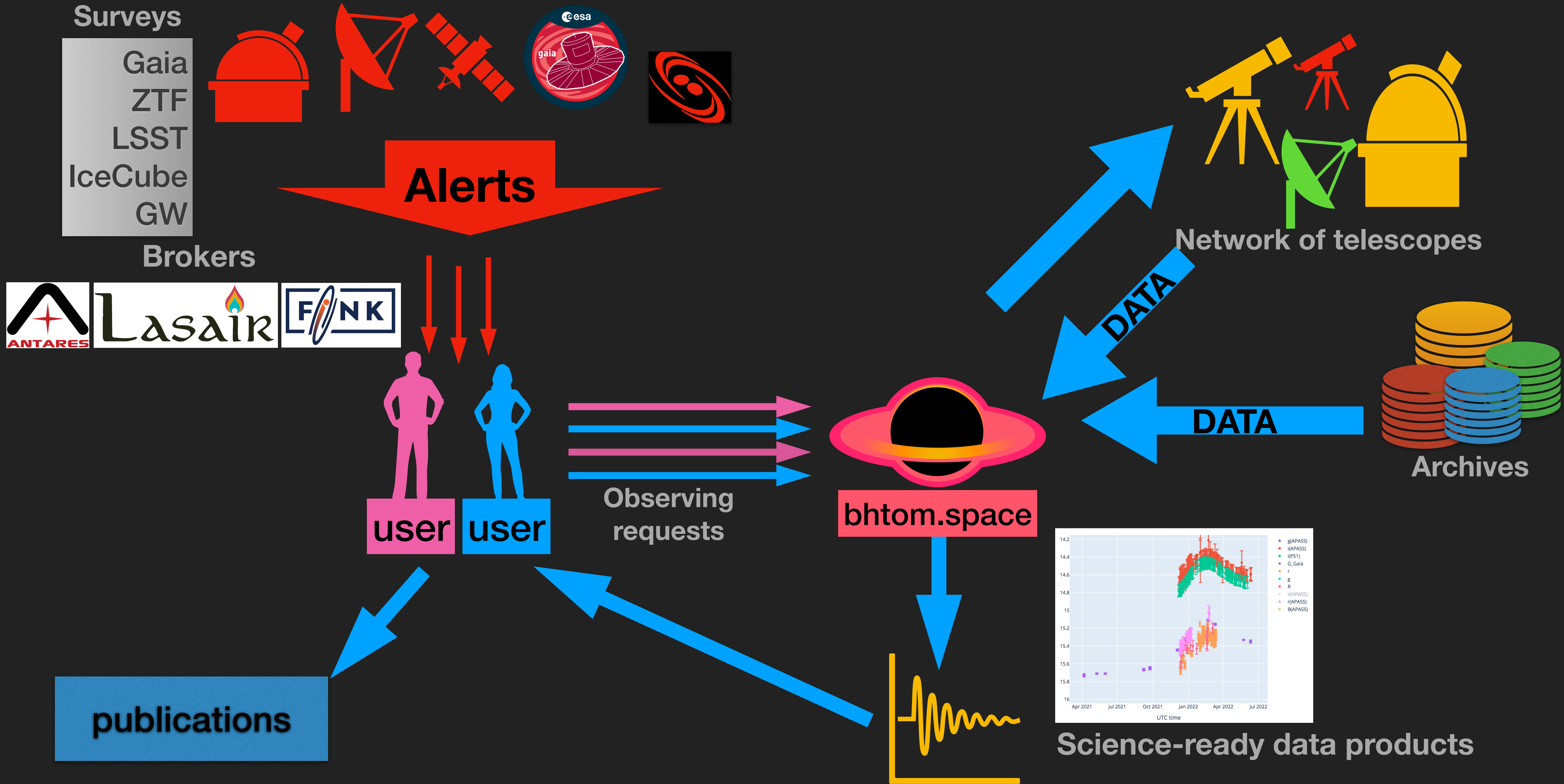


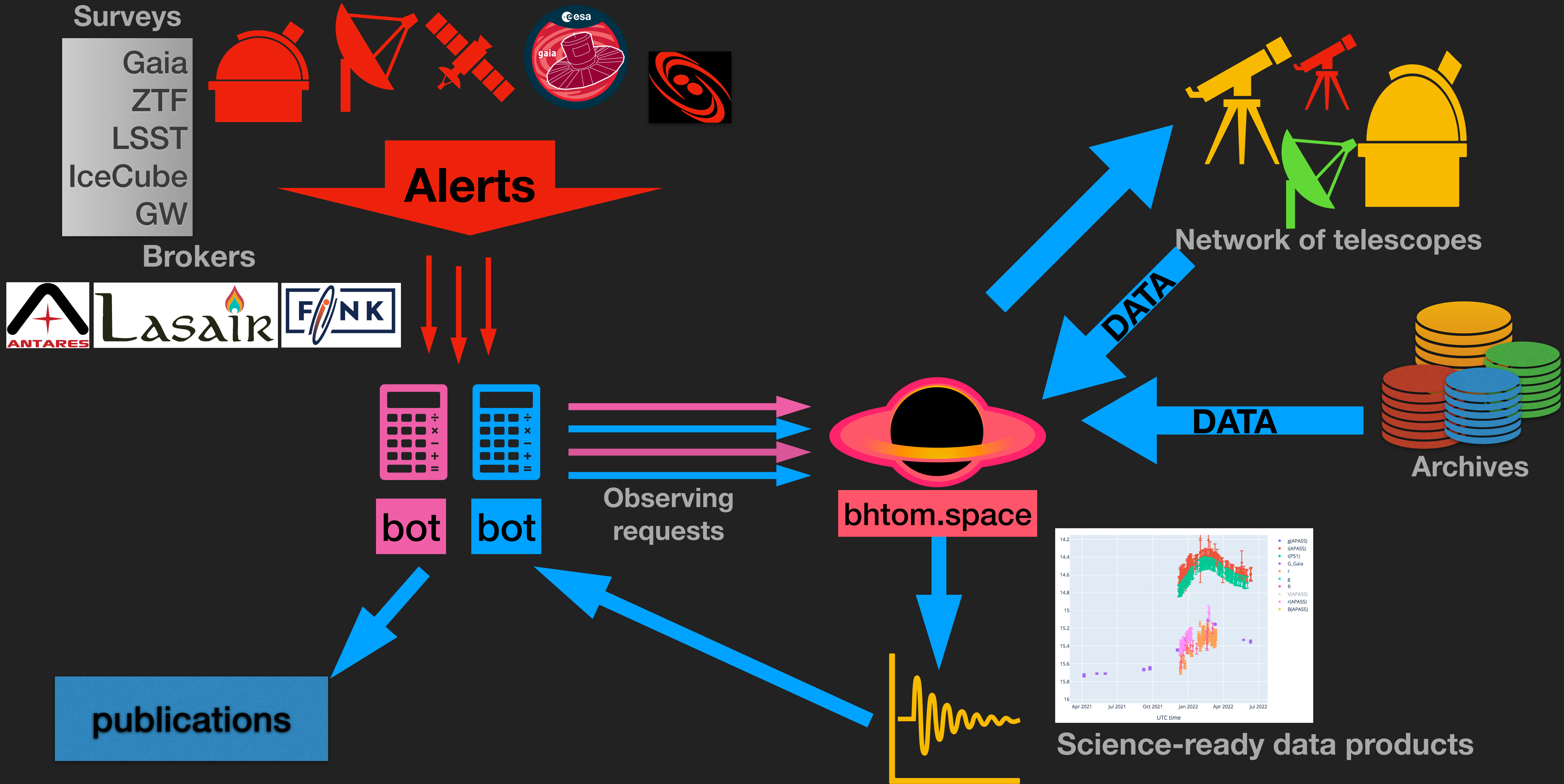


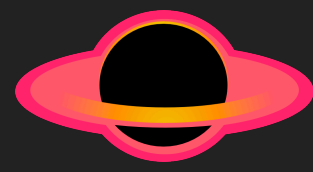






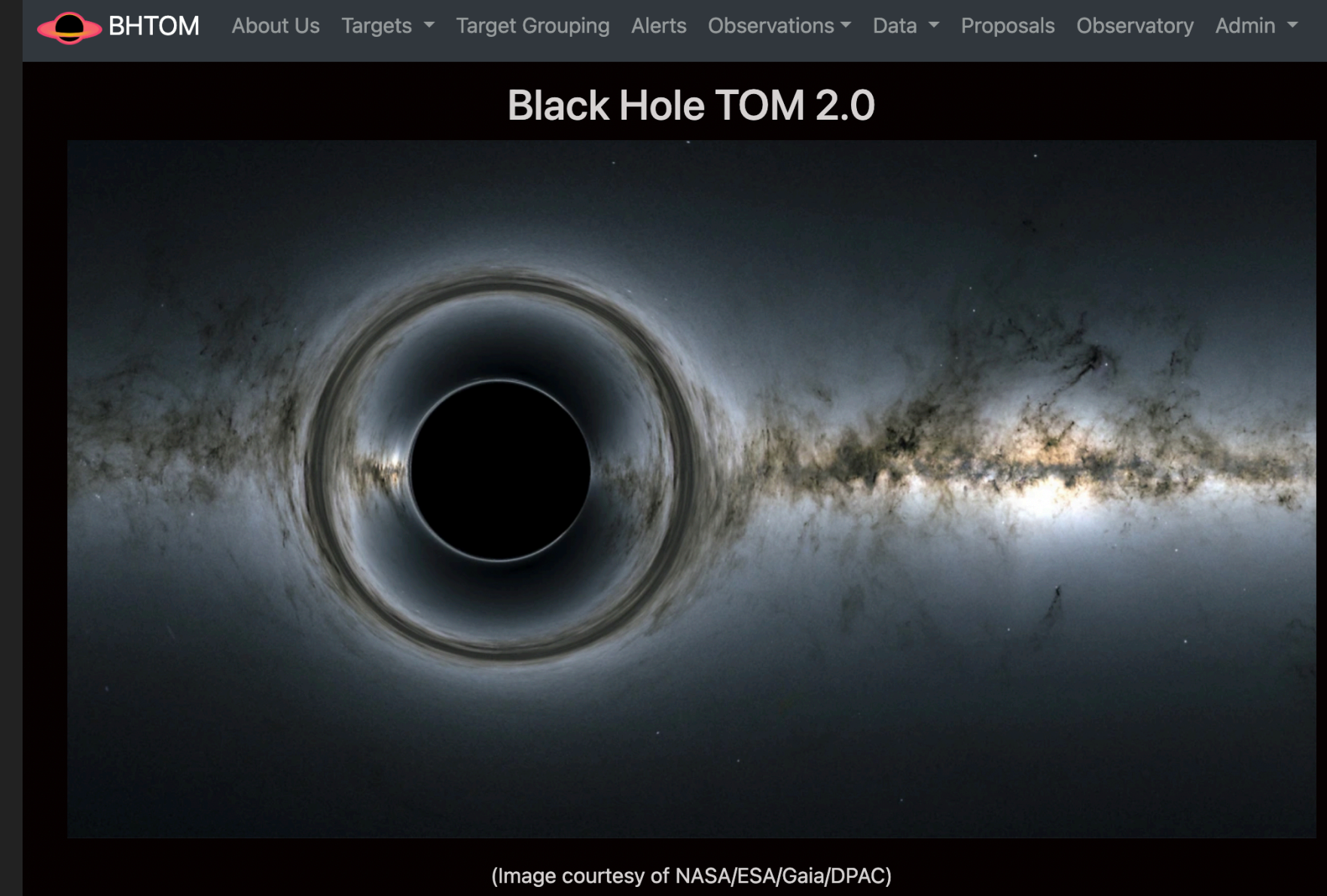






BLACK HOLE TARGET AND OBSERVATION MANAGER (BHTOM)

- ▶ web tool for coordination for time-domain observations
- ▶ automated observation requests
- ▶ processing of raw images from heterogenous units
- ▶ automated standardisation
- ▶ archival multi-wavelength time-domain photometry
- ▶ open for new users, new telescopes, new targets!



Names	RA	Dec	Nobs	Last Gmag	Last Filter	Importance	Created	Priority	Sun	Class
Gaia18acq	22:05:42.324	+03:39:17.064	982	20.2	Gaia/r	9.99	2023-09-18 10:09:17	799.0	155	long_period_variable
Gaia22bpl	10:38:42.425	-61:15:49.680	903	12.7	Gaia/r	9.99	2023-09-18 10:09:48	208.6	64	microlensing_event
Gaia22awa	19:04:51.962	-08:34:00.660	1602	15.0	Gaia/r	9.99	2023-09-17 21:09:11	770.1	111	microlensing_event
ZTF19abflrit	18:24:23.314	-24:36:42.053	842	15.2	Gaia/r	0.0	2023-09-19 11:09:02	0.0	100	long_period_variable

BHTOM About Us Targets Target Grouping Alerts Observations Data Proposals Observatory Admin

Gaia22dkv

Name: Gaia22dkv

Ra,Dec: 151.76898 -66.18089
10:07:04.555 -66:10:51.204

Galactic (l,b): 287.36783 -8.410186

Constellation: Carina

Discovered: 2022-08-16 22:08:56

Class: Microlensing Event

Description: very bright gal.plane microlensing event with a planet

Phot.Class: Red Giant 89.0%

Last MJD: 60184.81287

Last G Mag: 13.2

Cadence requested (d): 100.0

Sun Separation (deg): 66.0

Other names:

