

ELKH Research Centre  
for Astronomy and Earth Sciences  
Konkoly Thege Miklós  
Astronomical Institute



**Recent past, present and  
future of the  
Konkoly Observatory**



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director

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25 November 2021

150 éves az ógyallai csillagvizsgáló, Hurbanovo/Ógyalla, Szlovákia

# “Konkoly Observatory”, Budapest

- Nicolaus Konkoly Thege (1842 – 1916)
- Nobleman, composer, captain, locomotive driver
- Member of the Parliament, member of the Academy
- Founded a private observatory in Hurbanovo (Ógyalla), Slovakia
- photography, geophysics, seismology, meteorology, instrument building





# Konkoly Observatory, Budapest



- An institute of the Eötvös Loránd Research Network (1871 - 1899 - 1919 - 1949 - 2019)

- Since 2012: one of the three institutes of the Research Centre for Astronomy and Earth Sciences

- Astronomical Institute (aka Konkoly Observatory)

<https://konkoly.hu>

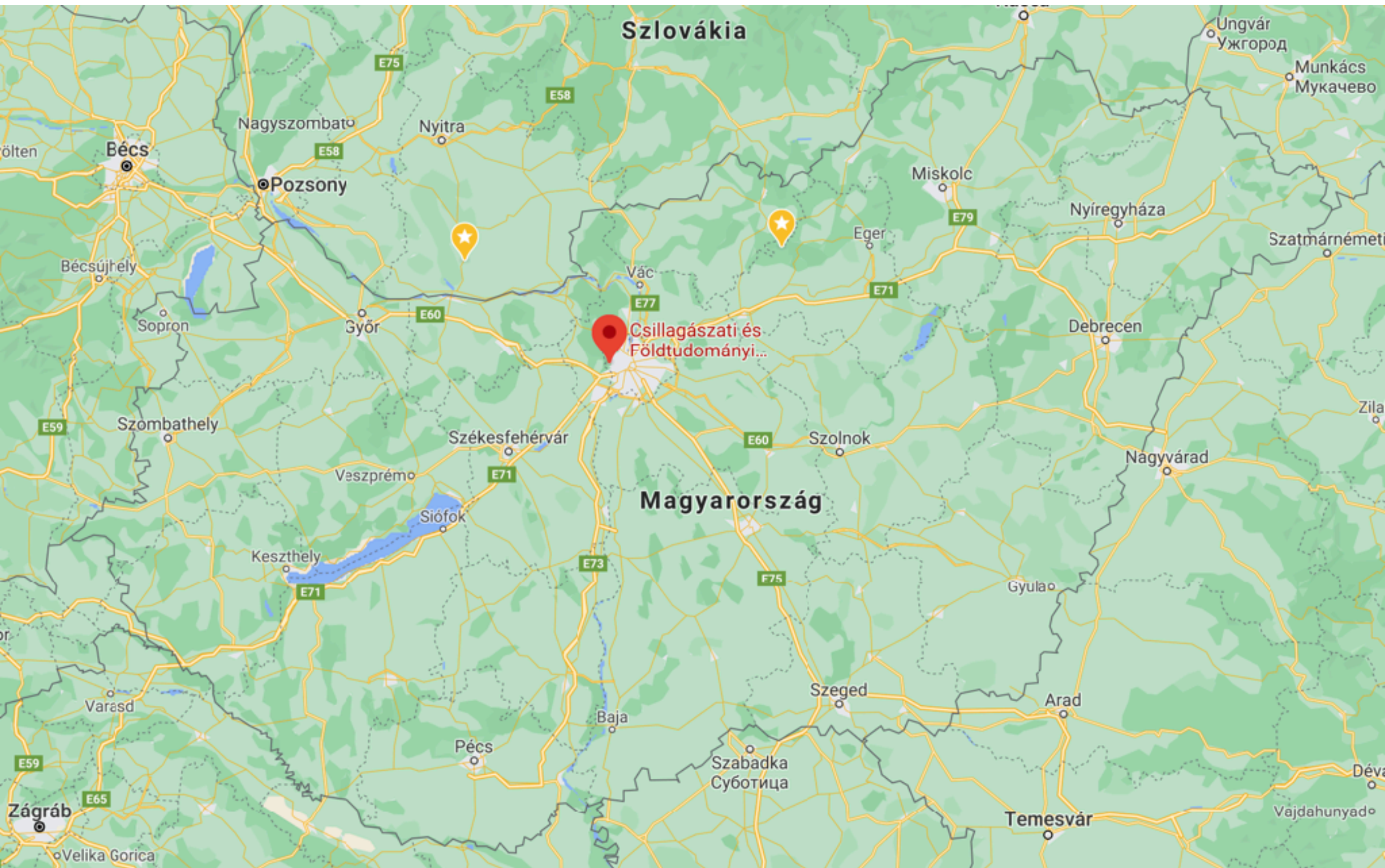
- Institute for Geological and Geochemical Research

