BHTOM
– WHAT AND WHY?

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TEAM AND COLLABORATIONS

Warsaw University Astronomical Observatory

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Mariusz Gromadzki
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Priscila Pessi
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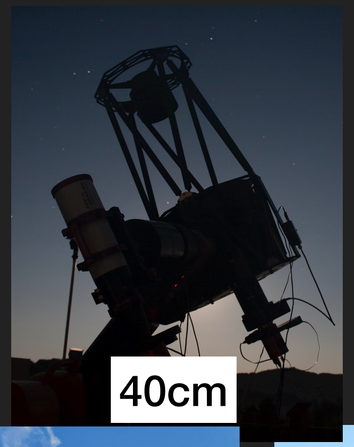
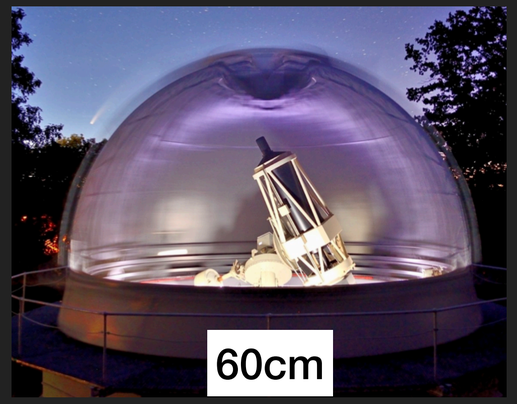
Funding:

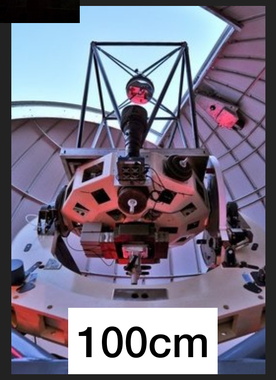
Łukasz Wyrzykowski

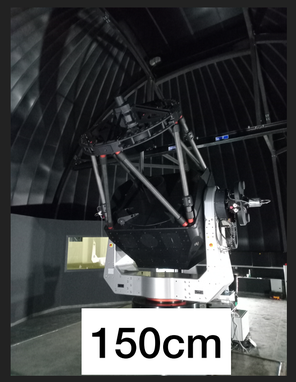
WHAT ARE THE SMALL TELESCOPES?

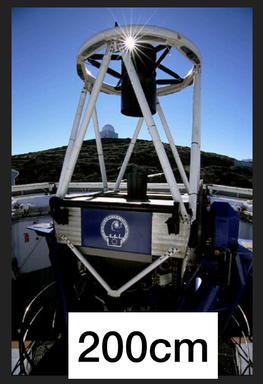
- professional - old (some very old!) & new, built in best astronomical sites in the world
- amateur - modern, growing in numbers, in backyard, shed and in Chile, Spain
- schools - modern, in big cities
- outreach facilities - modern, in big cities

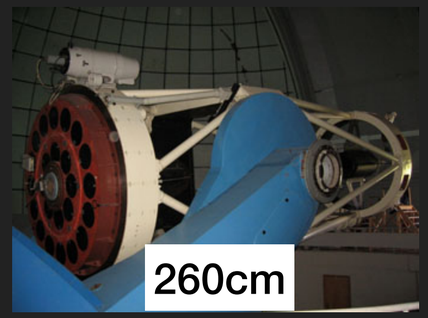












SCHOOL OBSERVATORY IN BOLECINA/POLAND

40-cm remotely controlled telescope

THE ROLE OF SMALL TELESCOPES

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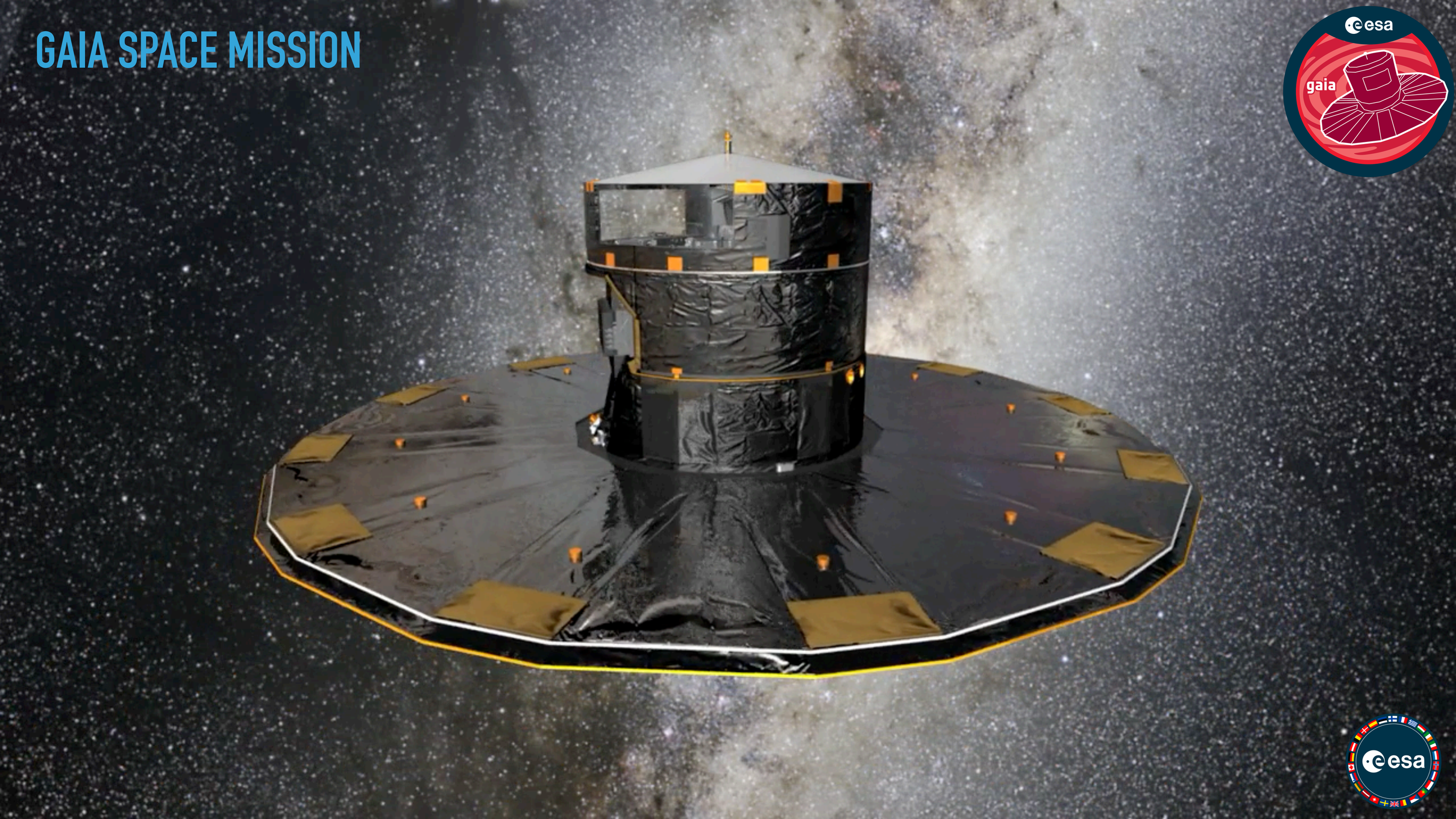
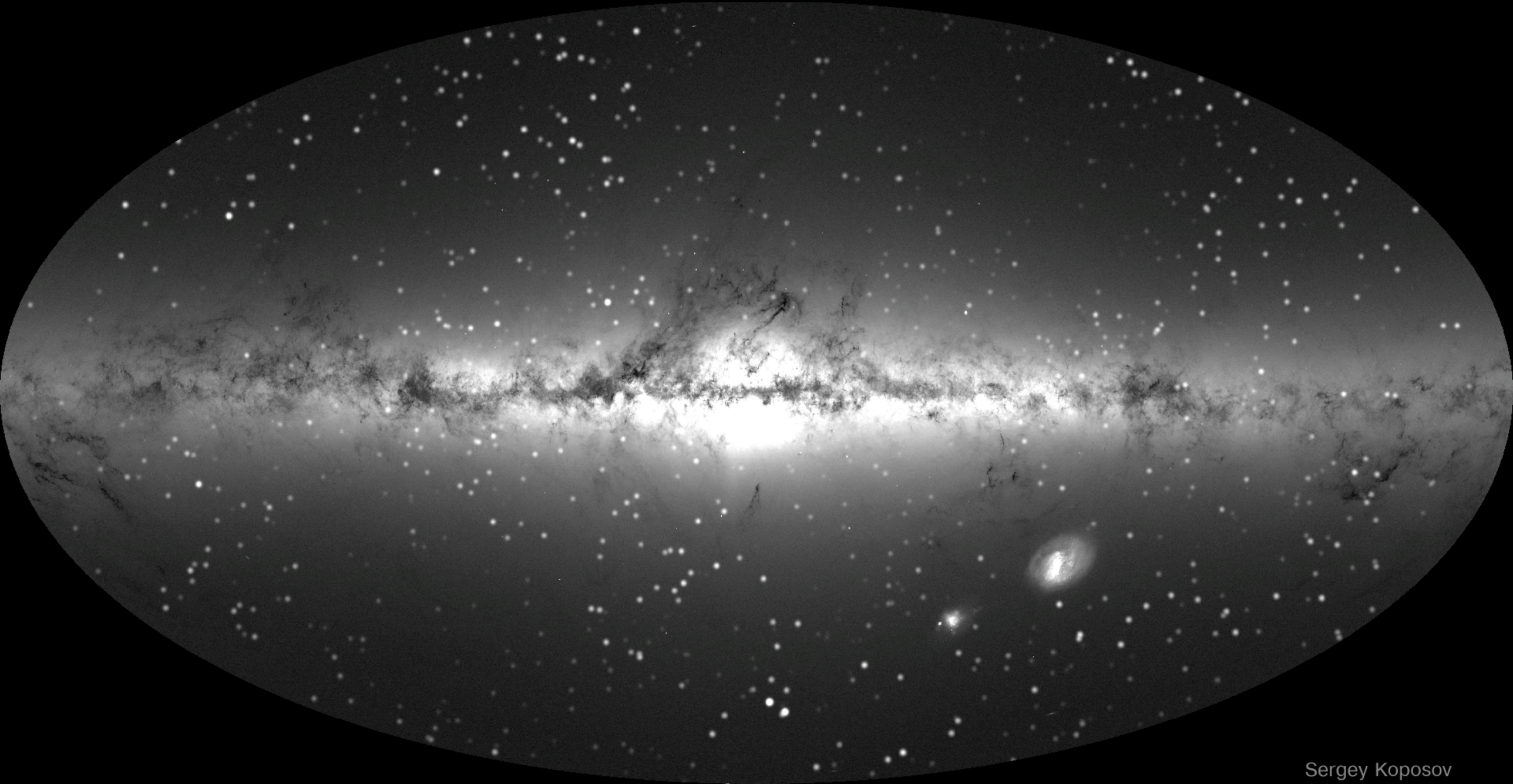
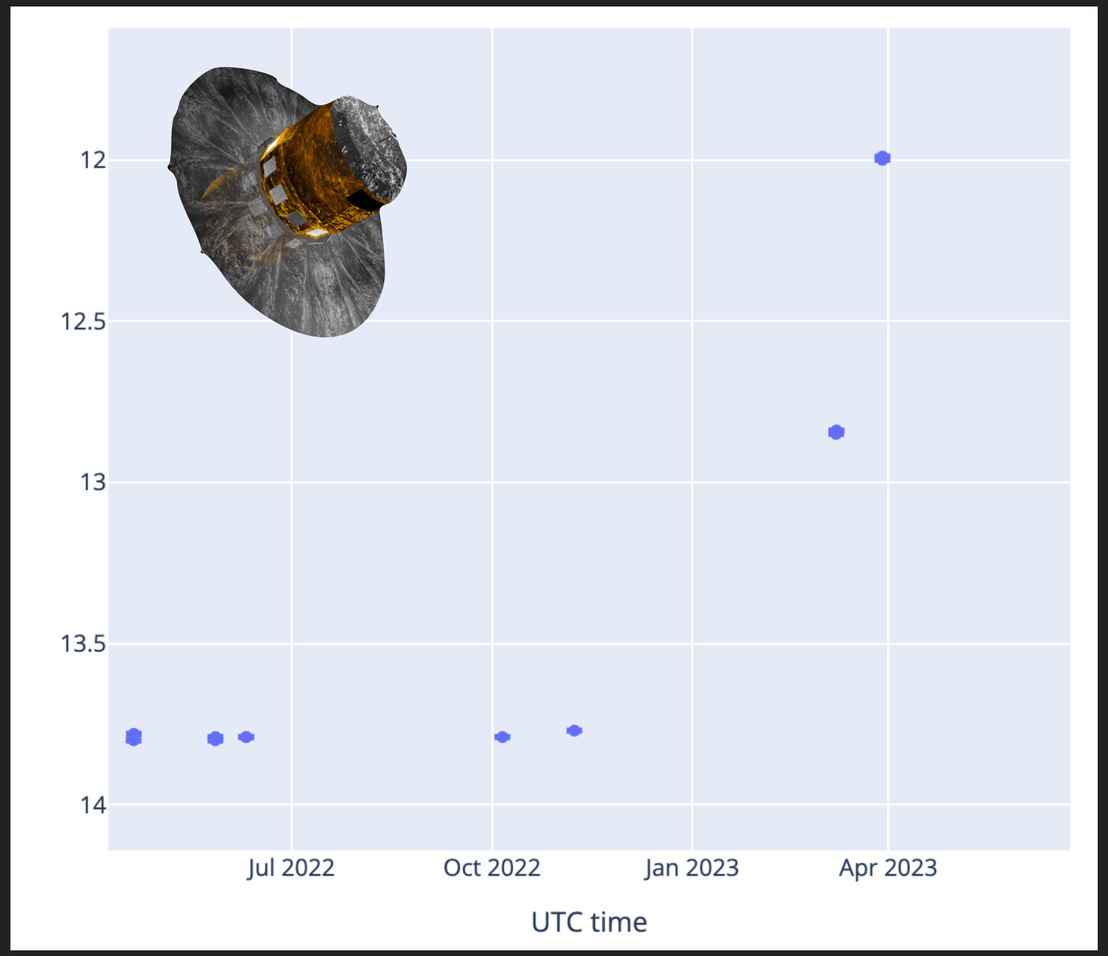
GAIA SPACE MISSION