GAIA_ALERTS: Gaia22dkv

GAIA_DR3: 5246137870147780736

NEOWISE: NEOWISE: 151.76898 -66.18089

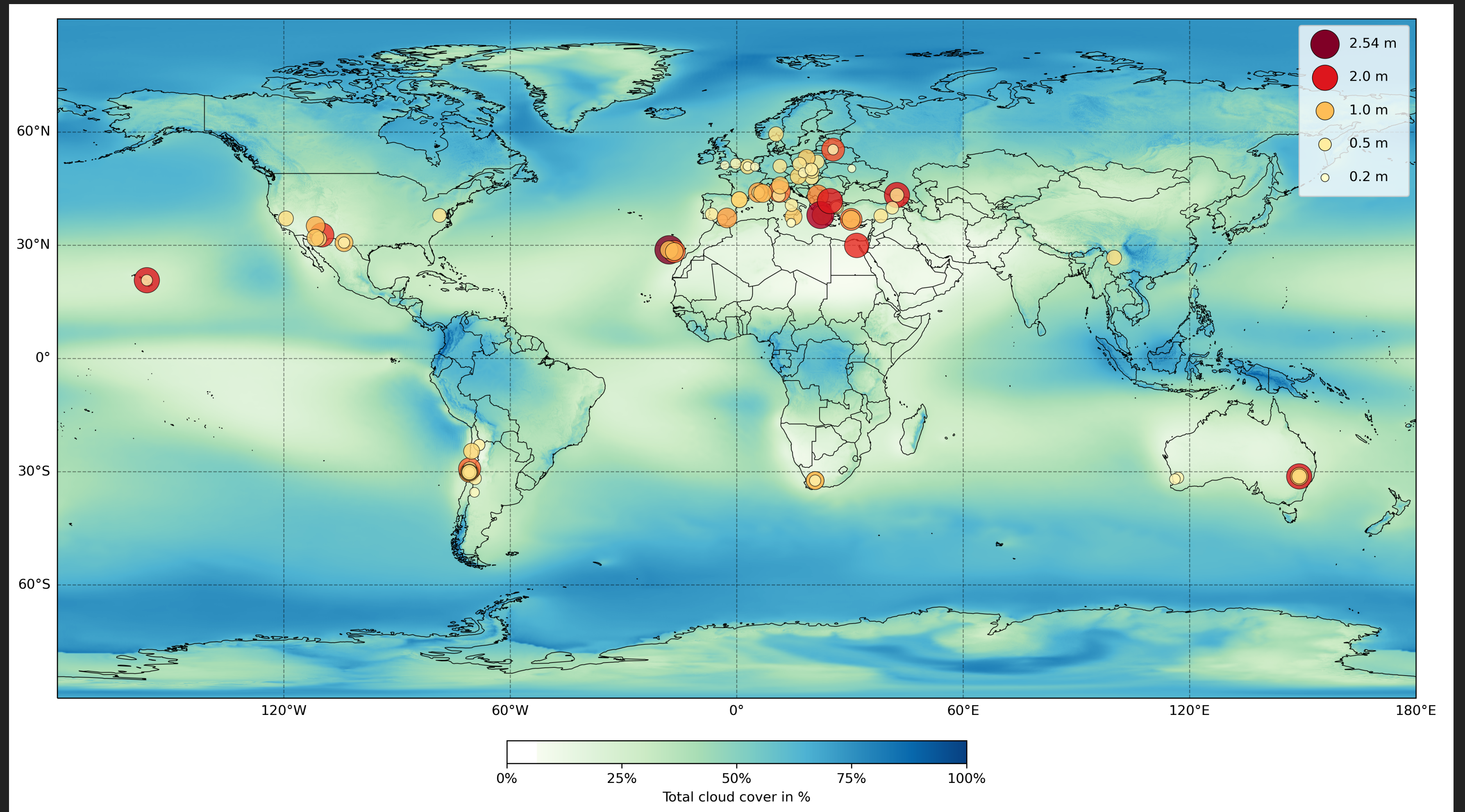
Photometry Models Spectroscopy Observe Observations Publication Manage Data Manage Groups

Photometry

Download photometry data Download radio data

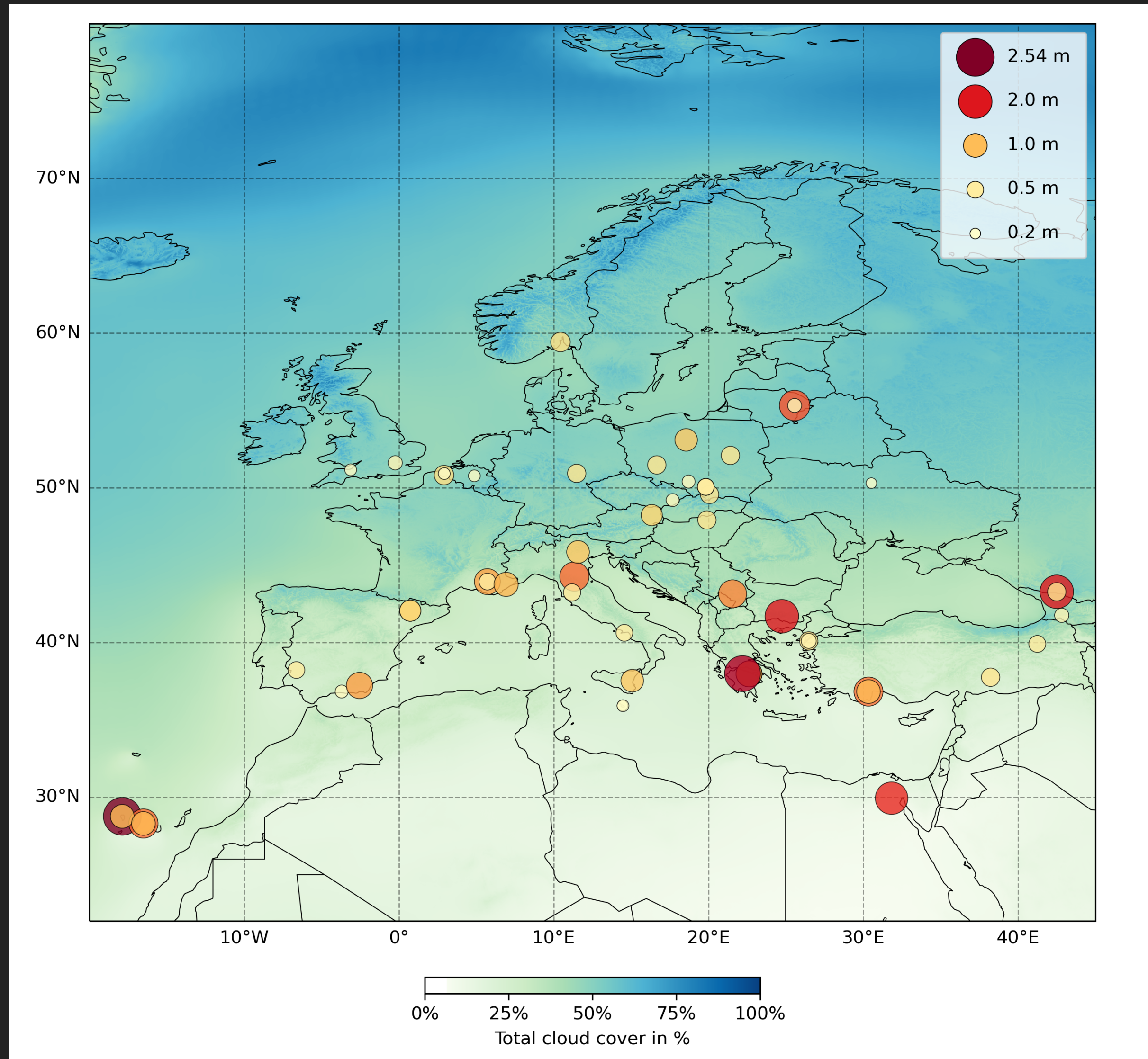
BHTOM OPTICAL TELESCOPE NETWORK

- ~130 telescopes
- sizes 0.25 - 2.5 m
- professional
- amateur
- schools
- outreach facilities
- manual
- robotic
- with good weather
- with poor weather
- volunteering
- via proposals