- Geographical Institute





# Piszkéstető Mountain Station





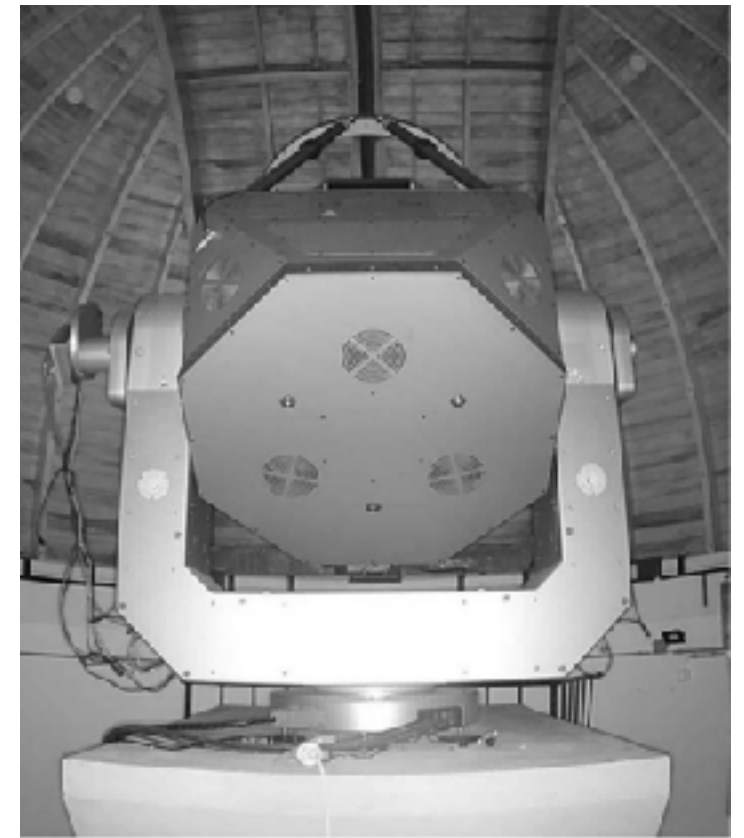
# Piszkéstető Mountain Station



1m RCC

60/90 cm  
Schmidt

0.8m robotic



# **RESEARCH TOPICS**



# Research topics of the Konkoly Observatory

## Stellar physics

- pulsating stars, eclipsing binaries
- stellar activity
- solar physics

## Physics of circumstellar space

- star formation
- exoplanets
- small bodies in solar systems

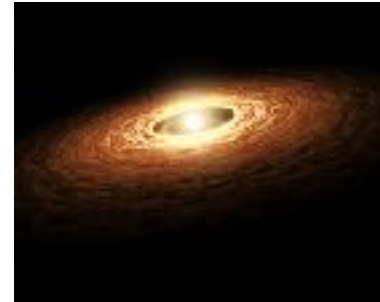
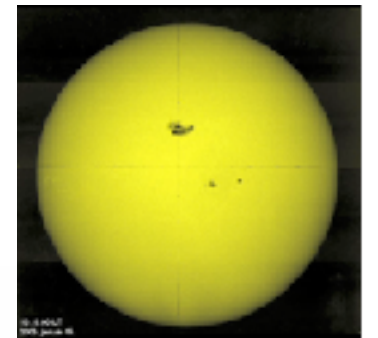
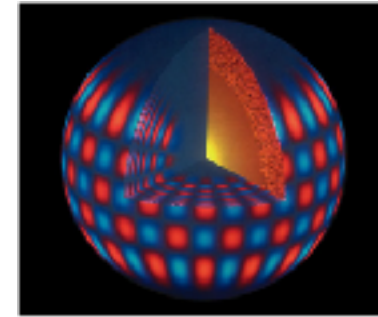
## Extragalactic research