ALERTS REPORTED BY GAIA

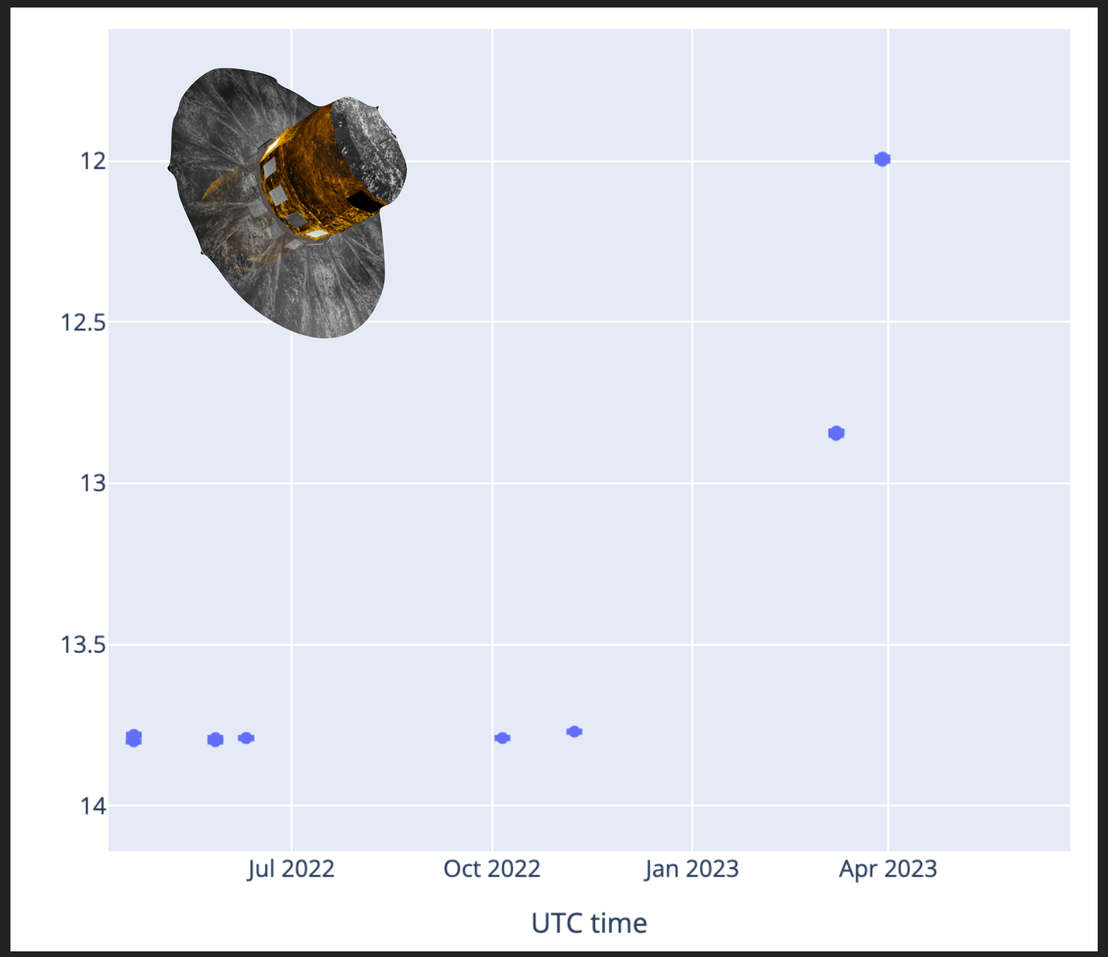


GAIA23BAY ▸ Example alert from Gaia

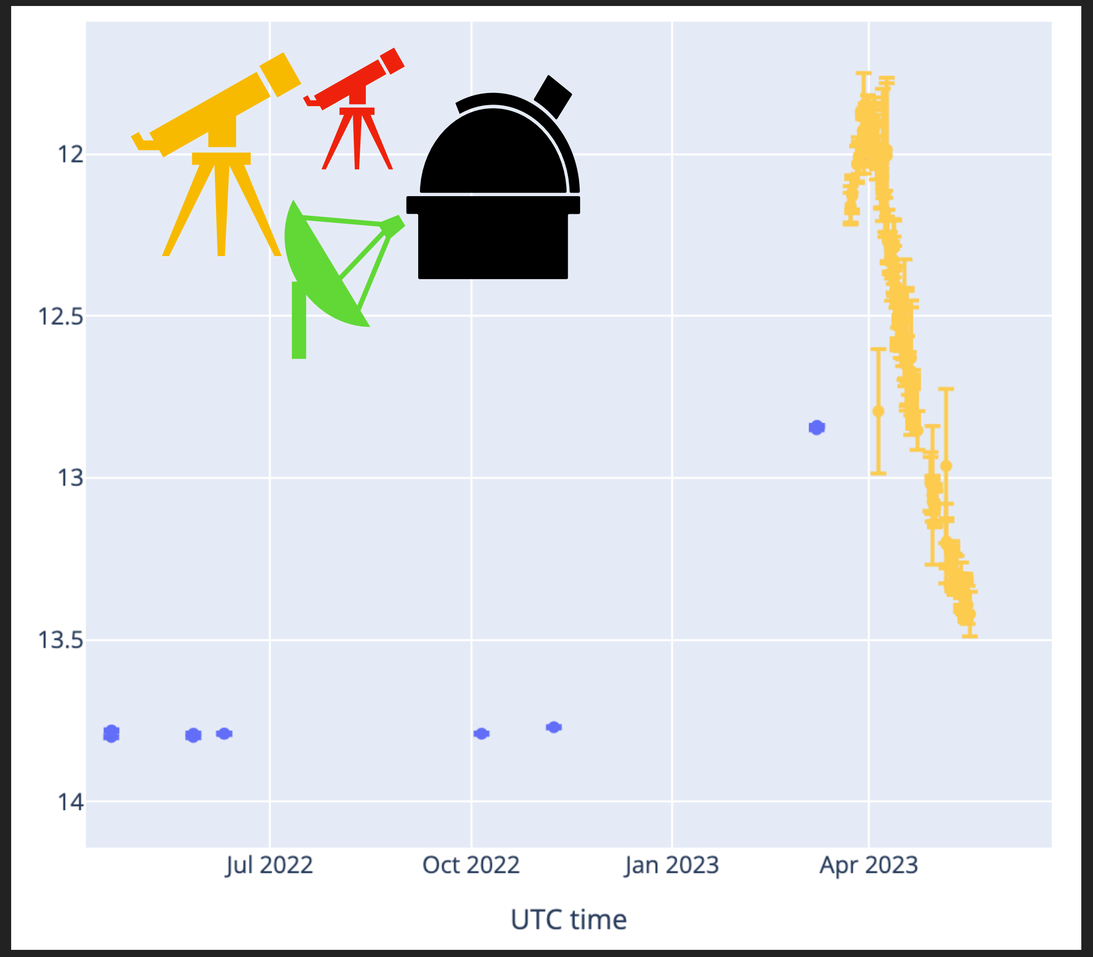


only Gaia

GAIA23BAY ▸ Example alert from Gaia

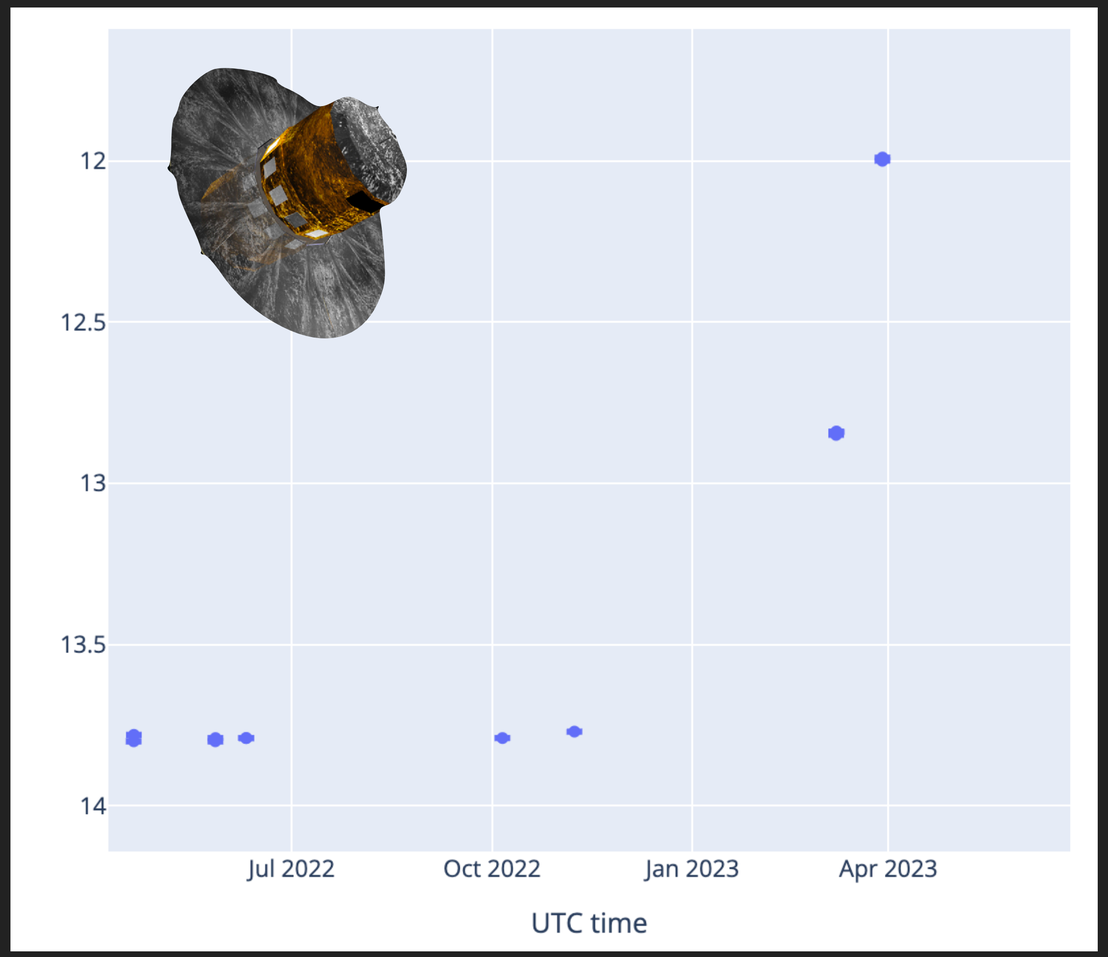


only Gaia

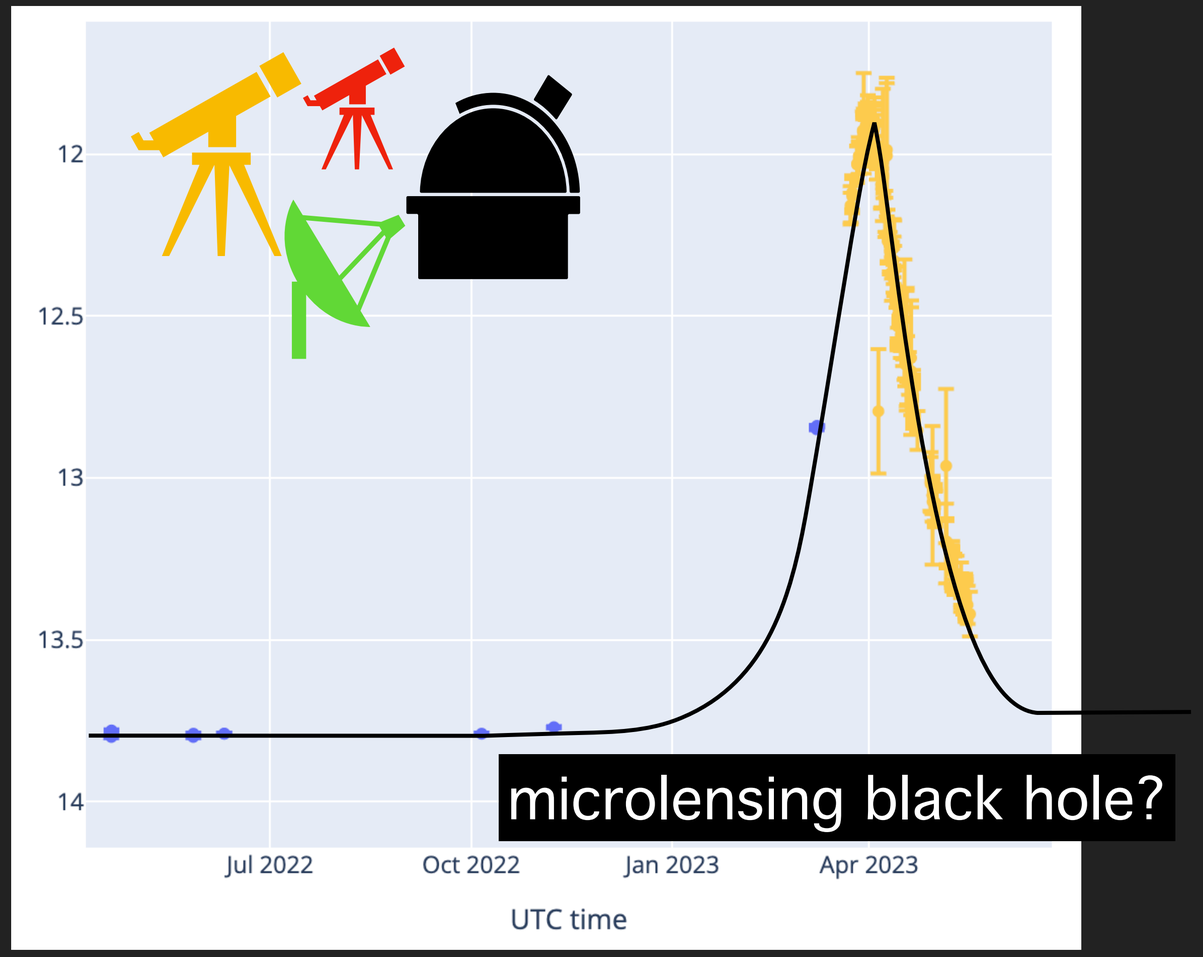


Gaia+small telescopes

GAIA23BAY ▸ Example alert from Gaia



only Gaia

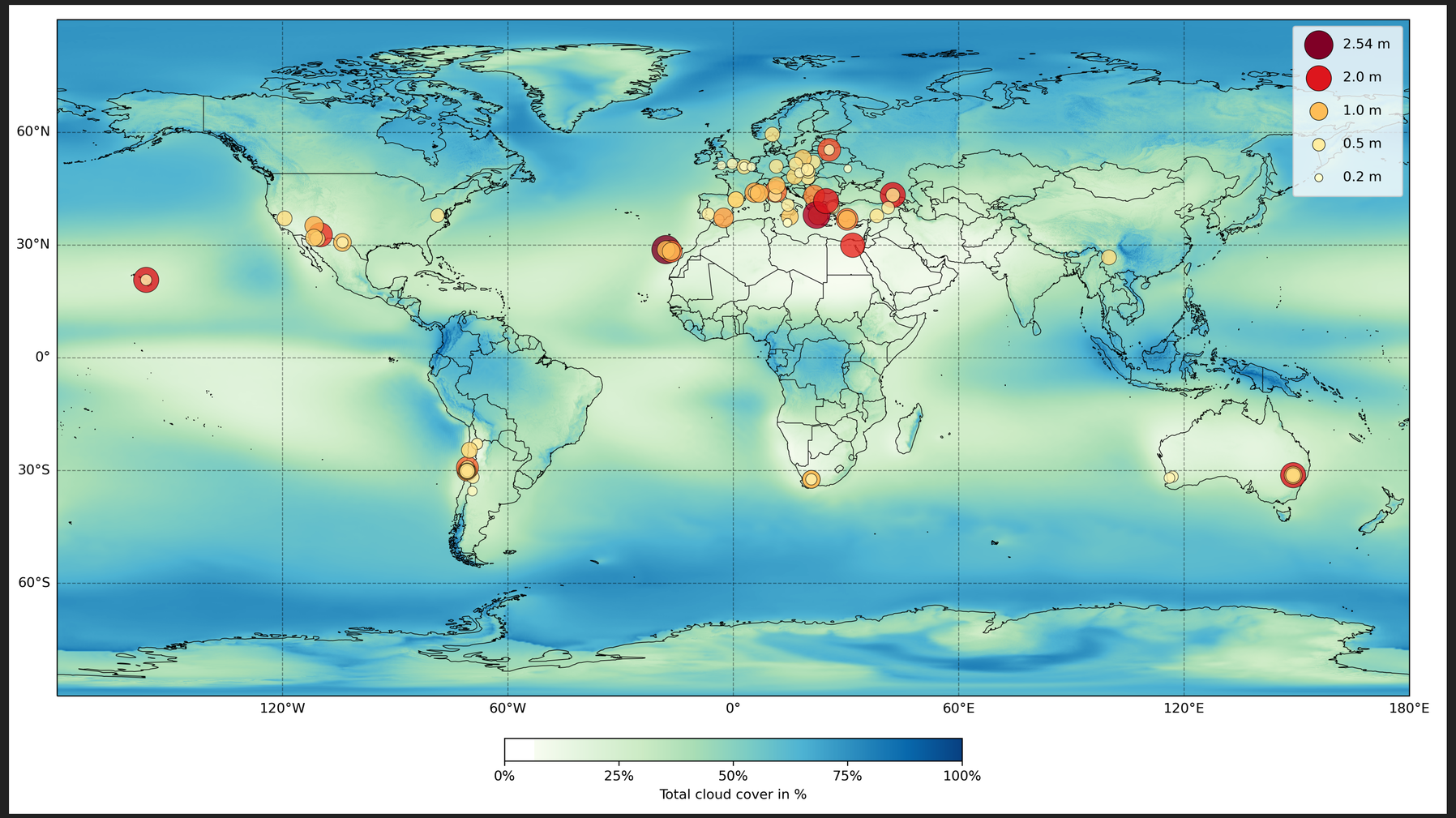


Gaia+small telescopes