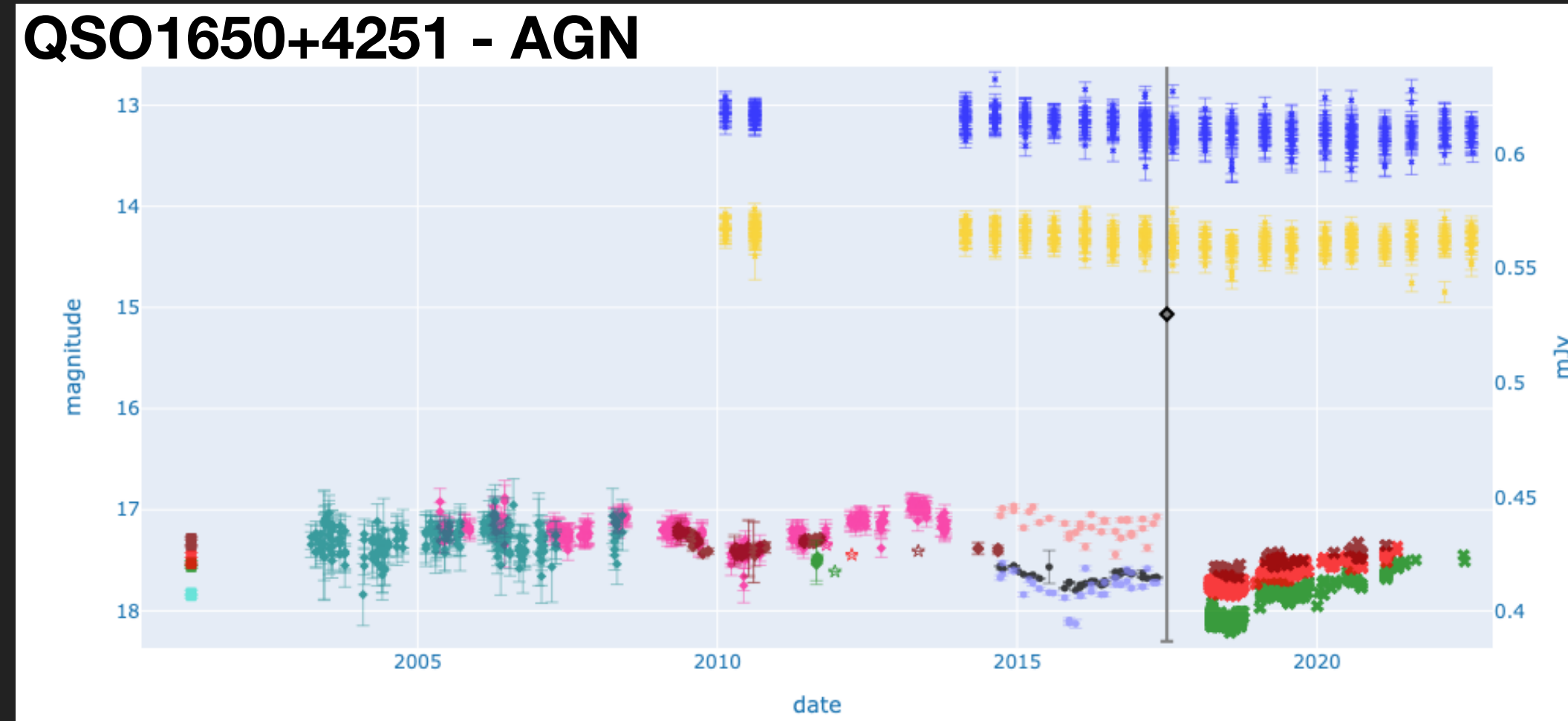


BHTOM OPTICAL TELESCOPE NETWORK

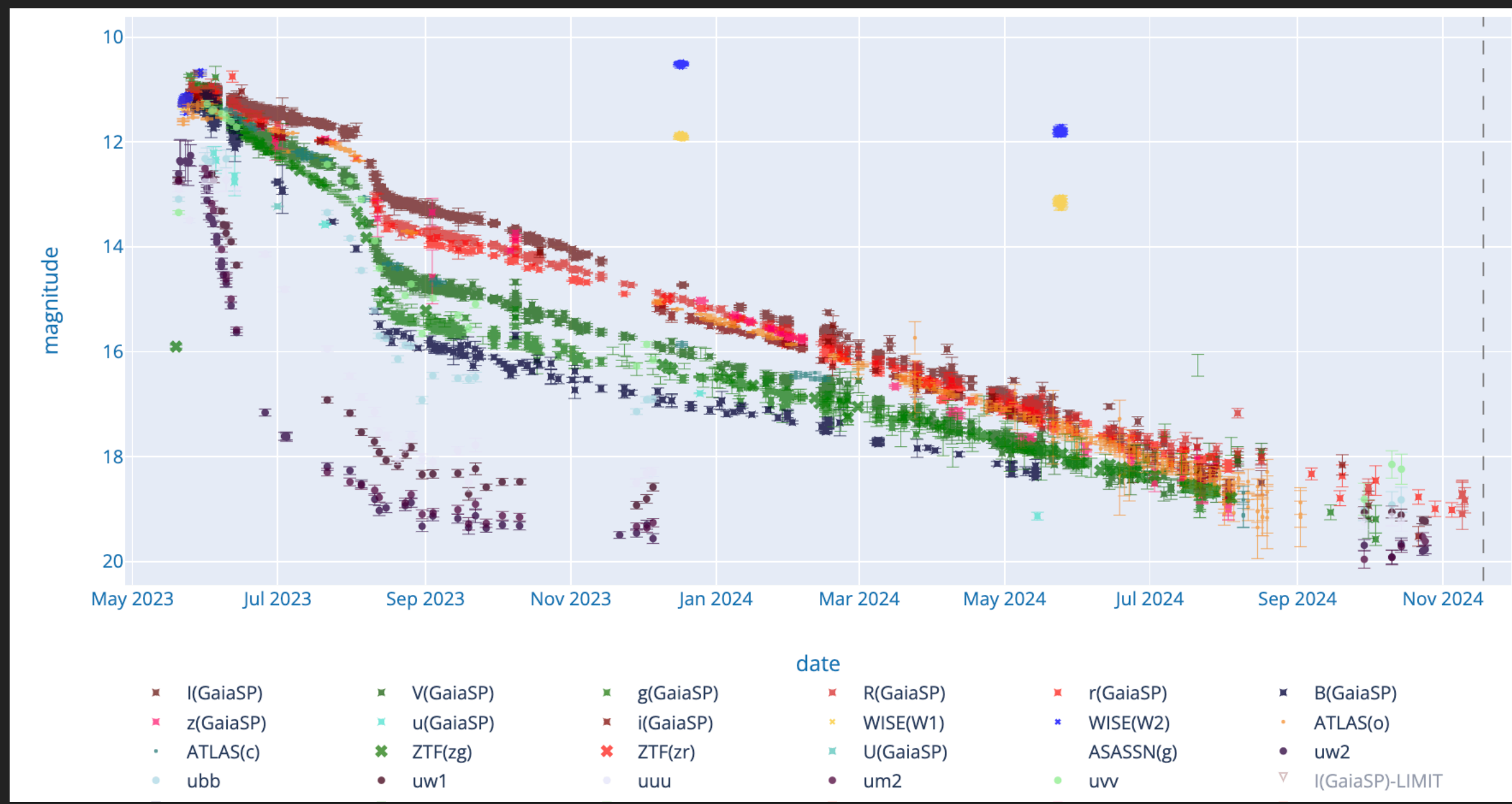
- ~130 telescopes
- sizes 0.25 - 2.5 m
- professional
- amateur
- schools
- outreach facilities
- manual
- robotic
- with good weather
- with poor weather
- volunteering
- via proposals