- Supernovae, high-energy transients, AGN
- Radio astronomy, VLBI

## Nuclear astrophysics

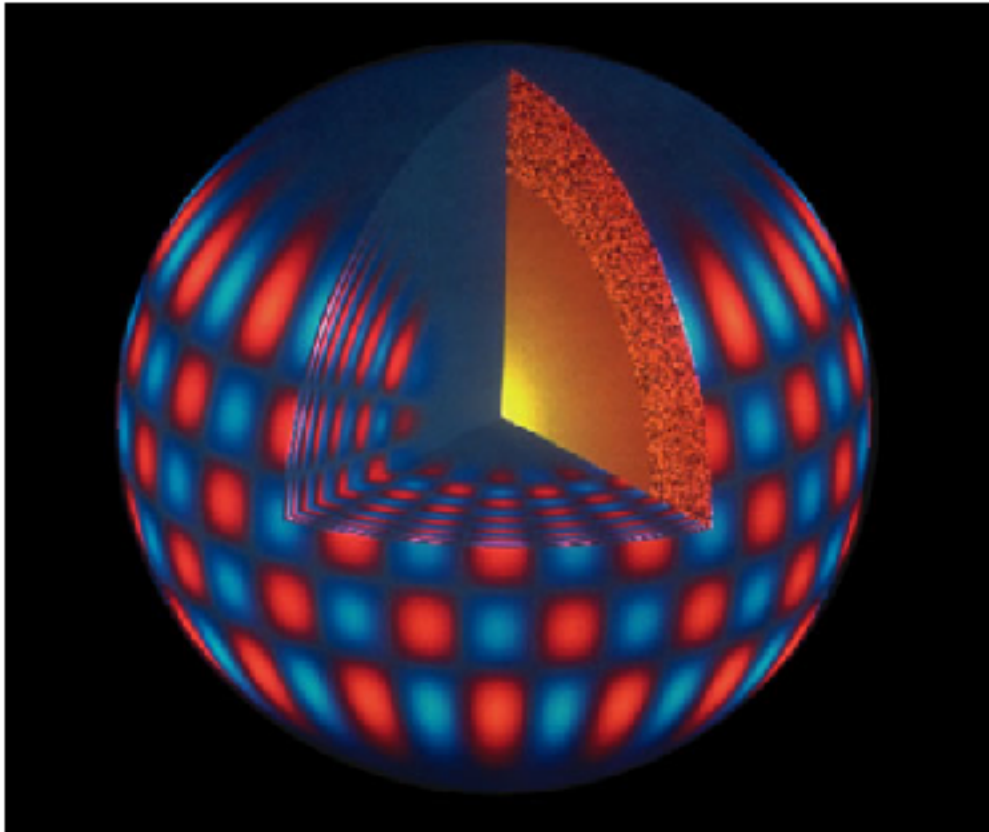
## Instrument building

- cubesats, ELT instruments



## History of astronomy

# Stellar pulsations, asteroseismology



Classical, internationally well-recognized research field

Physics of stars, internal structure and evolution

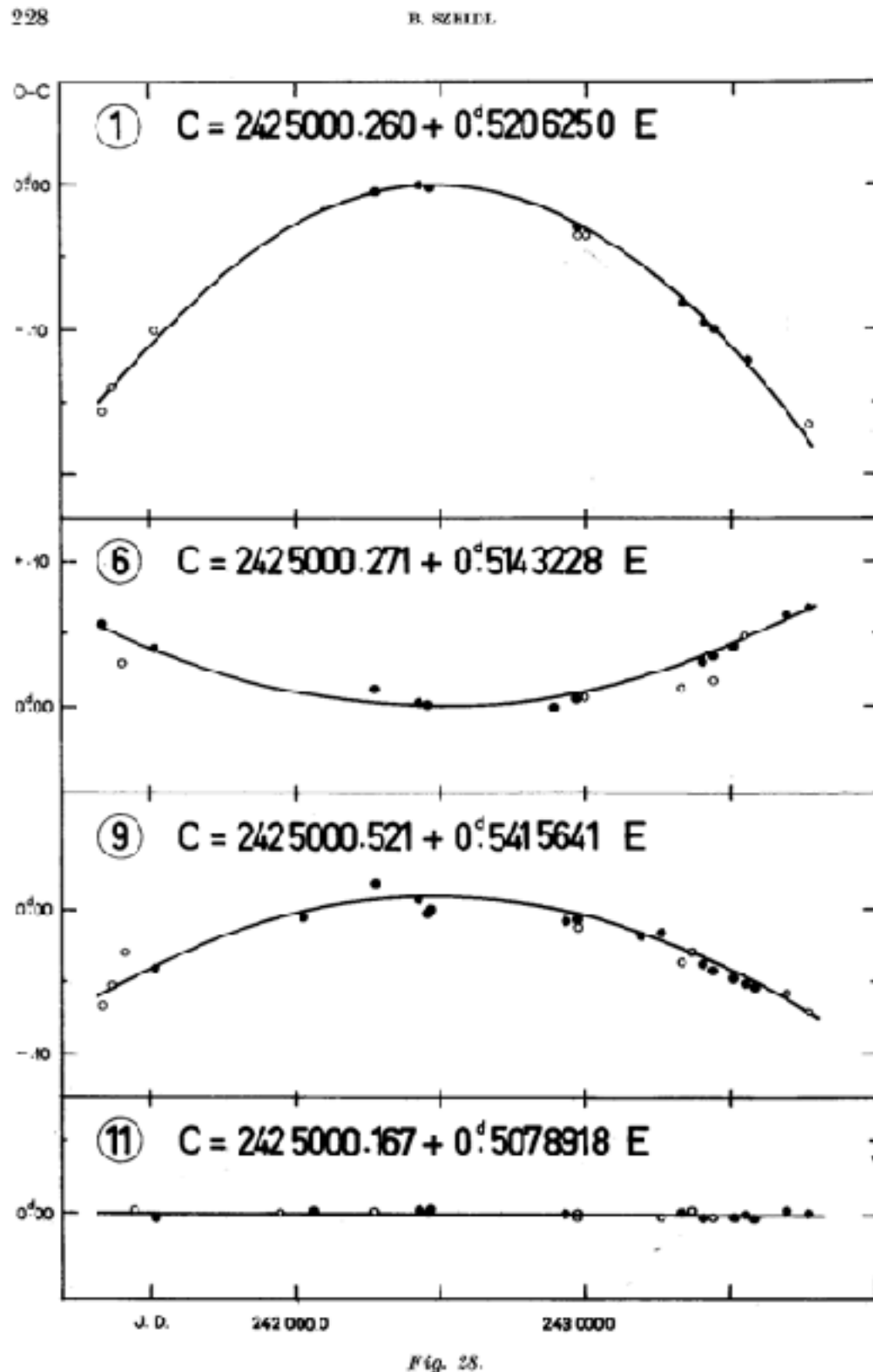
Space photometry (CoRoT, Kepler/K2, MOST, TESS, PLATO, ...)

Theory of pulsations, dynamical phenomena, numerical simulations

Galactic structure, distance scale, galactic archaeology (Gaia, LSST, ...)



# Stellar pulsations, asteroseismology



Classical pulsating variable stars

Cepheids, RR Lyrae stars, delta Scuti

Period variations, evolutionary connection

Blazhko-effect

COMMISSIONS 27 AND 42 OF THE IAU  
INFORMATION BULLETIN ON VARIABLE STARS

Jubilee of the Information Bulletin on Variable Stars

Konkoly Observatory  
Budapest  
28 September 2011  
HU ISSN 0374 - 0676

Jubilee Issue of IBVS:  
Half a Century of Variable Star Science Publishing

7 April 2011, Konkoly Observatory

Szeidl, 1965, CoKon 5  
The RR Lyrae stars in Messier 3

# Exoplanets



Ground-based projects (HATNet, HAT-South)

Data analysis, transit search (BLS, TFA, ...)