BHTOM TELESCOPE NETWORK

- since 2013, built for Gaia Alerts

- ~130 telescopes
- sizes 0.05 - 2.5 m
- manual
- robotic
- with good weather
- with poor weather
- volunteering
- via proposals
- your telescope?



map by K.Kotysz & P.Mikołajczyk

BHTOM TELESCOPE NETWORK

- since 2013, built for Gaia Alerts

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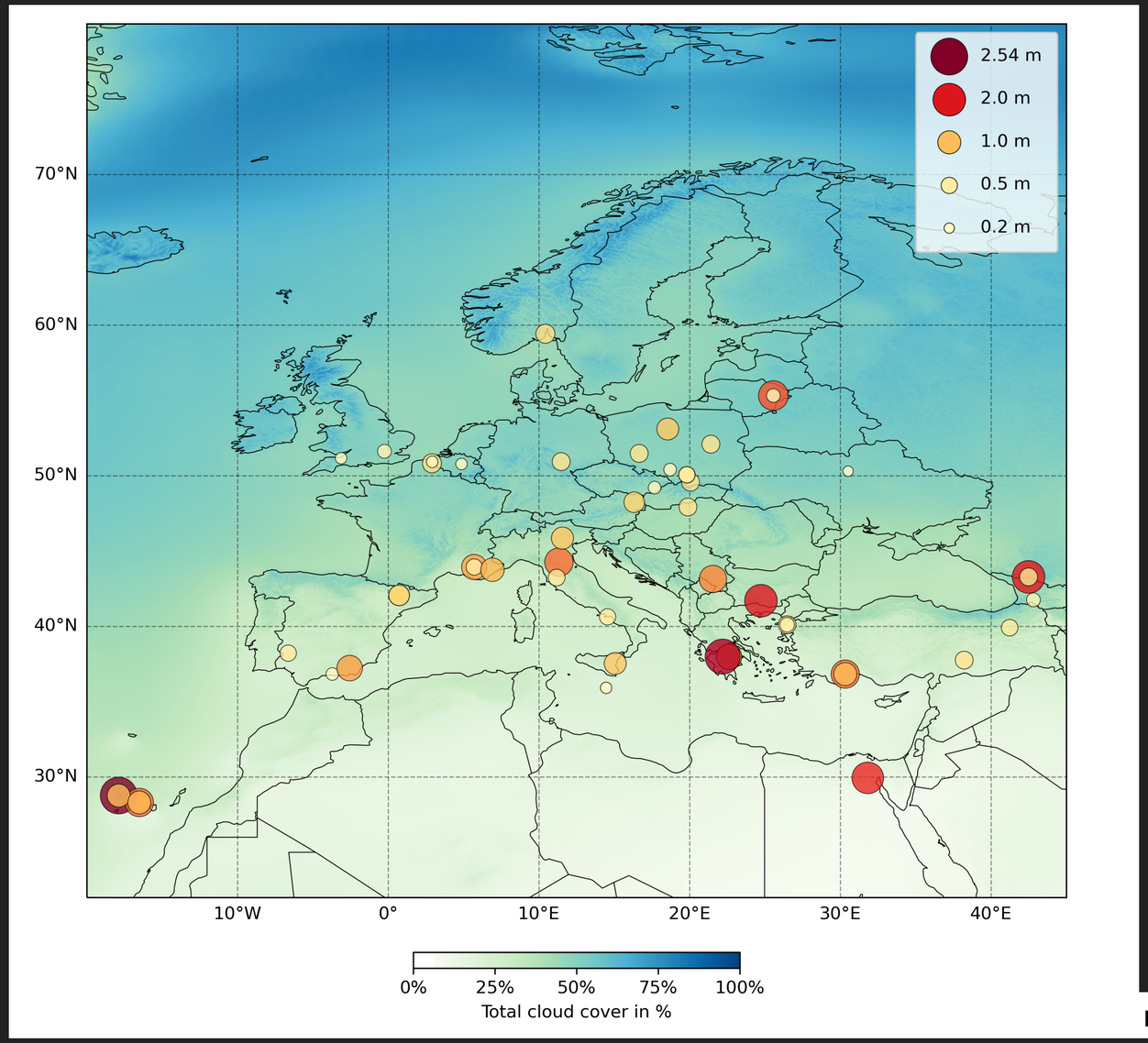
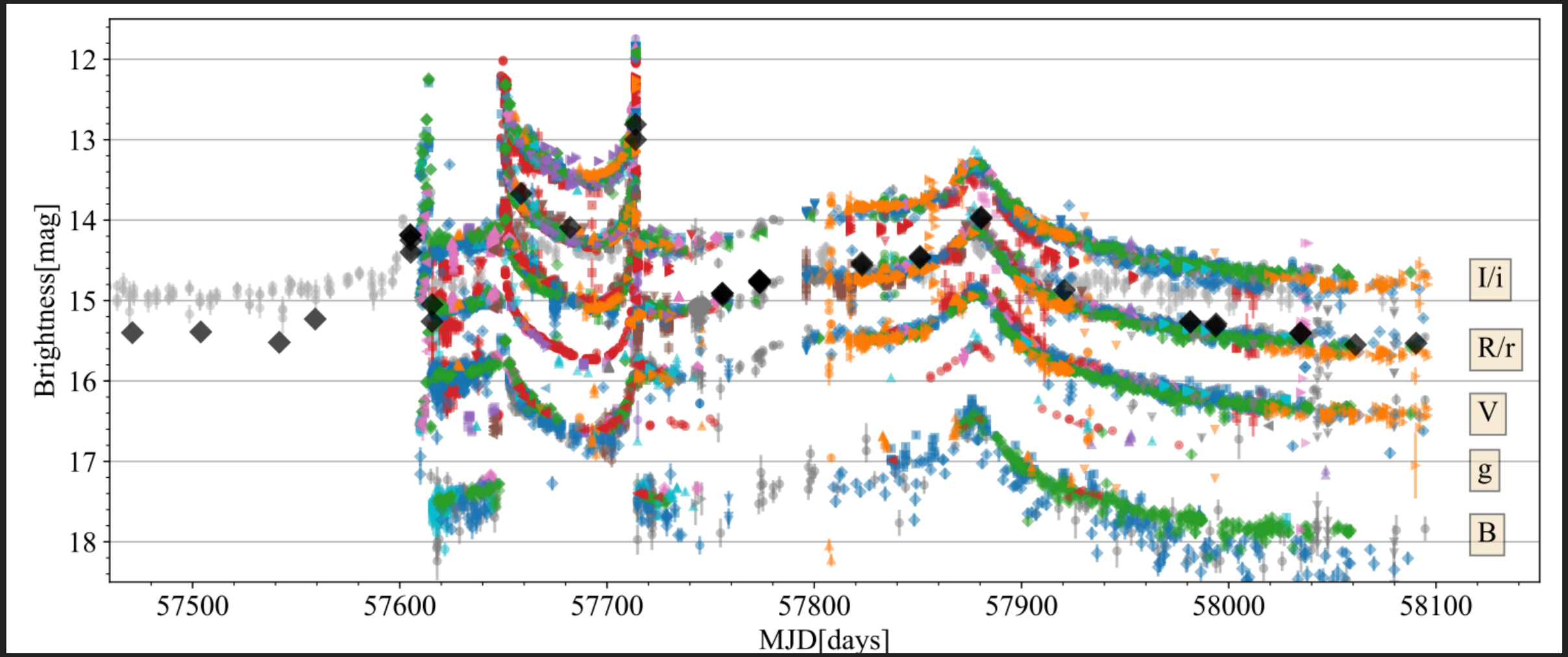