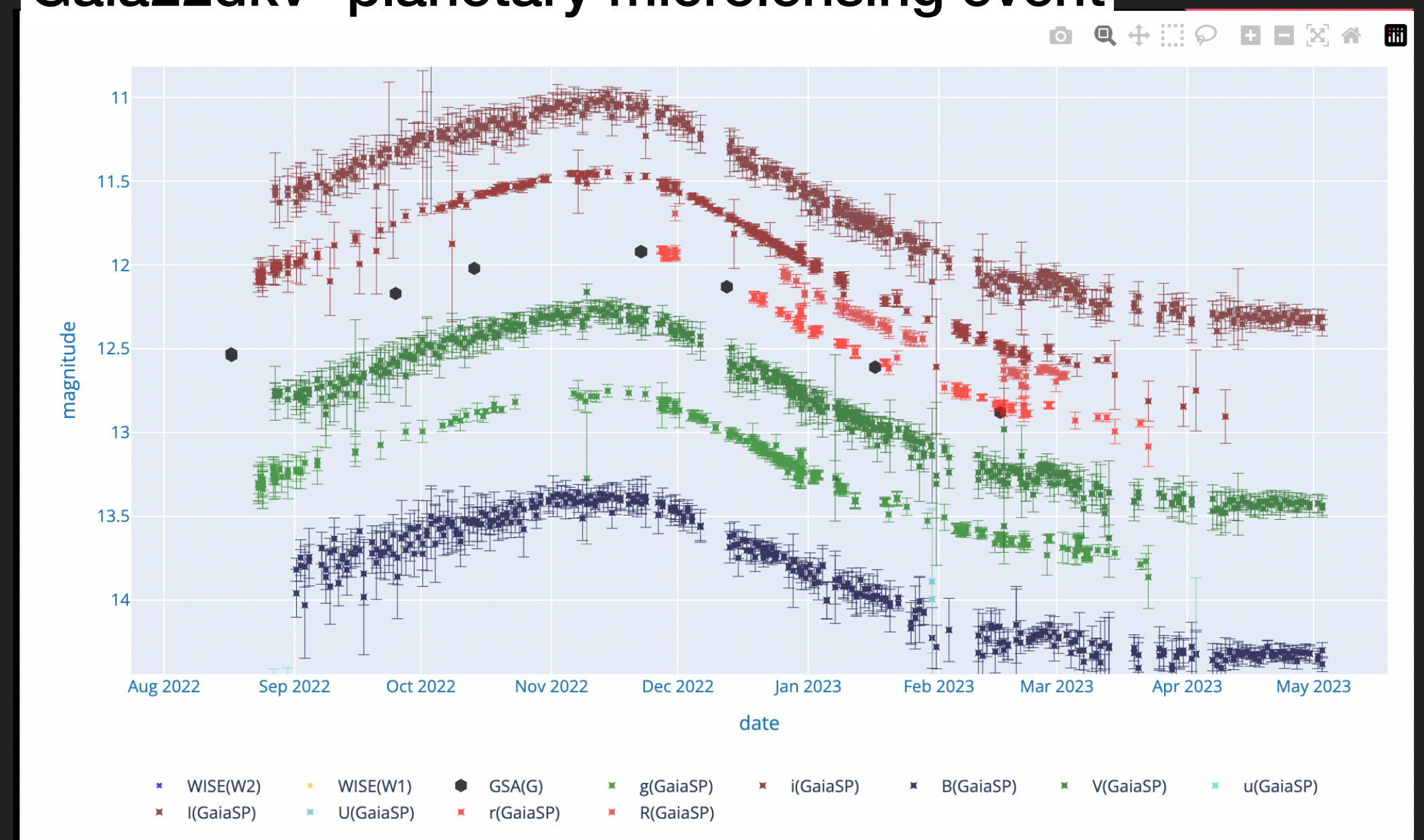
BHTOM - EXAMPLES



SN2023ixf - from X, UV to IR

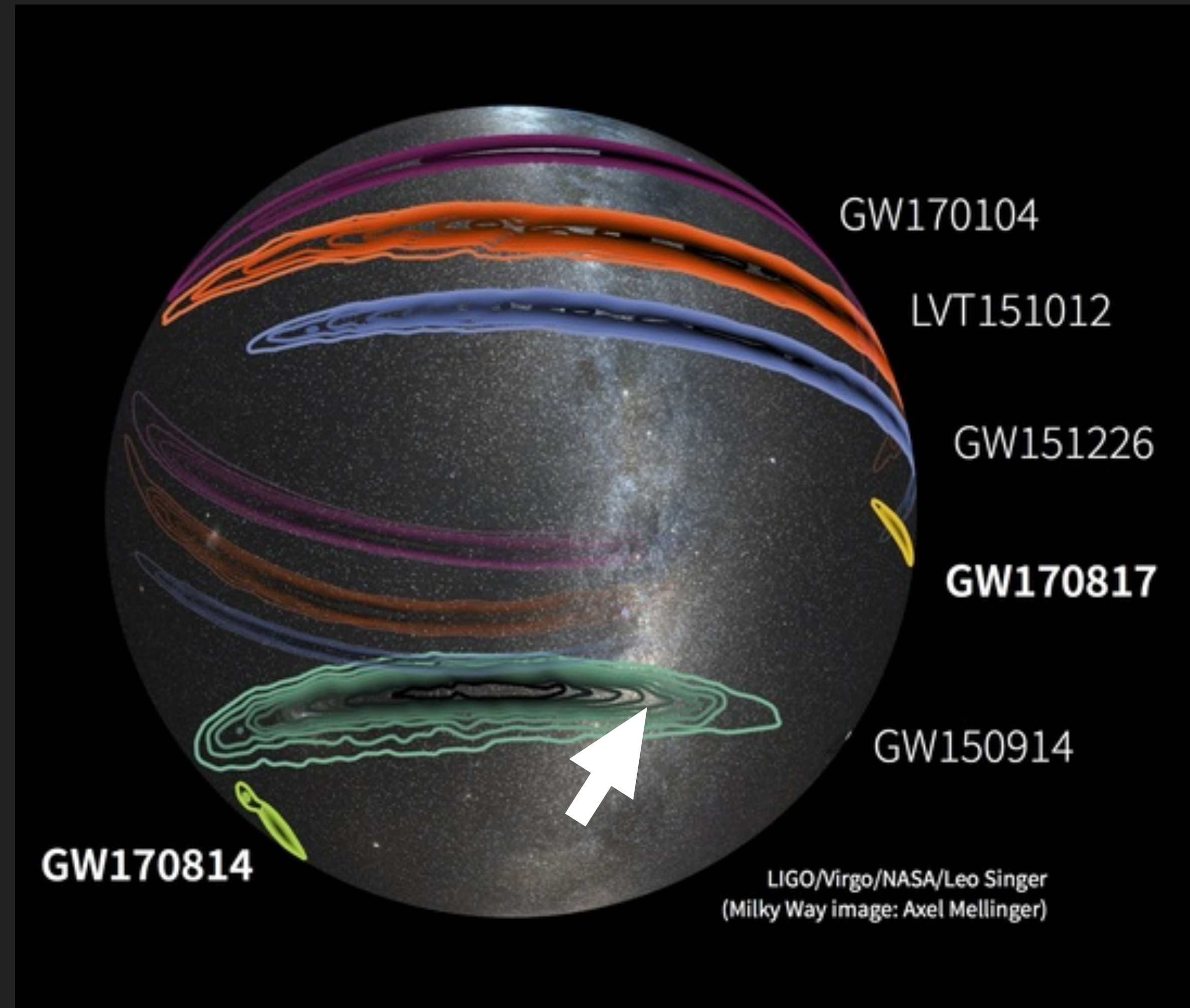


Gaia22dkv - planetary microlensing event

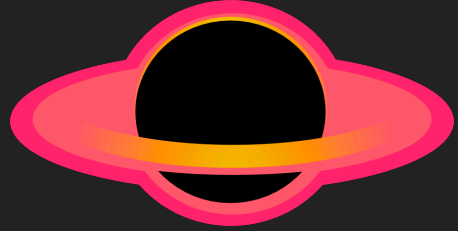


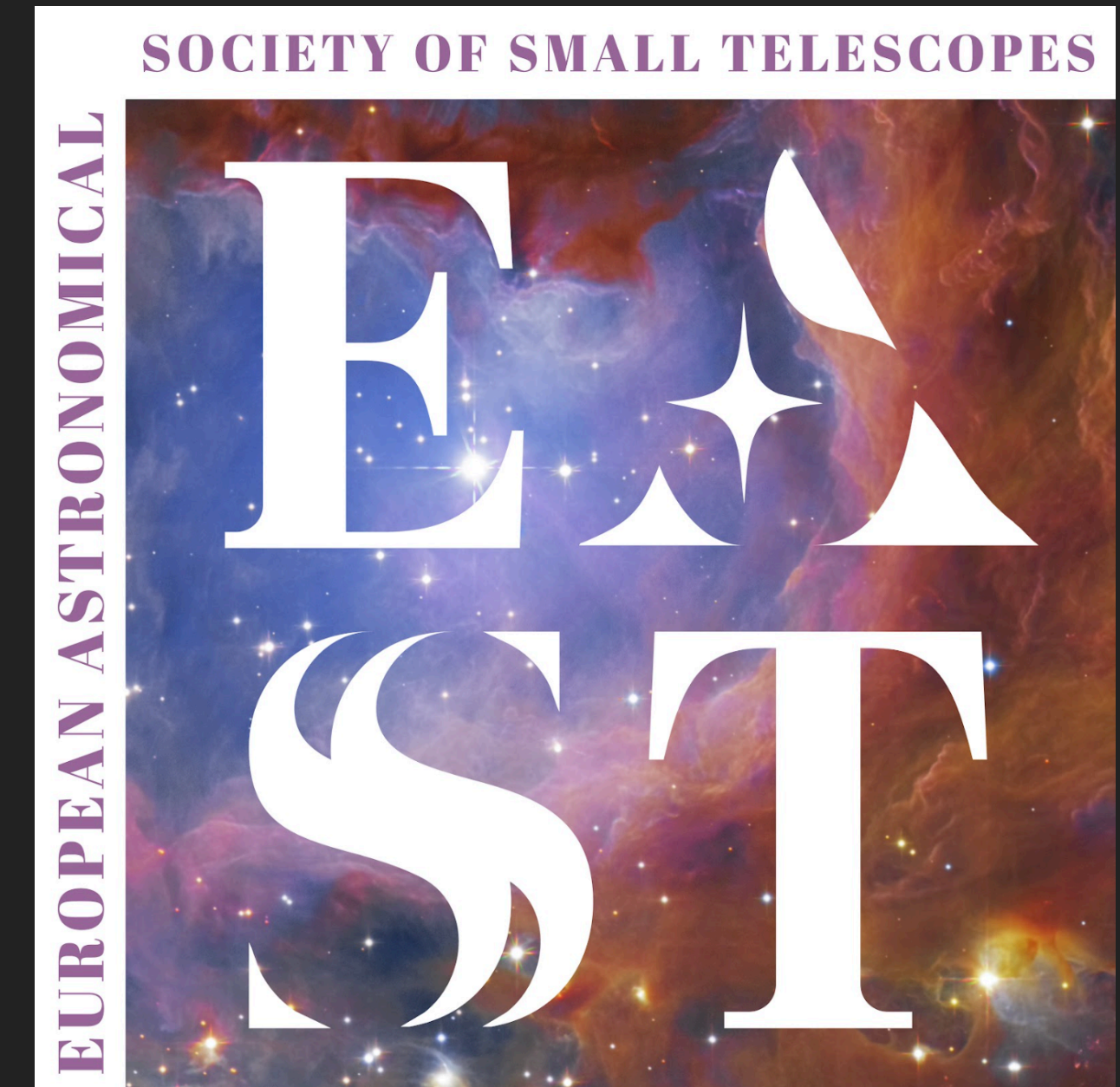
BHTOM FOR GW

- ▶ **Distributed telescope network**
 - can respond to multiple candidates for GW counterparts on both hemispheres
- ▶ **Archives**
 - can rule out a candidates just based on the historic time-domain data
- ▶ **Automated data processing**
 - automated confirmation or rejection of candidates
- ▶ **Galactic Plane** → we are not afraid!



EUROPEAN ASTRONOMICAL SOCIETY OF SMALL TELESCOPES (EASST)

- ▶ Advancing Citizen Science with the use of small telescopes (with BHTOM as the core tool) 
- ▶ Outreach Activities, local and global
- ▶ Connecting Astronomers, professionals and amateur
- ▶ Expanding the Telescope Network for Science
- ▶ Build international partnerships in astronomy
- ▶ Enhancing Telescope Technology
- ▶ Protecting Dark Skies



Funded on Valentines Day 2025

WHERE THE SKY BEGINS



GAIA SCIENCE ALERTS WORKSHOP
 Wednesday 29 June - Friday 1 July 2011, at the
 Institute of Astronomy, University of Cambridge
DETAILS AND REGISTRATION
<http://www.astron.cam.ac.uk/iaa/wiki/gsaaw2011>

GAIA SCIENCE ALERTS WORKSHOP
 Wednesday 29 June - Friday 1 July 2011, at the
 Institute of Astronomy, University of Cambridge
 Important dates: Registration closes - 30 April 2010, Invitations allocated - 10 May 2010



Gaia Science Alerts Verification and Follow-up Workshop