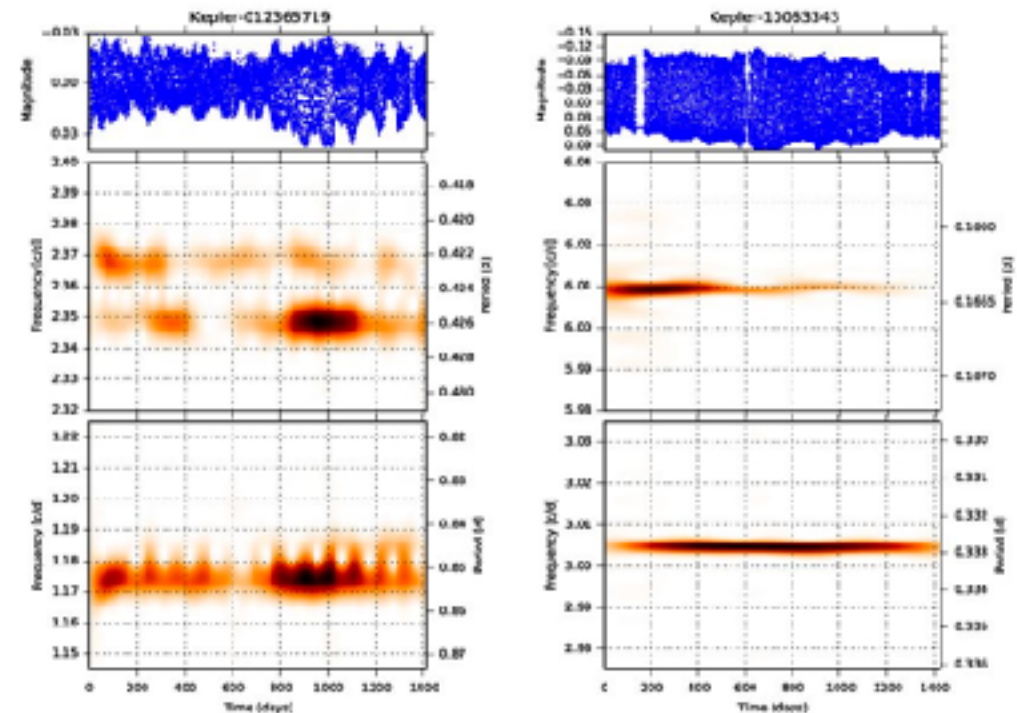
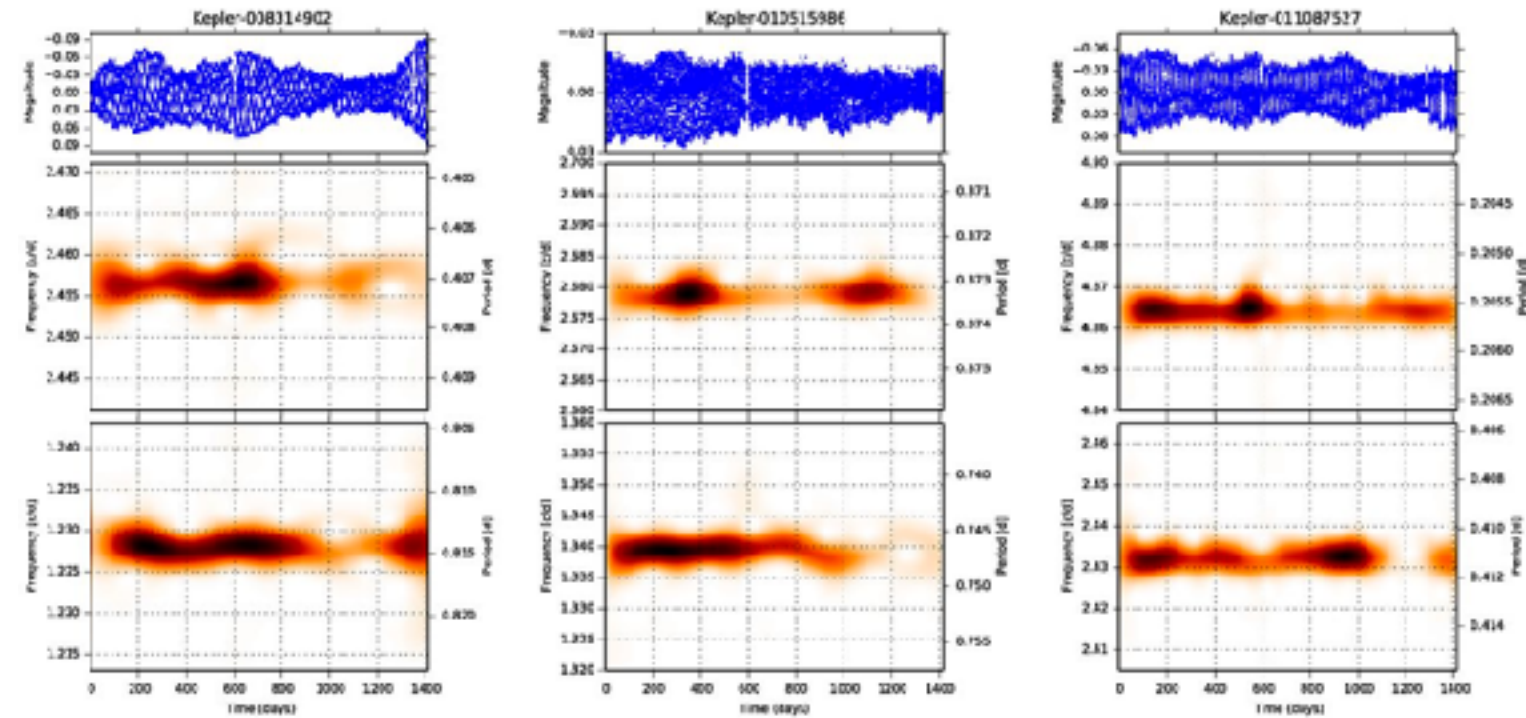
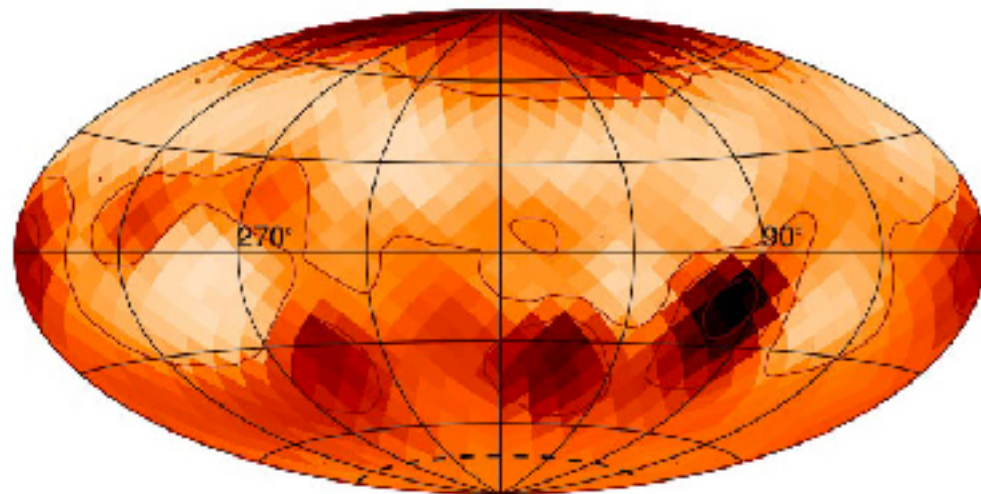