map by K.Kotysz & P.Mikołajczyk

BHTOM TELESCOPE NETWORK

- since 2013, built for Gaia Alerts

Gaia16aye



Wyrzykowski+2020

PUBLICATIONS SINCE 2020

+ 4 under review

1. Ban, M., et al. (2025): AT2021uey: A planetary microlensing event outside the Galactic bulge, https://ui.adsabs.harvard.edu/abs/2025A&A...697A..57B
2. Siwak, M., et al. (2025): Gaia20bdk – New FU Ori-type star in the Sh 2-301 star-forming region, https://ui.adsabs.harvard.edu/abs/2025A&A...695A.130S
3. Howil, K., et al. (2025): Uncovering the invisible: A study of Gaia18ajz, a candidate black hole revealed by microlensing, https://ui.adsabs.harvard.edu/abs/2025A&A...694A..94H
4. Maskoliūnas, M., et al. (2024): Lens Mass Estimate in the Galactic Disk Extreme Parallax Microlensing Event Gaia19dke, https://ui.adsabs.harvard.edu/abs/2024AcA....74...77M
5. Wu, Zexuan, et al. (2024): Gaia22dkvLb: A Microlensing Planet Potentially Accessible to Radial-velocity Characterization, https://ui.adsabs.harvard.edu/abs/2024AJ....168...62W
6. Bachelet, E., et al. (2024): A Close Binary Lens Revealed by the Microlensing Event Gaia20bof, https://ui.adsabs.harvard.edu/abs/2024AJ....168....9B
7. Rota, P., et al. (2024): Gaia21blx: Complete resolution of a binary microlensing event in the Galactic disk, https://ui.adsabs.harvard.edu/abs/2024A&A...686A.173R
8. Fiorellino, E., et al. (2024): The enigma of Gaia18cjb: A possible rare hybrid of FUor and EXor properties, https://ui.adsabs.harvard.edu/abs/2024A&A...686A.160F
9. Nagy, Z., et al. (2023): The Gaia alerted fading of the FUor-type star Gaia21elv, https://ui.adsabs.harvard.edu/abs/2023MNRAS.524.3344N
10. Nagy, Zsófia, et al. (2022): Photometric and spectroscopic study of the burst-like brightening of two Gaia-alerted young stellar objects, https://ui.adsabs.harvard.edu/abs/2022MNRAS.515.1774N
11. Kruszyńska, K., et al. (2022): Lens parameters for Gaia18cbf - a long gravitational microlensing event in the Galactic plane, https://ui.adsabs.harvard.edu/abs/2022A&A...662A..59K
12. Cassan, A., et al. (2022): Microlensing mass measurement from images of rotating gravitational arcs, https://ui.adsabs.harvard.edu/abs/2022NatAs...6..121C
13. Rybicki, K. A., et al. (2022): Single-lens mass measurement in the high-magnification microlensing event Gaia19bld located in the Galactic disc, https://ui.adsabs.harvard.edu/abs/2022A&A...657A..18R
14. Bachelet, E., et al. (2022): A spectroscopic follow-up for Gaia19bld, https://ui.adsabs.harvard.edu/abs/2022A&A...657A..17B
15. Merc, J., et al. (2020): Gaia18aen: First symbiotic star discovered by Gaia, https://ui.adsabs.harvard.edu/abs/2020A&A...644A..49M
16. Zhang, Jujia, et al. (2020): SN 2018zd: an unusual stellar explosion as part of the diverse Type II Supernova landscape, https://ui.adsabs.harvard.edu/abs/2020MNRAS.498...84Z
17. Szegedi-Elek, E., et al. (2020): Gaia 18dvy: A New FUor in the Cygnus OB3 Association, https://ui.adsabs.harvard.edu/abs/2020ApJ...899..130S
18. Wyrzykowski, Ł., et al. (2020): Full orbital solution for the binary system in the northern Galactic disc microlensing event Gaia16aye, https://ui.adsabs.harvard.edu/abs/2020A&A...633A..98W
19. Zieliński, P., et al. (2019): CPCS 2.0 – new automatic tool for time-domain astronomy, https://ui.adsabs.harvard.edu/abs/2019CoSka..49..125Z

PUBLICATIONS

- All observers included!

Monthly Notices of the ROYAL ASTRONOMICAL SOCIETY
MNRAS 515, 1774–1787 (2022) https://doi.org/10.1093/mnras/stac1915
Advance Access publication 2022 July 12

Photometric and spectroscopic study of the burst-like brightening of two *Gaia*-alerted young stellar objects

Zsófia Nagy,[1,2★] Péter Ábrahám,[1,2,3] Ágnes Kóspál,[1,2,3,4] Sunkyung Park,[1,2] Fernando Cruz-Sáenz de Miera,[1,2] Eleonora Fiorellino,[1,2,5] David García-Álva Marianna Szabó,[1,2,8,9] Simone Antoniucci,[5] Teresa Giannini,[5] Alessio Giunta,[1] Mária Kun,[1,2] Gábor Marton,[1,2] Attila Moór,[1,2] Brunella Nisini,[5] Andras Pál Paweł Zieliński[11] and Łukasz Wyrzykowski[12]

Full orbital solution for the binary system in the northern Galactic disc microlensing event Gaia16aye★

Łukasz Wyrzykowski[1,★★], P. Mróz[1], K. A. Rybicki[1], M. Gromadzki[1], Z. Kołaczkowski[45,79,★★★], M. Zieliński[1], P. Zieliński[1], N. Britavskiy[4,5], A. Gomboc[35], K. Sokolovsky[19,3,66], S.T. Hodgkin[6], L. Abe[89], G.F. Aldi[20,80], A. AlMannaei[62,100], G. Altavilla[72,7], A. Al Qasim[62,100], G.C. Anupama[8], S. Awiphan[9], E. Bachelet[63], V. Bakis[10], S. Baker[100], S. Bartlett[50], P. Bendjoya[11], K. Benson[100], I.F. Bikmaev[76,87], G. Birenbaum[12], N. Blagorodnova[24], S. Blanco-Cuaresma[15,74], S. Boeva[16], A.Z. Bonanos[19], V. Bozza[20,80], D.M. Bramich[62], I. Bruni[25], R.A. Burenin[84,85], U. Burgaz[21], T. Butterley[22], H. E. Caines[34], D. B. Caton[93], S. Calchi Novati[83], J.M. Carrasco[23], A. Cassan[29], V. Čepas[56], M. Cropper[100], M. Chruślińska[1,24], G. Clementini[25], A. Clerici[35], D. Conti[91], M. Conti[48], S. Cross[63], F. Cusano[25], G. Damljanovic[26], A. Dapergolas[19], G. D'Ago[81], J. H. J. de Bruijne[27], M. Dennefeld[29], V. S. Dhillon[30,4], M. Dominik[31], J. Dziedzic[1], O. Erece[32], M. V. Eselevich[86], H. Esenoglu[33], L. Eyer[74], R. Figuera Jaimes[31,53], S. J. Fossey[34], A. I. Galeev[76,87], S. A. Grebenev[84], A. C. Gupta[99], A. G. Gutaev[76], N. Hallakoun[12], A. Hamanowicz[1,36], C. Han[2], B. [illegible] erden[103], V. L. Hoette[95], K. [illegible] Itoh[43], P. Iwanek[1], [illegible] Khamitov[44,76], Y.Kilic[32], J. [illegible], G. Latey[16], C-H. Lee[17,18], [illegible] J. Manser[52], S. Mao[53], D. [illegible] ntjes[103], S. S. Melnikov[76,87], [illegible] ohy[102], S. Nazarov[90], H. [illegible] laversa[6,74], A. Pandey[99], E. [illegible] 96,97], J. K. T. Qvam[98], C. [illegible] 89], G. Rixon[6], D. Roberts[47], [illegible] Shappee[69], R. Schmidt[41], Y. [illegible] es[34], B. van Soelen[103], Z. T. [illegible] I. Szegedi[103], L. M. Tinjaca [illegible] ambsganss[41,42], I. P. van der [illegible] kov[76,87], D. G. Zhukov[76], J.

The Astrophysical Journal, 899:130 (8pp), 2020 August 20

Gaia 18dvy: A New FUor in the Cygnus OB3 Association

E. Szegedi-Elek[1], P. Ábrahám[1,2], Ł. Wyrzykowski[3], M. Kun[1], Á. Kóspál[1,2,4], L. Chen[1], G. Marton[1,2], A. Moór[1,2], C. Kiss[1,2], A. Pál[1,2,5], L. Szabados[1], J. Varga[1,6], E. Varga-Verebélyi[1], C. Andreas[7], E. Bachelet[8], R. Bischoff[7], A. Bódi[1,9], E. Breedt[10], U. Burgaz[11,12], T. Butterley[13], J. M. Carrasco[14], V. Čepas[15], G. Damljanovic[16], I. Gezer[3], V. Godunova[17], M. Gromadzki[3], A. Gurgul[3], L. Hardy[18], F. Hildebrandt[7], S. Hoffmann[7], M. Hundertmark[19], N. Ihanec[3], R. Janulis[15], Cs. Kalup[1], Z. Kaczmarek[3], R. Könyves-Tóth[1], M. Krezinger[1], K. Kruszyńska[3], S. Littlefair[18], M. Maskoliūnas[15], L. Mészáros[1], P. Mikołajczyk[20], M. Mugrauer[7], H. Netzel[21], A. Ordasi[1], E. Pakštienė[15], K. A. Rybicki[3], K. Sárneczky[1], B. Seli[1], A. Simon[22], K. Šiškauskaitė[15], Á. Sódor[1], K. V. Sokolovsky[23,24,25] R. Szakáts[1], L. Tomasella[26], Y. Tsapras[19], K. Vida[1,2], J. Zdanavičius[15], M. Zieliński[3], P. Z

Lens mass estimate in the Galactic disk extreme parallax microlensing event Gaia19dke

M. Maskoliūnas[1], Ł. Wyrzykowski[2], K. Howil[2], K. A. Rybicki[2], P. Zieliński[3], Z. Kaczmarek[4], K. Kruszyńska[2], M. Jabłońska[2], J. Zdanavičius[1], E. Pakštienė[1], V. Čepas[1], P. J. Mikołajczyk[2,8], R. Janulis[1], M. Gromadzki[2], N. Ihanec[2], R. Adomavičienė[1], K. Šiškauskaitė[1], M. Bronikowski[2,7], P. Sivak[2], A. Stankevičiūtė[2], M. Sitek[2], M. Ratajczak[2], U. Pylypenko[2], I. Gezer[5], S. Awiphan[9], E. Bachelet[10], K. Bąkowska[3], R. P. Boyle[12], V. Bozza[32,33], S. M. Brincat[13], U. Burgaz[11], T. Butterley[29], J. M. Carrasco[14], A. Cassan[38], F. Cusano[15], G. Damljanovic[6], V. S. Dhillon[22], M. Dominik[39], F. Dubois[16], H. H. Esenoglu[17], R. Figuera Jaimes[34], A. Fukui[19], C. Galdies[20], A. Garofalo[15], V. Godunova[21], T. Güver[17,18], J. Heidt[22], M. Hundertmark[36], I. Izviekova[3], B. Joachimczyk[3], M.K. Kamińska[39], K. Kamiński[39], S. Kaptan[17,18], T. Kvernadze[24], O. Kvaratskhelia[24], S. Littlefair[22], O. Michniewicz[24], N. Nakhatutai[35], W. Ogłoza[42], J. M. Olszewska[39], M. Polińska[39], A. Popowicz[25], J. K. T. Qvam[26], M. Radziwonowicz[2], A. Słowikowska[37,3], A. Simon[30,31], E. Sonbas[40,41] M. Stojanovic[6] Y. Tsapras[36], S. Vanaverbeke[16], R. W. Wilson[29], M. Zejmo[24], S. Zola[28],

Single lens mass measurement in the high magnification microlensing event Gaia19bld located in the Galactic Disk

K. A. Rybicki,[★1] Ł. Wyrzykowski,[1] E. Bachelet,[2] A. Cassan,[3] P. Zieliński,[1] A. Gould,[4,5] S. Calchi Novati,[6] J.C. Yee,[7] Y.-H. Ryu,[8] M. Gromadzki,[1] P. Mikołajczyk,[9] N. Ihanec,[1] K. Kruszyńska,[1] F.-J. Hambsch,[10,11] S. Zola,[12] S. J. Fossey,[13] S. Awiphan,[14] N. Nakharutai,[15] F. Lewis,[16,17] F. Olivares E.,[18] S. Hodgkin,[19] A. Delgado,[19] E. Breedt,[19] D. L. Harrison,[19,20] M. van Leeuwen,[19] G. Rixon,[19] T. Wevers,[19] A. Yoldas,[19] A. Udalski,[1] M. K. Szymański,[1] I. Soszyński,[1] P. Pietrukowicz,[1] S. Kozłowski,[1] J. Skowron,[1] R. Poleski,[1] K. Ulaczyk,[21,1] P. Mróz,[1,22] P. Iwanek,[1] M. Wrona,[1] R.A. Street,[2] Y. Tsapras,[23] M. Hundertmark Gaudi,[5] C. Henderson,[6] Y. Shvartzvald,[25] W. Zang

SN 2018zd: An Unusual Stellar Explosion as Part of the Diverse Type II Supernova Landscape

Jujia Zhang,[1,2,3,4★] Xiaofeng Wang,[5,6] József Vinkó[7,8,9] Qian Zhai,[1,2,3,4] Tianmeng Zhang,[10] Alexei V. Filippenko,[12,13] Thomas G. Brink,[12] WeiKang Zheng,[12] Łukasz Wyrzykowski,[14] Przemysław Mikołajczyk,[14] Fang Huang,[15] Xinhan Zhang,[5] Huijuan Wang,[10,11] James A. Bódi,[7,18] G. Csörnyei,[7,8] O. Hanyecz,[7] I R. Könyves-Tóth,[7,8] A. Ordasi,[7] A. Pál,[7,8] G. Zsidi[7,8,19]

The *Gaia* alerted fading of the FUor-type star Gaia21elv

Zsófia Nagy,[1,2★] Sunkyung Park,[1,2] Péter Ábrahám,[1,2,3] Ágnes Kóspál,[1,2,3,4] Fernando Cruz-Sáenz de Miera,[1,2] Mária Kun,[1,2] Michał Siwak,[1,2] Zsófia Marianna Szabó,[1,2,5,6] Máté Szilágyi,[1,2,3] Eleonora Fiorellino,[7] Teresa Giannini,[8] Jae-Joon Lee,[9] Jeong-Eun Lee,[10] Gábor Marton,[1,2] László Szabados,[1,2] Fabrizio Vitali,[8] Jan Andrzejewski,[11] Mariusz Gromadzki,[12] Simon Hodgkin,[13] Maja Jabłońska,[12] Rene A. Mendez,[14] Jaroslav Merc,[15] Olga Michniewicz,[11] Przemysław J. Mikołajczyk,[12,16] Uliana Pylypenko,[12] Milena Ratajczak,[12] Łukasz Wyrzykowski,[12] Michal Zejmo,[11] Paweł Zieliński[17]

AT2021uey: A planetary microlensing event outside the Galactic bulge

Ban, M.[1], Voloshyn, P.[2,3], Adomavičienė, R.[4], Bachelet, E.[5,6], Bozza, V.[7,8], Brincat, S. M.[9], Bruni, I.[10], Burgaz, U.[11], Carrasco, J. M.[12], Cassan, A.[5], Čepas, V.[4], Dominik, M.[13], Dubois, F.[14], Figuera Jaimes, R.[15], Fukui, A.[16,17], Galdies, C.[18,19], Garofalo, A.[10], Hundertmark, M.[20], Kruszyńska, K.[1], Kulijanishvili, V.[21], Kvernadze, T.[21], Logie, L.[14], Maskoliūnas, M.[4], Mikołajczyk, P. J.[1,22], Mróz, P.[1], Narita, N.[16,17,23], Pakštienė, E.[4], Peloton, J.[3], Poleski, R.[1], Qvam, J. K. T.[24], Rau, S.[14], Rota, P.[7,8] Rybicki, K. A.[1,25], Street, R. A.[26], Tsapras, Y.[20], Vanaverbeke, S.[14], Wambsganss, J.[20], Wyrzykowski, Ł.[1], Zdanavičius, J.[4], and Zieliński, P.[27]