 Wednesday 29 June - Friday 1 July 2011, at the
 Institute of Astronomy, University of Cambridge
DETAILS AND REGISTRATION
<http://www.astron.cam.ac.uk/iaa/wiki/gsaaw2011>

For more information e-mail: gsaaw2011@cam.ac.uk
 © 2011 Institute of Astronomy, Madingley Road, Cambridge CB3 0HA, Telephone +44 (0)1223 337348



GAIA SCIENCE ALERTS WORKSHOP
 BOLOGNA 6-7 SEPTEMBER 2012
 Scientific Organising Committee: Lukasz Wyrzykowski, Gery Gilmore, Massimo Tassini, Gery Gilmore
 Organising Committee: Lukasz Wyrzykowski, Gery Gilmore, Massimo Tassini, Gery Gilmore
 Registration deadline 15 August Contact: gsaaw2012@cam.ac.uk

Further details at: <http://www.astron.cam.ac.uk/iaa/wiki/gsaaw2012>



Gaia Science Alerts



FIFTH GAIA SCIENCE ALERTS WORKSHOP
 UNIVERSITY OF WARSAW 9-12 SEPTEMBER 2014
 DETAILS AND REGISTRATION: <http://www.astron.cam.ac.uk/iaa/wiki/gsaaw2014>

Status of Gaia
 First Alerts and preliminary results from the Verification Phase (Gaia alerts follow-up campaigns) Science with Gaia transients: Supernovae, Microlensing, Novae, TDEs, CVs, YSOs (Current/planned multi-wavelength transient surveys and synergies)

Workshop Organising Committee:
 Lukasz Wyrzykowski
 Simon Hodgkin
 Gery Gilmore
 Nicholas Walton
 Szymon Kozłowski
 Heather Campbell
 Morgan Fraser
 Nadejda Blagoderina



Gaia Science Alerts Workshop 2015
 Liverpool John Moores University (UK)
 10-13 November 2015

- Follow-up observations
- Automated classification
- Gaia Alerts Publisher
- Science cases
- Robotic telescopes
- Outreach
- Transient surveys
- Hands-on sessions