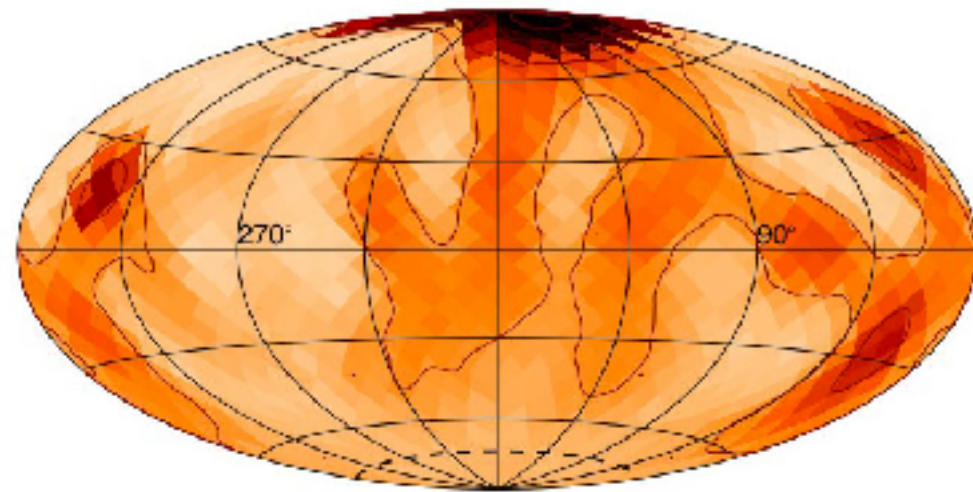
Space observations (CoRoT, Kepler/K2, TESS, CHEOPS, PLATO, ARIEL)