PUBLICATIONS – T CORONA BOREALIS WILL EXPLODE SOMEDAY BUT NOT TONIGHT

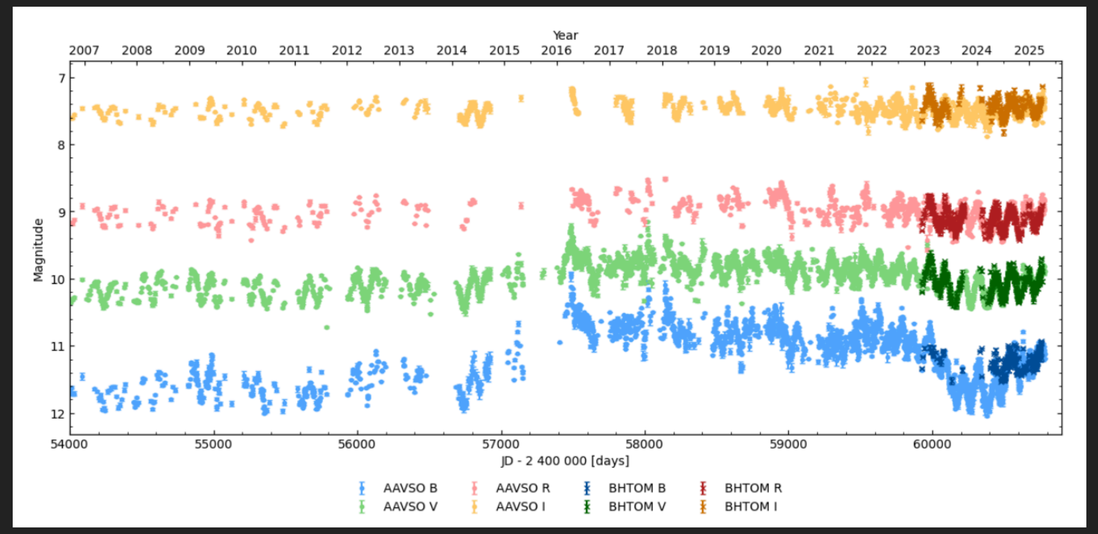
- All observers included!

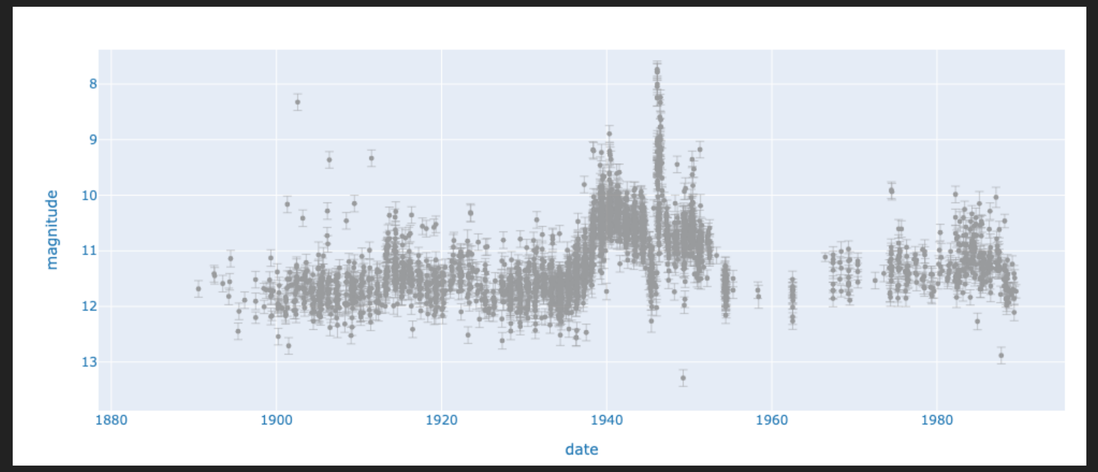
Is the Symbiotic Recurrent Nova T CrB Late? Recent Photometric Evolution and Comparison with Past Pre-Outburst Behaviour

Jaroslav Merc[1,2★], Łukasz Wyrzykowski[3,4], Paul G. Beck[2,5], Przemysław J. Mikołajczyk[3,4,6], Krzysztof Kotysz[3,6], Staszek Zola[7], Marek Drozdz[8], Charles Galdies[9,10], Franz-Josef Hambsch[11,12], Stephen M. Brincat[13], Barbara Joachimczyk[14], Mateusz Bronikowski[15], Jure Japelj[15], Matej Mihelcic[31], Josep Manel Carrasco[16,17,18], Umut Burgaz[29], Agnieszka Gurgul[14], Paweł Zieliński[14], Sebastian Kurowski[7], Waldemar Ogłoza[8], Jan Kåre Trandem Qvam[19], Justas Zdanavičius[20], Erika Pakštienė[20], Marius Maskoliūnas[20], Uliana Pylypenko[3], Dawid Moździerski[6], Franky Dubois[21,11], Siegfried Vanaverbeke[21,11], Justyna M. Olszewska[22], Alexios Liakos[23], Milan Stojanović[24], Goran Damljanović[24], Adam Popowicz[25], Mateusz Marzec[6], Magdalena Badura[6], Bartosz Gil[6], Alicja Pucek[7], Aleksandra Kowalska[7], Mateusz Szklarz[6], Teimuraz Kvernadze[26], Andrea Reguitti[27,28], Supachai Awiphan[30], Michel Dennefeld[32]

Affiliations are listed at the end of the paper

Merc et al. (2025)

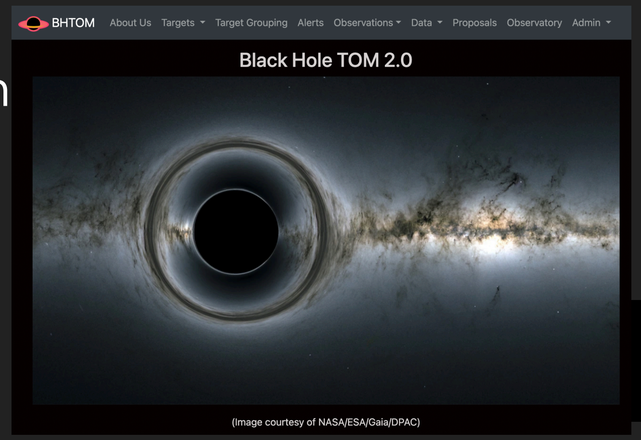




https://bhtom.space

BLACK HOLE TARGET AND OBSERVATION MANAGER (BHTOM)

- web tool for coordination for time-domain observation
- 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!



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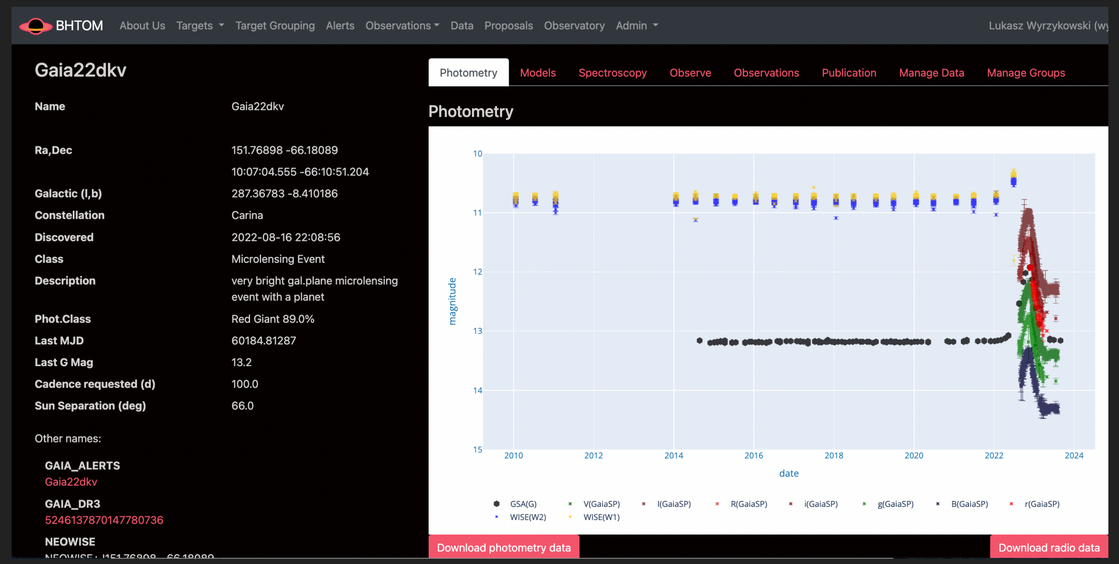
Gaia18acq	22:05:42.324	+03:39:17.064	982	20.2	Gaia/r	9.99	2023-09-18 10:09:17	799.0	155	long_period_variable
Gaia22bpl	10:38:42.425	-61:15:49.680	903	12.7	Gaia/r	9.99	2023-09-18 10:09:48	208.6	64	microlensing_event
Gaia22awa	19:04:51.962	-08:34:00.660	1602	15.0	Gaia/r	9.99	2023-09-17 21:09:11	770.1	111	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



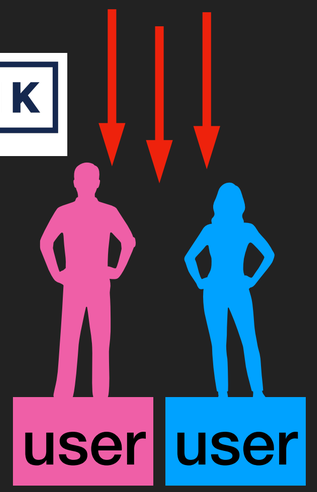
Surveys

Gaia,
ZTF,
OGLE,
ASAS-SN,
LSST,

Alerts

Brokers

ANTARES LASAIR FINK



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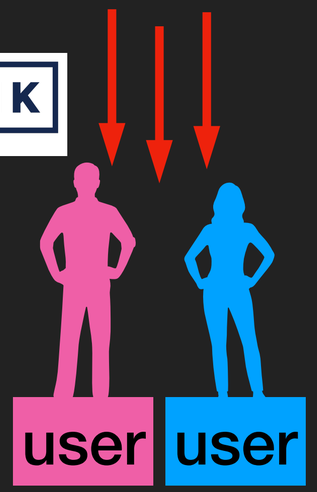

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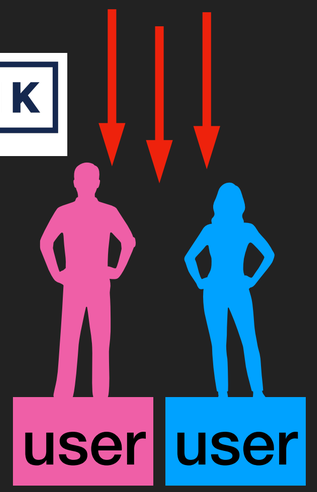