Details: www.ast.cam.ac.uk/iaa/wiki/gsaaw2015
 Contact: gaiaalertsworkshop2015@gmail.com



7th Gaia Science Alerts Workshop
 7-9 December 2016 * SRON Utrecht NL

SRON
 Netherlands Institute for Space Research



8th OPTICON Gaia Science Alerts Workshop
 6-8 December 2017
 Warsaw, Poland
 Details and registration: <https://tinyurl.com/gaiaaworkshop>

Workshop Organising Committee:
 Lukasz Wyrzykowski
 Simon Hodgkin
 Krzysztof Rybicki
 Katarzyna Kruszyńska



The 9th OPTICON GAIA SCIENCE ALERTS WORKSHOP
 8 - 10 OCTOBER 2018
 Vipava, Slovenia

Workshop Organizing Committee:
 Lukasz Wyrzykowski
 Andreja Gomboc
 Simon Hodgkin
 Kasia Kruszyńska
 Nada Ihanec
 Tanja Petrushevska
 Kalja Bricegan
 Aurora Clerici

Overview of the Gaia mission
 Overview of the Gaia Science Alerts
 Gaia Alerts highlights
 Gaia Alerts and DR2
 Machine-learning classification of transients
 New photometric calibration server
 Organizing the follow-up

DETAILS AND REGISTRATION
<https://tinyurl.com/gaiaalerts2018>



10th OPTICON Gaia Science Alerts Workshop
 Astronomical Observatory, University of Catania, Sicily, 18-20 December 2019

update on the Gaia mission
 update on the improvements in the Gaia Alerts
 Gaia Alerts highlights and results
 synergies with radio, X-ray and high energy
 new members of the telescope network
 new photometric calibration server
 organization of the follow-up
 future plans

Workshop Organizing Committee:
 Lukasz Wyrzykowski (Warsaw)
 Giuseppe Lato (INAF)
 Simon Hodgkin (Cambridge)
 Kasia Kruszyńska (Warsaw)
 Nada Ihanec (Warsaw)
 Flavia Calderone (INAF-OACT)
 Giancarlo Bellasari (INAF-OACT)

More information and registration
<https://tinyurl.com/gsaaw10>



11th OPTICON Gaia Science Alerts Workshop
 from the comfort of our homes
 18-22 January 2021

update on Gaia mission
 Gaia Alerts highlights and results
 future of alerts and extension of Gaia
 improvements in Gaia Alerts
 new photometric calibration server
 synergies with radio, X-ray and high energy observations
 new members of the telescope network
 organization of the follow-up

Organizing Committee:
 Lukasz Wyrzykowski
 Simon Hodgkin
 Rob Beswick
 Marius Maskoliunas
 Kasia Kruszyńska
 Nada Ihanec
 Gerry Gilmore

DETAILS AND REGISTRATION:
<https://tinyurl.com/gsaaw2020>



12th GAIA SCIENCE ALERTS WORKSHOP
 2021 NOV 8-12

FIRST ORP-TIME DOMAIN MEETING

UPDATES ON THE GAIA MISSION
 GAIA ALERTS UPDATES AND HIGHLIGHTS
 NEW PHOTOMETRIC CALIBRATION SERVER
 NEW MEMBERS OF THE TELESCOPE NETWORK
 SYNERGIES WITH RADIO WITHIN OPTICON-RADIOMET PILOT GRANT

LOCATION
 Institute of Astrophysics-FORTH at the island of Crete, Greece and online
<https://tinyurl.com/12GSAW2021>

REGISTER ONLINE
<https://tinyurl.com/12GSAW2021>



13th ORP and Gaia Science Alerts Workshop
 4 - 7 October 2022
 Pula, Sardinia

Workshop Organizing Committee:
 Lukasz Wyrzykowski (Warsaw)
 Milena Ratajczak (Warsaw)
 Simon Hodgkin (Cambridge)
 Charles Gilman (Cambridge)
 Paolo Sartori (Cambridge)
 Rob Beswick (Manchester)
 Gery Gilmore (Cambridge)
 Kasia Kruszyńska (Warsaw)
 Maria Madsen (Vienna)

<https://bit.ly/gaiaalerts2022>



14th Gaia Science Alerts and ORP Time-Domain Workshop
 Valletta, Malta
 2-5 October 2023
<https://bit.ly/gaiaalerts2023>

Gaia mission and Alerts BHTOM follow-up system highlights and results synergies with radio telescope network organization opportunities

Workshop Organizing Committee:
 Lukasz Wyrzykowski (Warsaw)
 Milena Ratajczak (Warsaw)
 Simon Hodgkin (Cambridge)
 Charles Gilman (Malta)
 Stephen M. Brinck (Malta)
 Gerry Gilmore (Cambridge)
 Nada Ihanec (Warsaw)

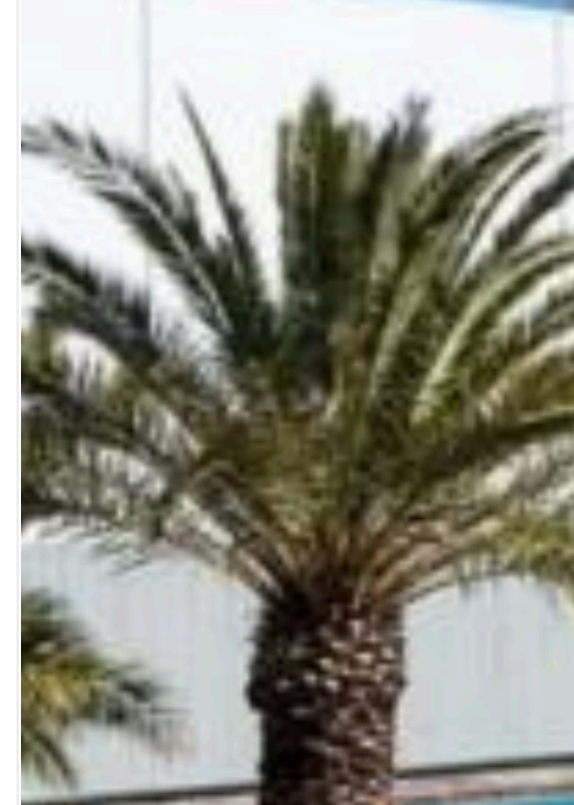


15th GAIA SCIENCE ALERTS AND ORP TIME-DOMAIN WORKSHOP
 Heraklion, Crete
 30 Sep-2 Oct-2024