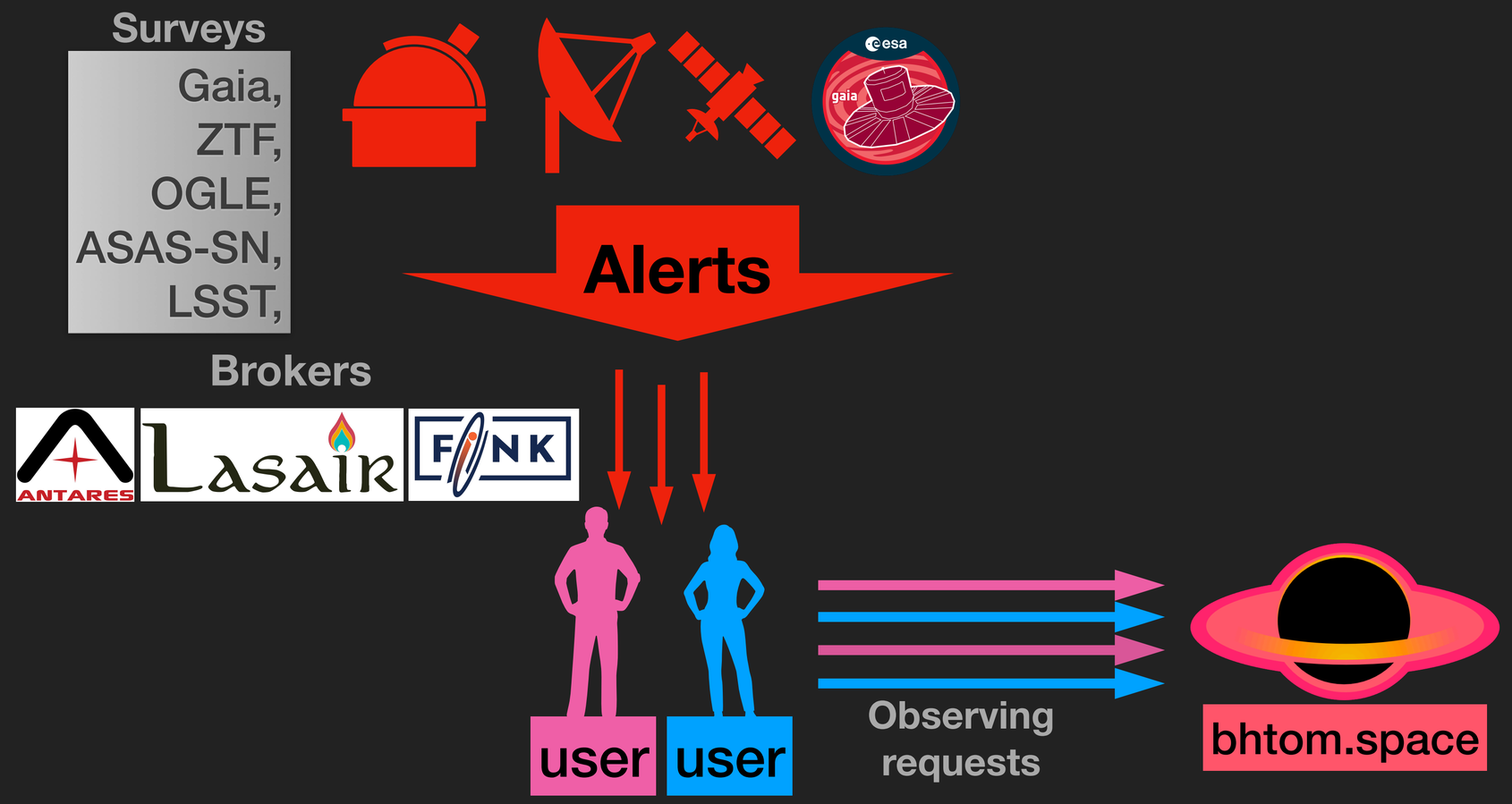
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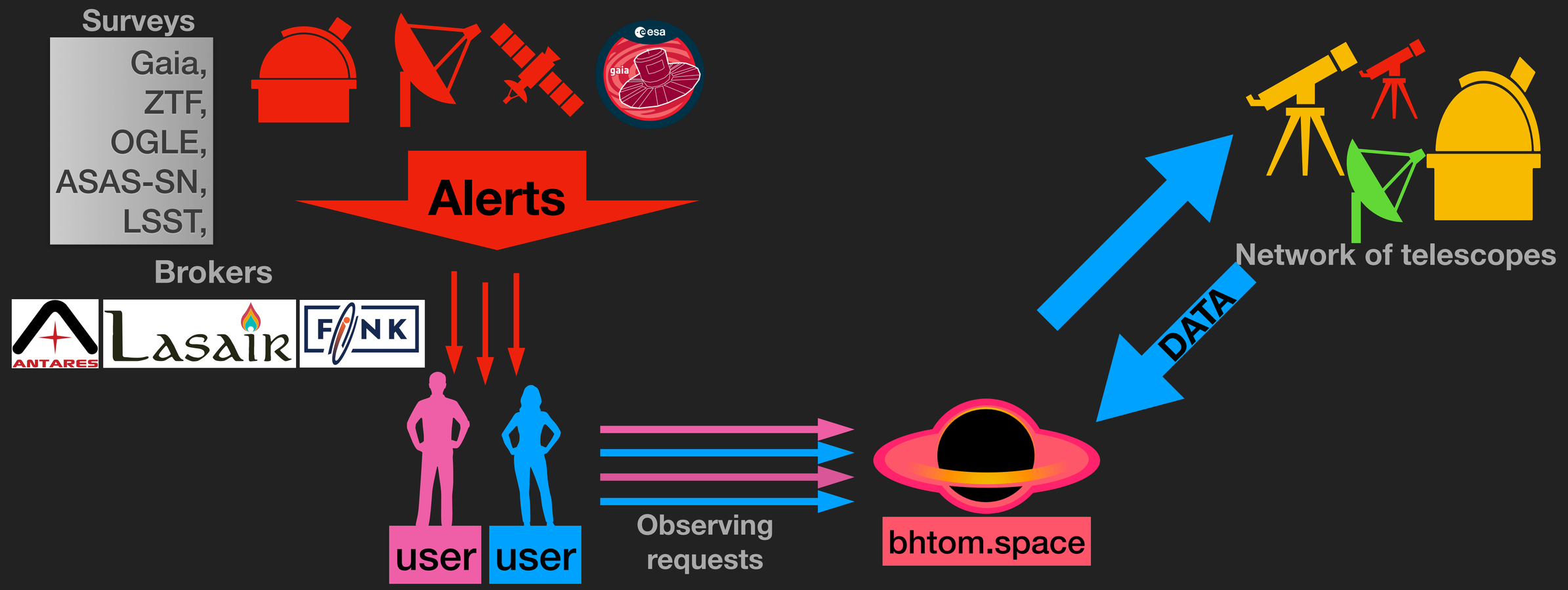
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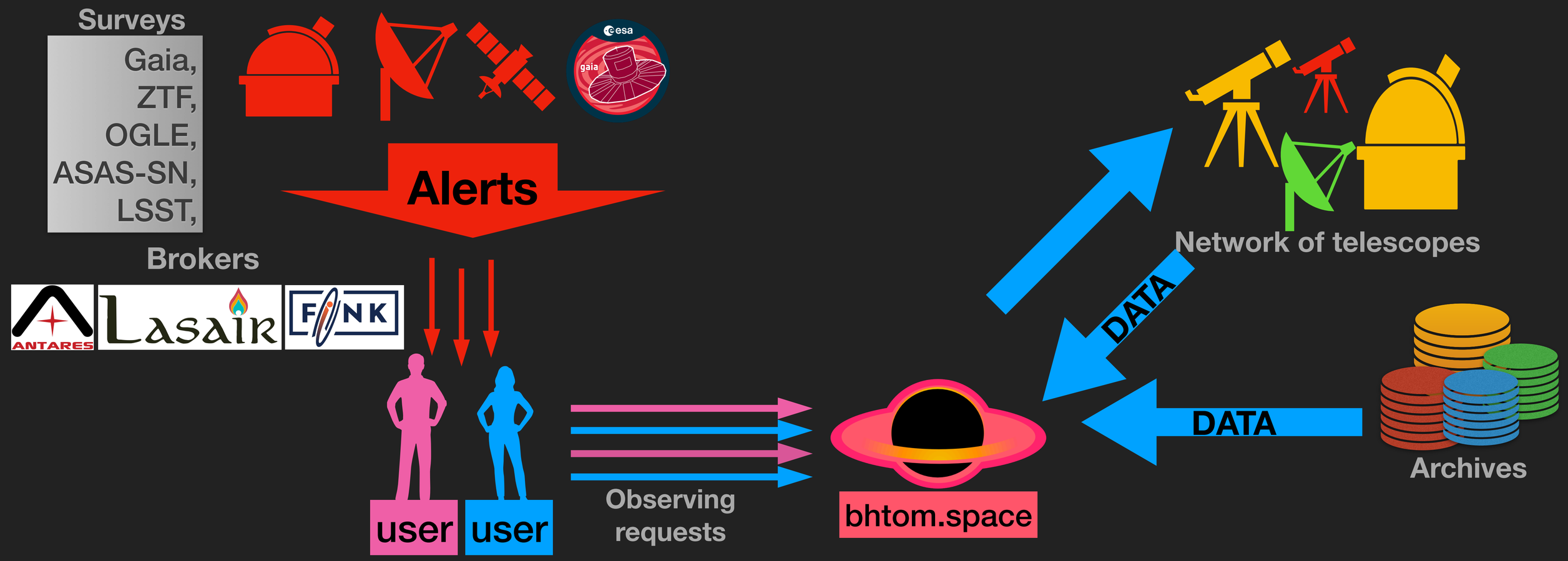
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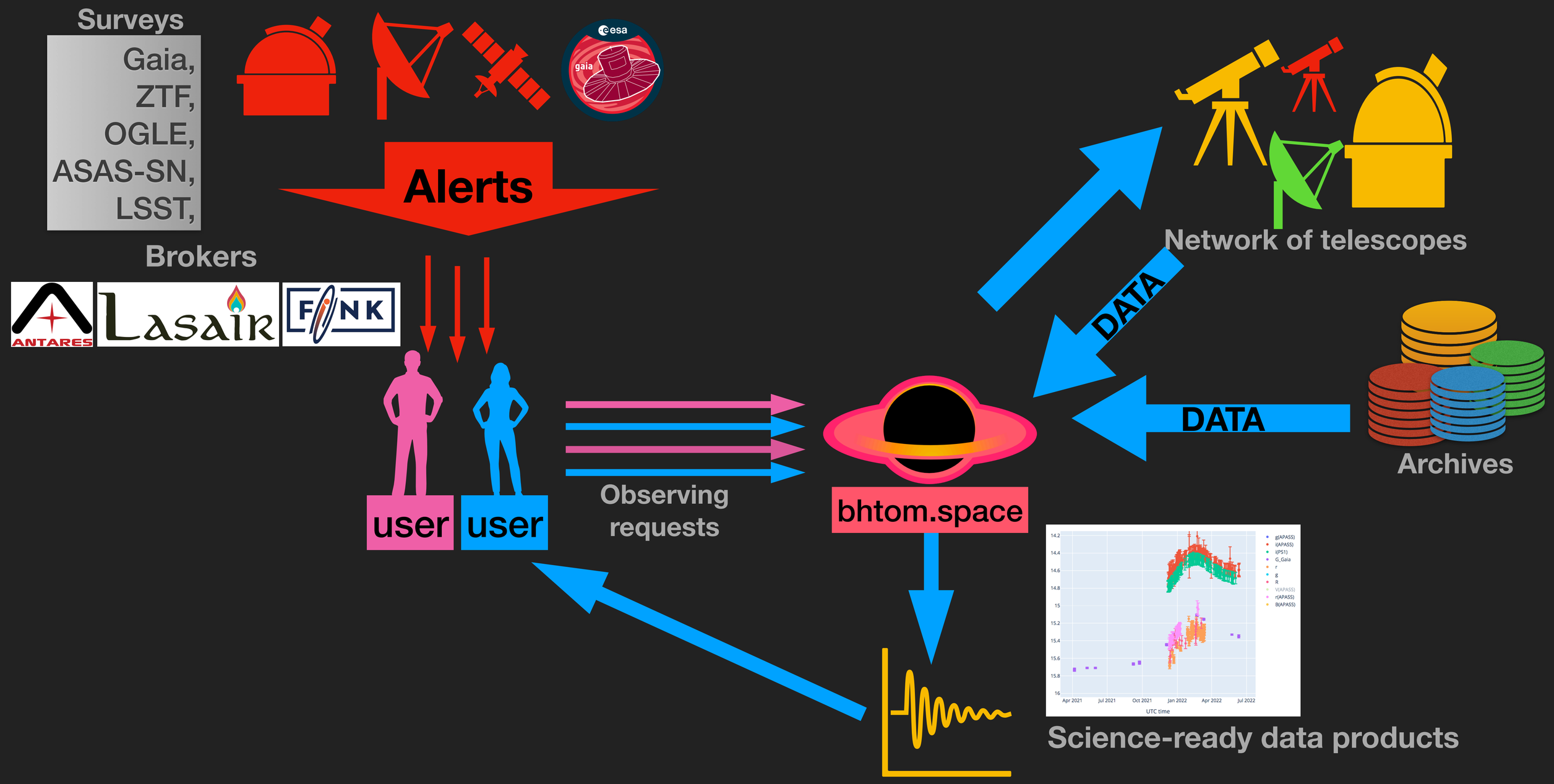
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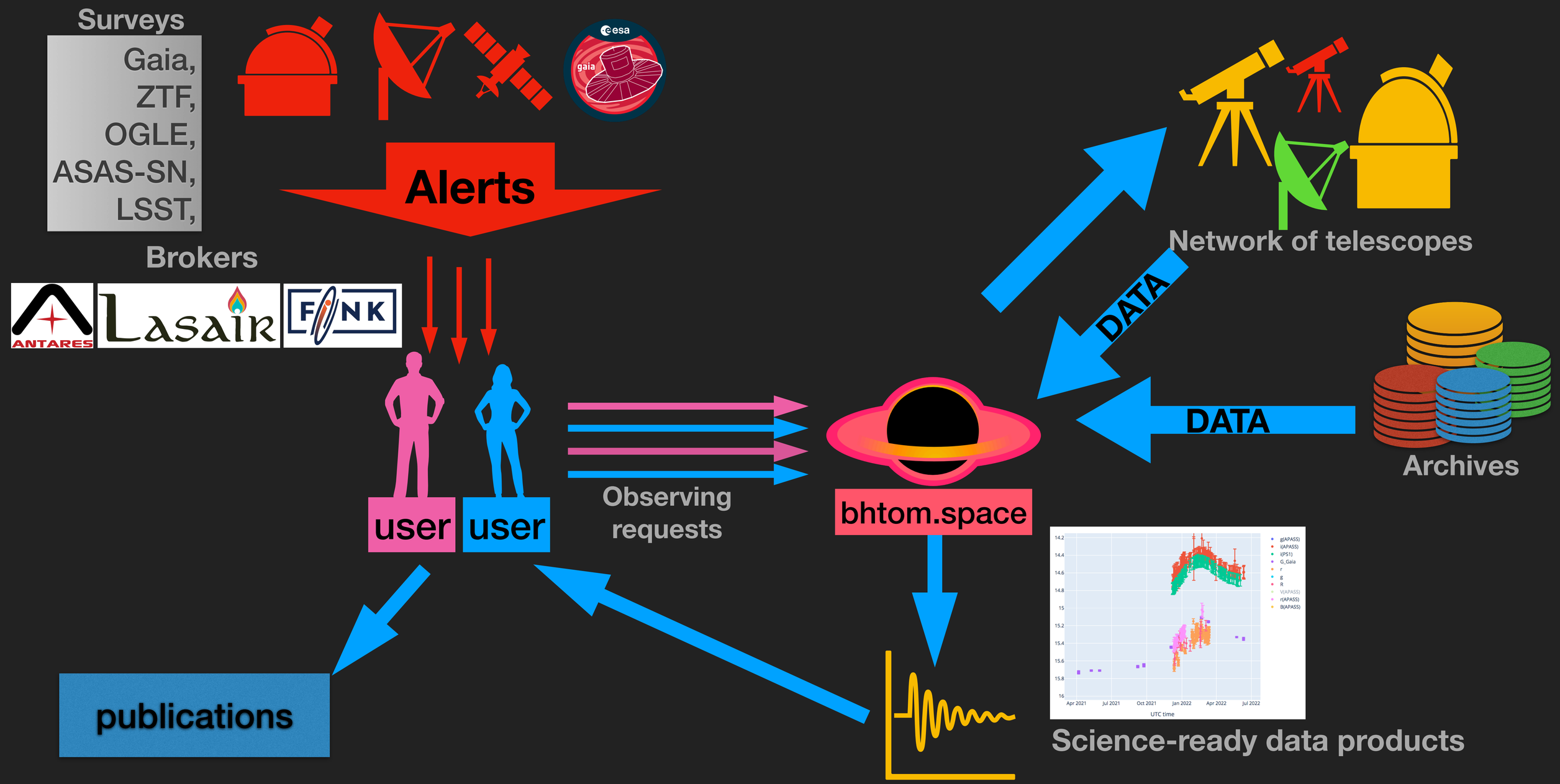
Archives
Science-ready data products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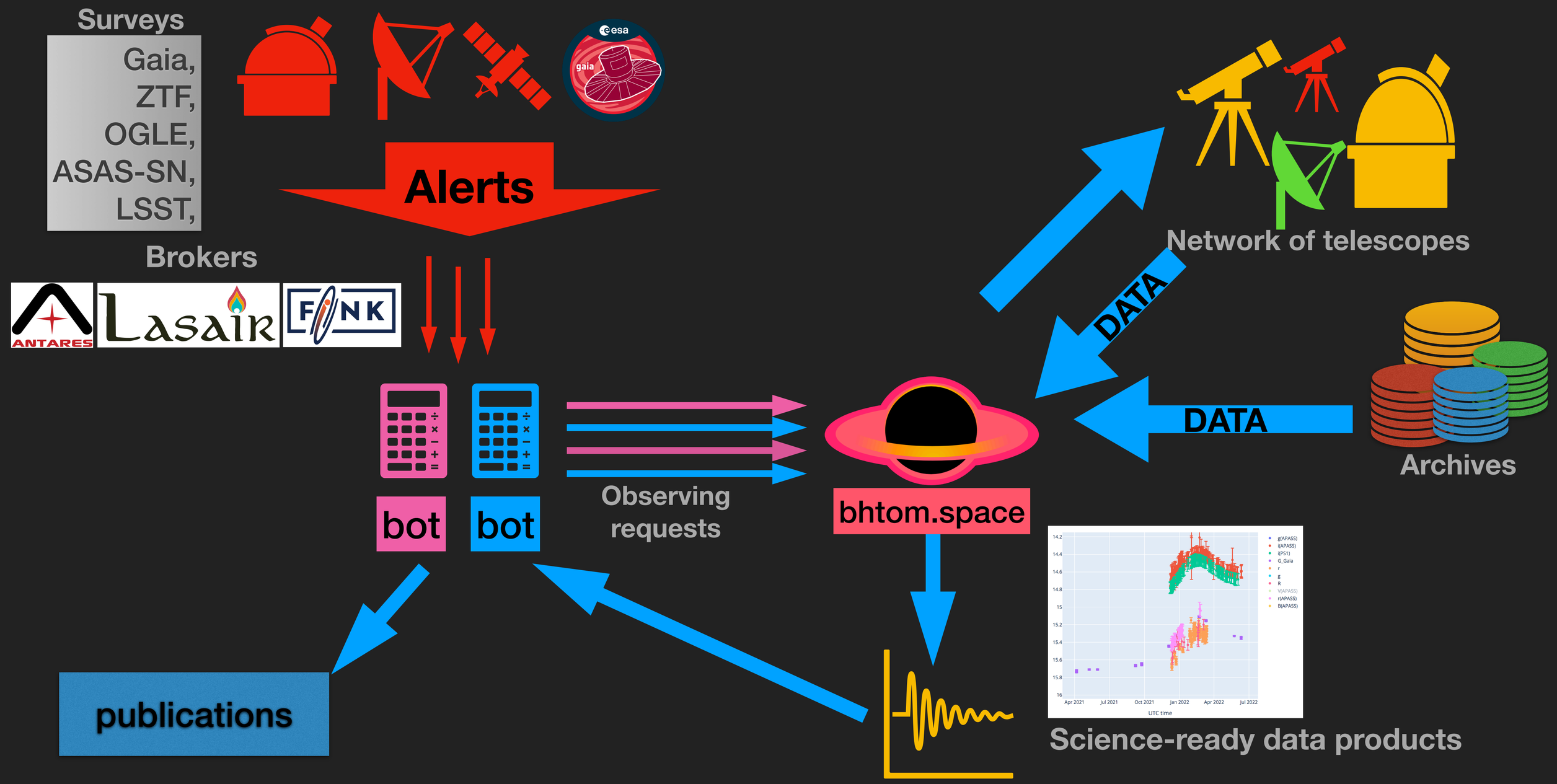
publications
Science-ready data products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DATA
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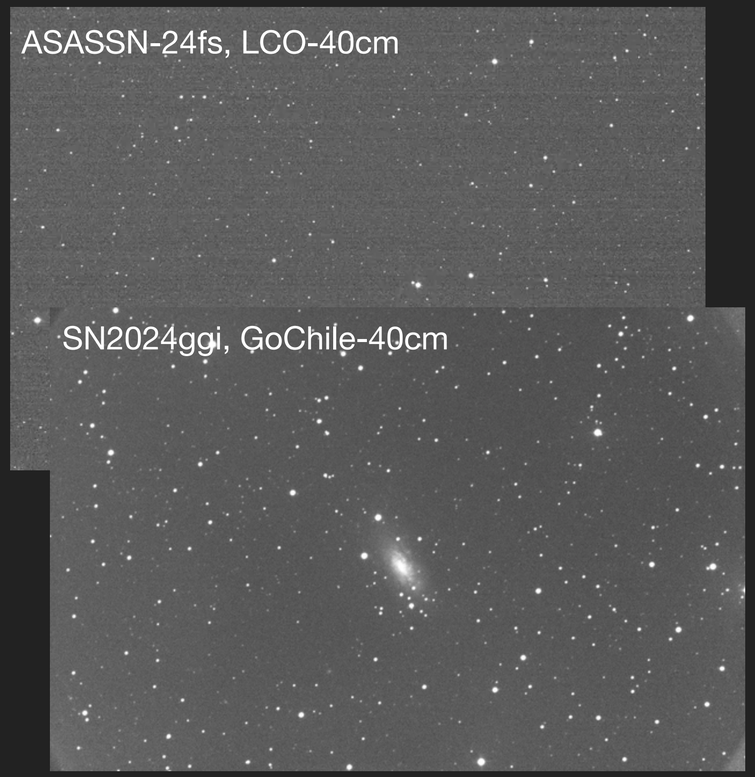
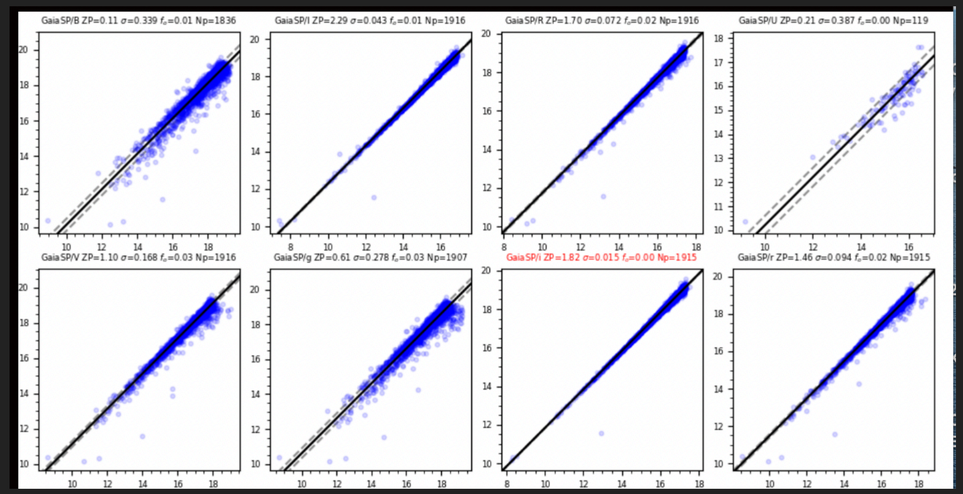
publications
Science-ready data products

BHTOM – FROM IMAGE REQUEST TO SCIENCE-READY LIGHT CURVES

- fully automated data processing - PSF photometry
- standardisation of observations from any filter to Gaia Synthetic Photometry
- downloadable and science-ready - for registered users

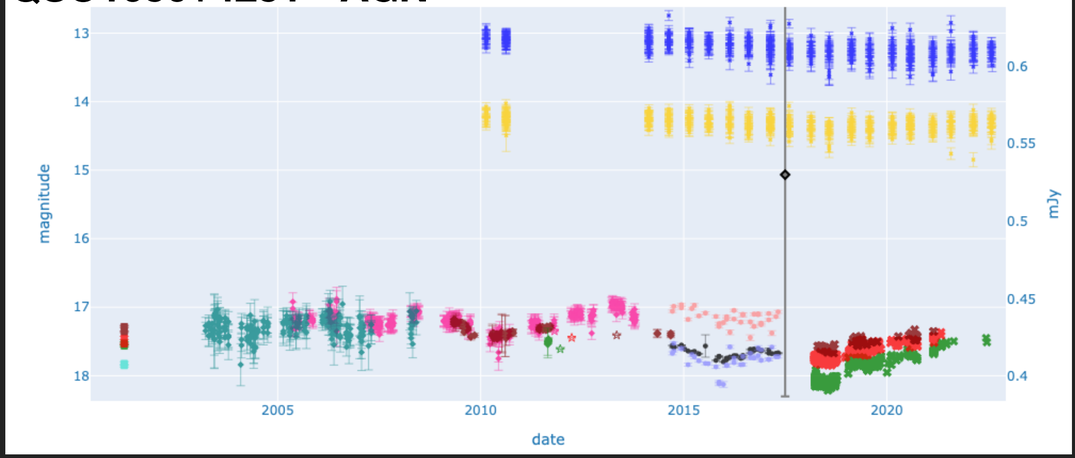




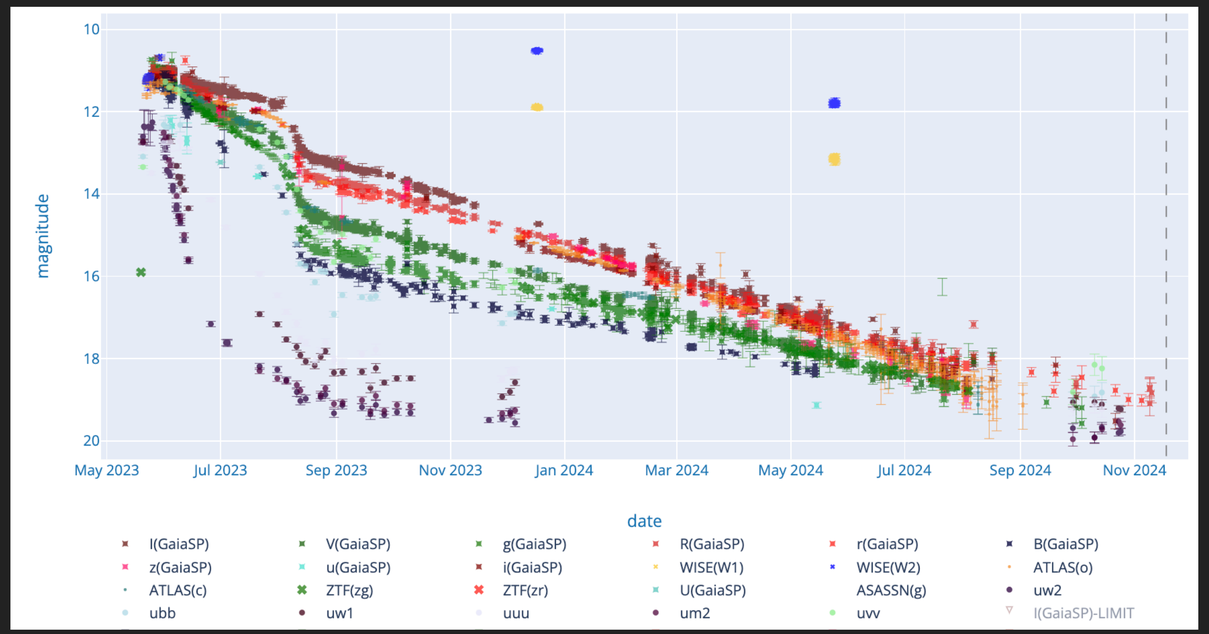
Automated detection of filter
and zero-point fit to Gaia Synthetic Photometry