CELEBRATE 10TH ANNIVERSARY OF THE FIRST GAIA ALERTS

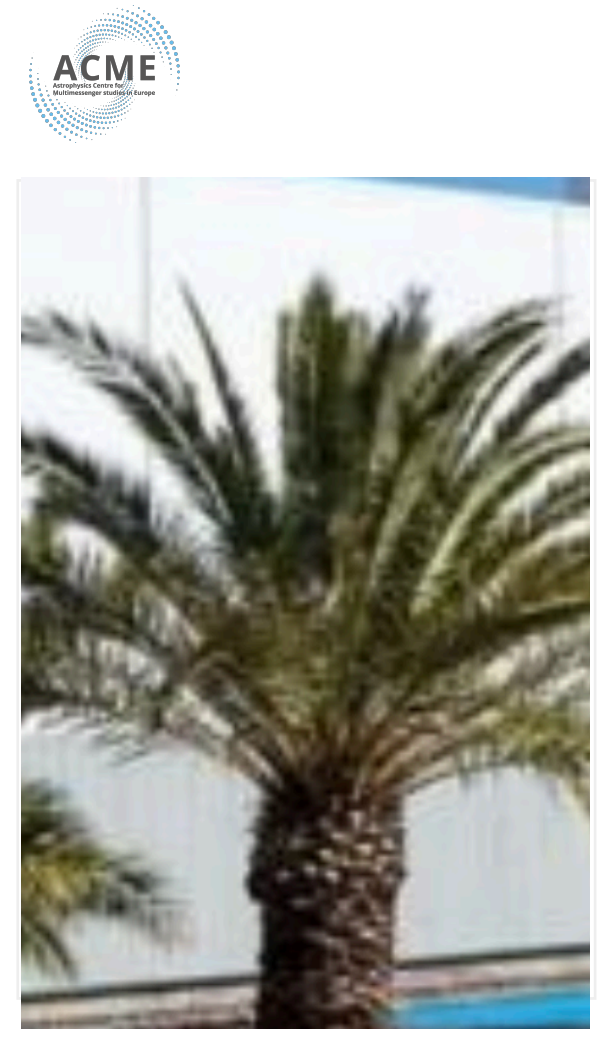
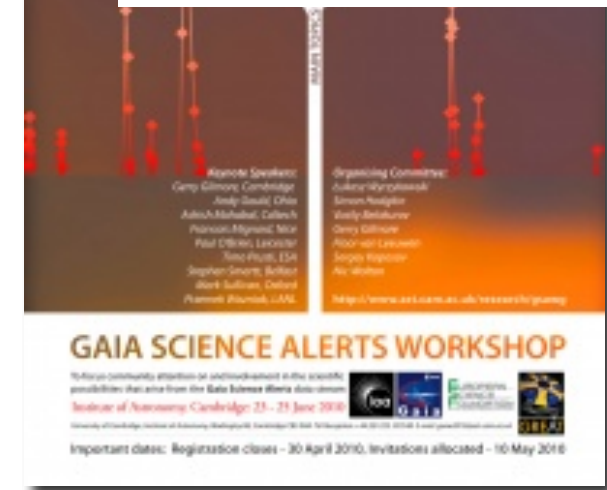
Gaia mission and Alerts BHTOM follow-up system highlights and results synergies with radio telescope network opportunities

Workshop Organizing Committee:
 Lukasz Wyrzykowski (Warsaw)
 Simon Hodgkin (Cambridge)
 Vasilius Charamis (ORP/TH)
 Przemyslaw J. Mikulajczyk (Warsaw/Wrocław)
 Justyna Chrusowska (Poznan)



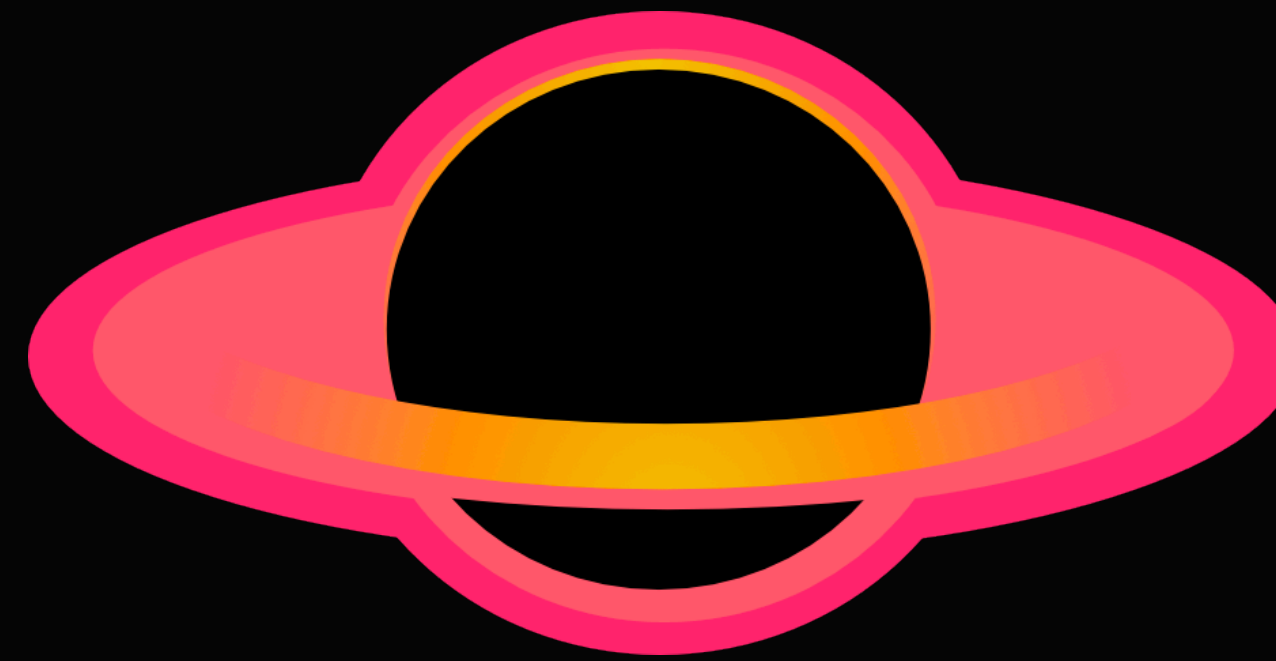


16th Gaia Alerts and ACME Time-Domain Workshop IAC Tenerife 29.Sept-3.Oct 2025

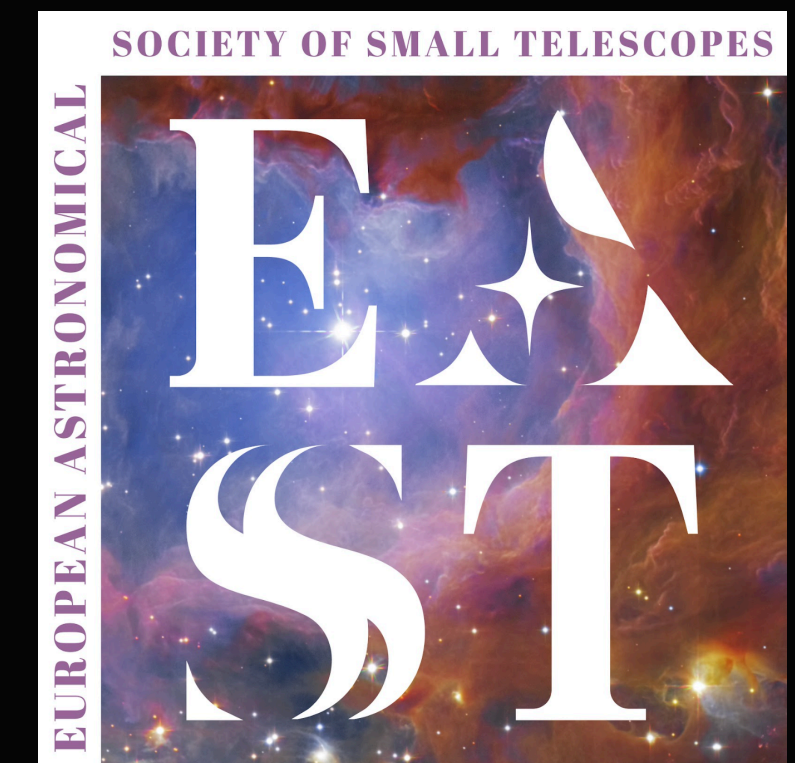




ACME.IN2P3.FR



BHTOM.SPACE



EASST.EU



LUKASZ.WYRZYKOWSKI@NCBJ.GOV.PL