BHTOM – SCIENCE CASES

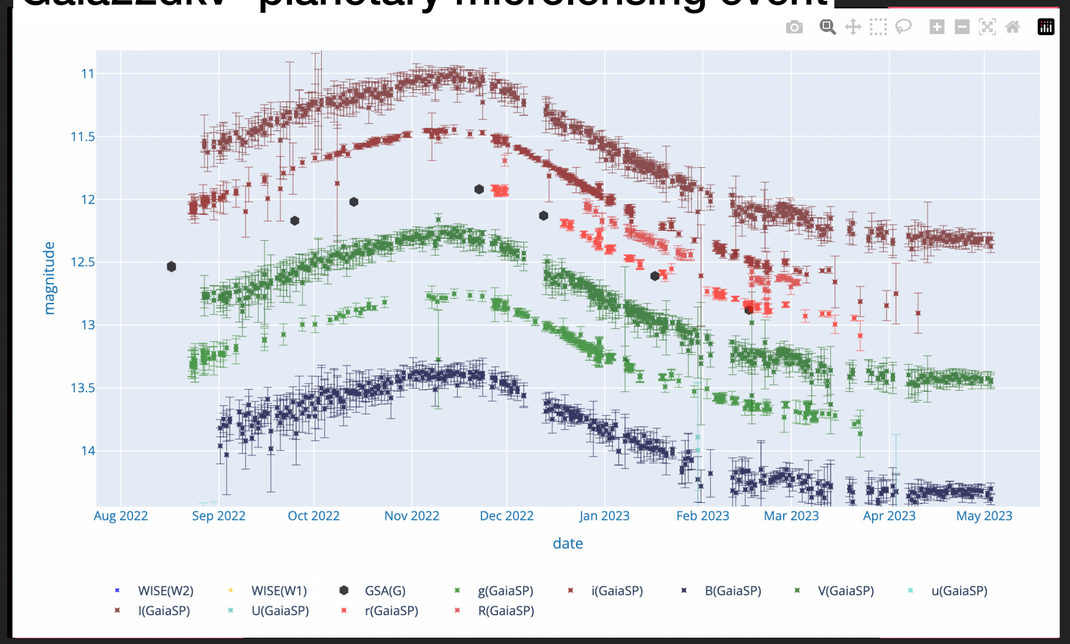
QSO1650+4251 - AGN



SN2023ixf - from X, UV to IR

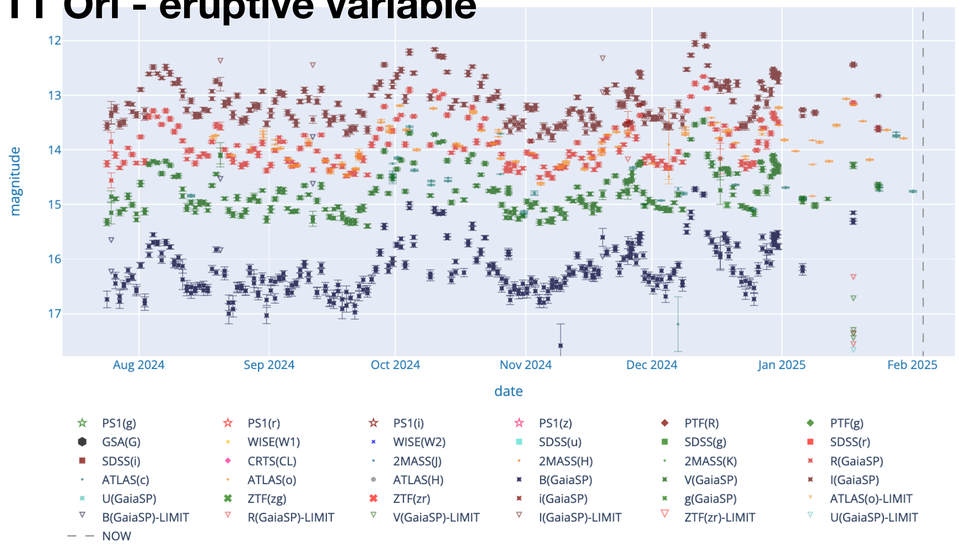


Gaia22dkv -planetary microlensing event



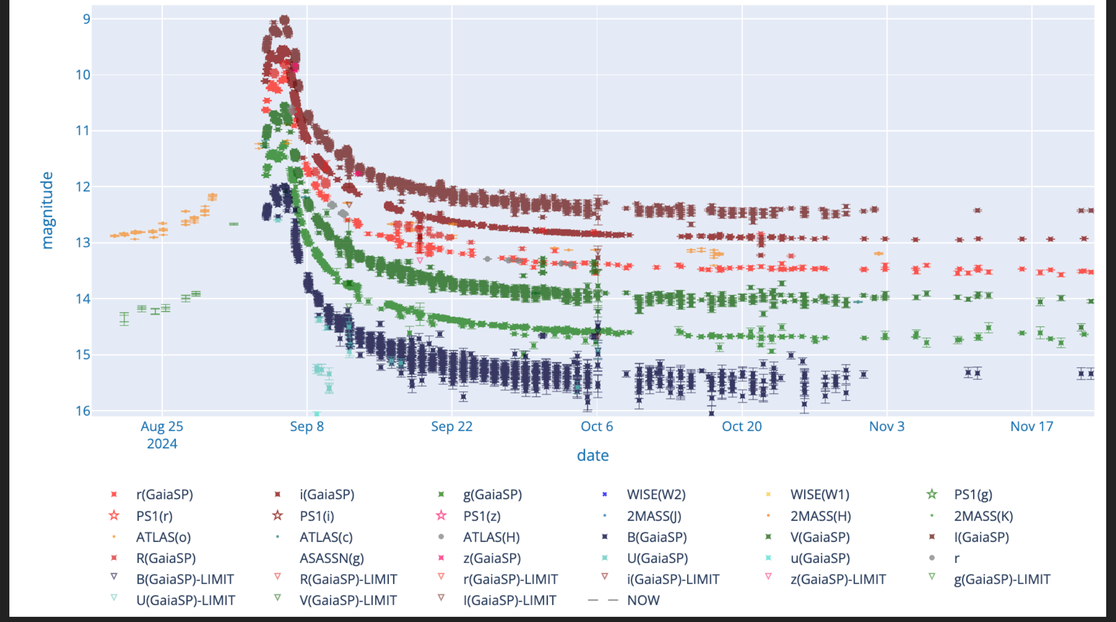
BHTOM – SCIENCE CASES

TT Ori - eruptive variable



SN2024ggi

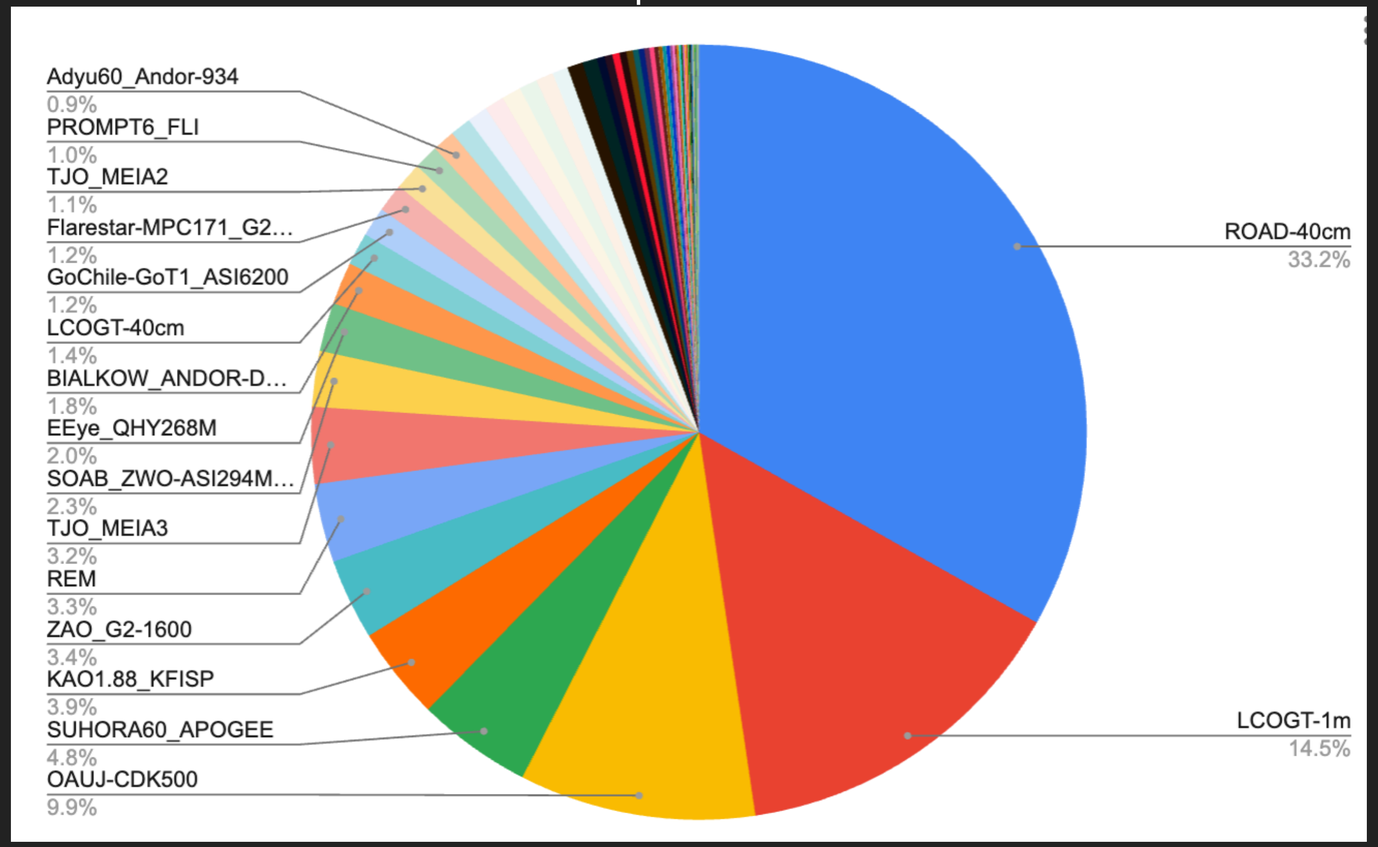
ASASSN-24fs - long binary microlensing event



DATA STATS

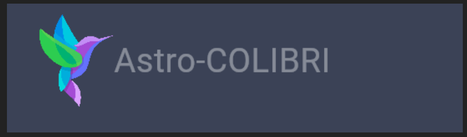
- 450 users registered as of Jun 2025
- 400 targets currently requested for observations
- 220,000 images processed
- ~10,000 images processed per week
- 22m measurements stored (including archival)
- We invite new telescopes!
- We invite new users!

BHTOM uploads 2023-2025



BHTOM – PROGRAMABLE ACCES (API)

- All functionalities of BHTOM are accessible via API
- Scripting the data flow to/from telescopes, observing requests, images upload for processing
- Astro-COLIBRI connected already!
- We provide ready scripts for: data download, data upload, target selection



BHTOM2 API Documentation

DATA DOWNLOAD API

Here we present end-points how to download the photometry and radio data from BHTOM.

Please contact us if you plan to use the data in a publication. By downloading the data from BHTOM you agree to follow our data policy and to use this acknowledgment:

```
The data was obtained via [BHTOM](https://bhtom.space), which has received funding from the European Union's Horizon
```

For more information about acknowledgement and data policy please visit https://about.bhtom.space

1. Photometry download

With this API one can download all photometric observations (magnitudes) in semi-color separated form. The columns of the output are the following:

MJD;Magnitude;Error;Facility;Filter;Observer

Request

- **Method**: POST
- **URL**: `/targets/download-photometry/`

BHTOM – NEWSLETTER

https://groups.google.com/g/bhtomtargets

BHTOM Targets for 16 September, 2024

0 views

Lukasz Wyrzykowski <wyrzykow@gmail.com>

13:02 (5 hours ago)

to bhtomtargets@googlegroups.com

Hello,

Greetings from the BHTOM Automated Newsletter!

As of 2024-09-16 10:01:58.253129+00:00, these are the new targets added in the last week, sorted by magnitude:

name	ra	dec	mag_last	sun_separation	classification	description
V1725 Sco	256.693920	-35.468560	10.6	86.0	Nova	Astro-COLIBRI target
Mrk 42	178.424000	46.211833	15.6	44.0	AGN	None
WISEA J091848.61+211717.0	139.702580	21.288110	16.8	38.0	AGN	X-ray variable AGN
2MASX J00414632-	10.443019	-28.461840	17.0	150.0	Unknown	X-ray supersoft source
		756	17.0	27.0	QSO	variable quasar probably binary SMBH, not for observations
		9460	17.5	61.0	Unknown	Gaia and GALEX source brightens by ~1 mag
		889	17.6	58.0	Unknown	X-ray supersoft source
		390	17.9	68.0	Unknown	long-term rise in Gaia and SDSS source
		883	18.8	114.0	Microlensing Event	Candidate microlensing event from Chinese KATS survey, KATS24Q003.

Last week's fits uploads score (sorted by count)

observatory-user	count
Franz-Josef Hambsch (ROAD_QHY600M)	1781
Rachel Street (LCOGT-Teide-40cm_QHY600M)	412
Waldemar Ogloza (Planetarium_Slaskie_Kepler4040)	294
Rachel Street (LCOGT-HO-40cm_QHY600M)	276
Sjoerd Dufoer (EEye_QHY268M)	210

EUROPEAN ASTRONOMICAL SOCIETY OF SMALL TELESCOPES (EASST)

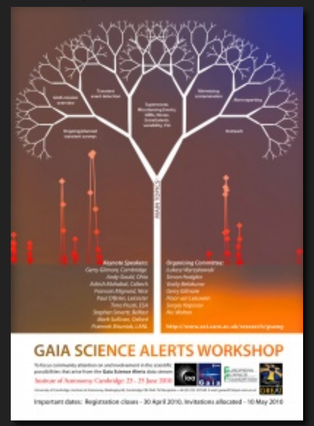
https://easst.eu

- 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, outreach and space industry
- Enhancing telescope technology
- Protecting dark skies
- We seek new partners!

Funded on Valentines Day 2025

WORKSHOPS SINCE 2010

2010-Cambridge



2011-Cambridge

2012-Bologna

2013-Paris

2014-Warsaw

2015-Liverpool

2016-Utrecht

2017-Warsaw

2018-Vipava

2019-Catania

2020 - on-line

2021-Crete

2022-Sardinia

2023-Malta

2024-Crete

2025-Tenerife

ARCHIVAL RECORDINGS: HTTPS://GSAWG.WIKI.AST.CAM.AC.UK

WORKSHOPS SINCE 2010

2010-Cambridge

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2013-Paris

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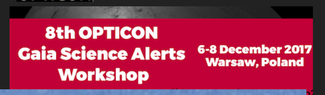
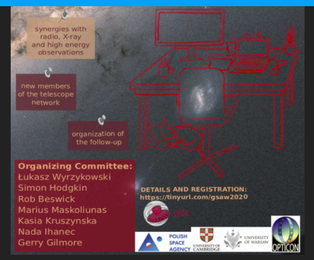


https://meetings.iac.es/gaiaalerts25/



ARCHIVAL RECORDINGS: HTTPS://GSAWG.WIKI.AST.CAM.AC.UK

thank you!

LW@ASTROUW.EDU.PL

BHTOM.SPACE

EASST.EU