Planet formation (numerical simulations)

Exomoons, habitability



# Stellar activity, starspots



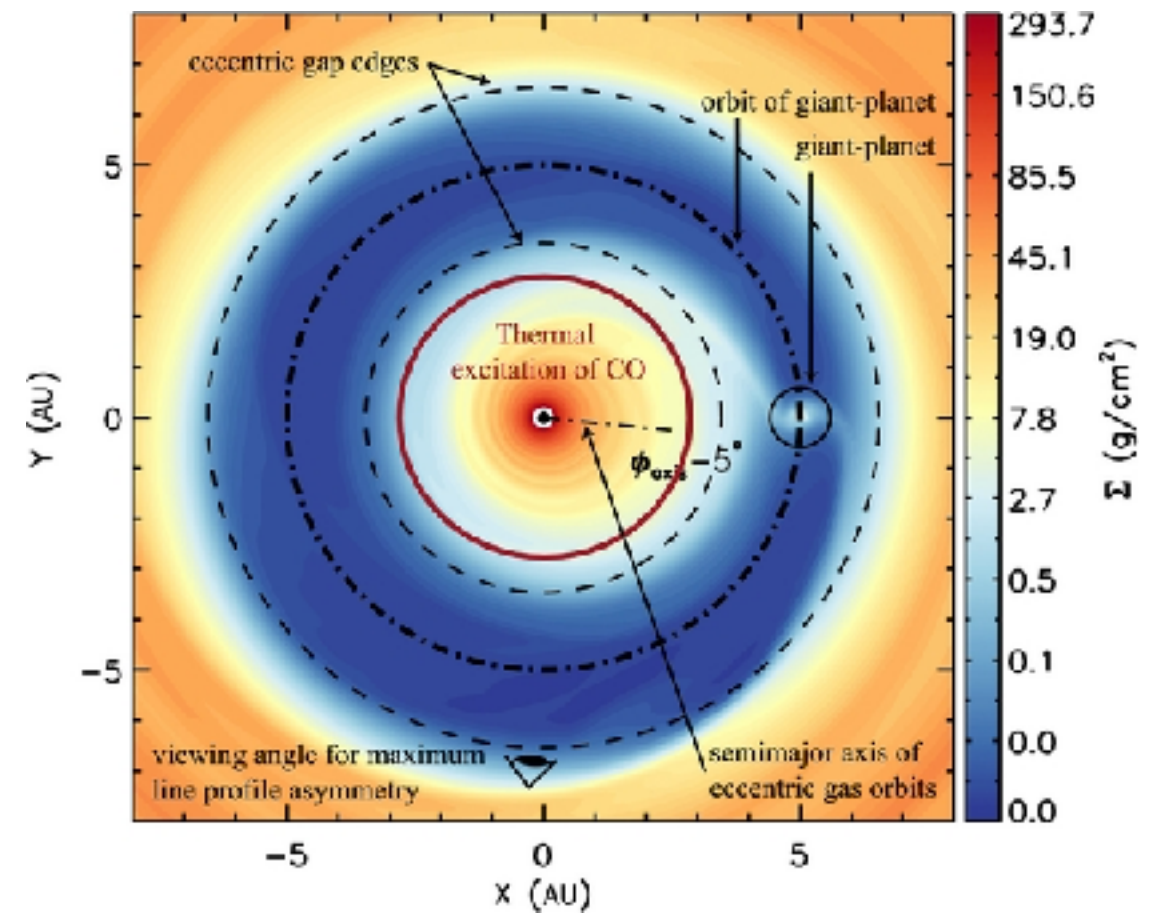
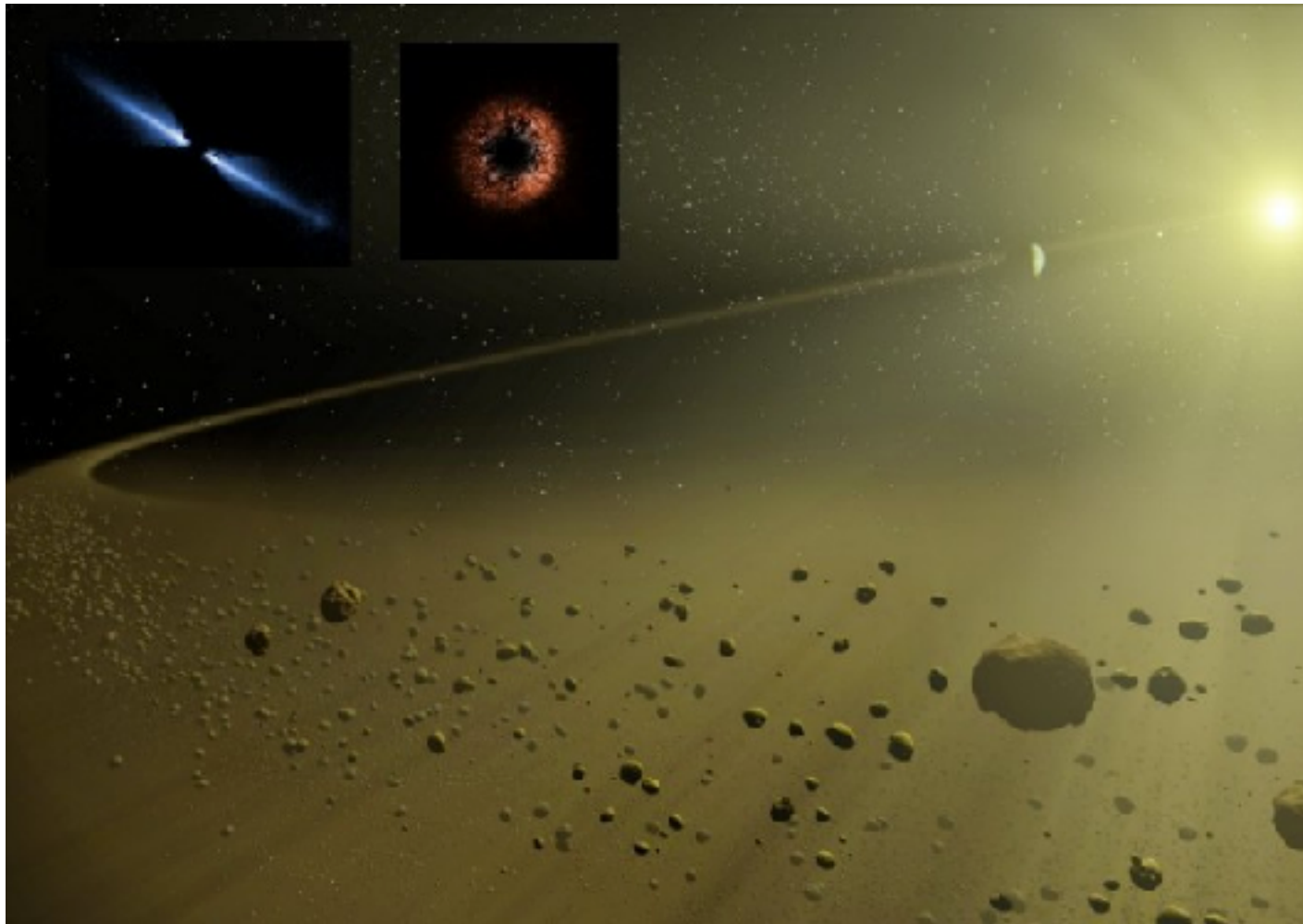
Activity cycles, Sun as a star

Active stars, binarity

Differential rotation, dynamo mechanisms

Doppler imaging and interferometry of stellar disks

# Star formation



Star and planet formation

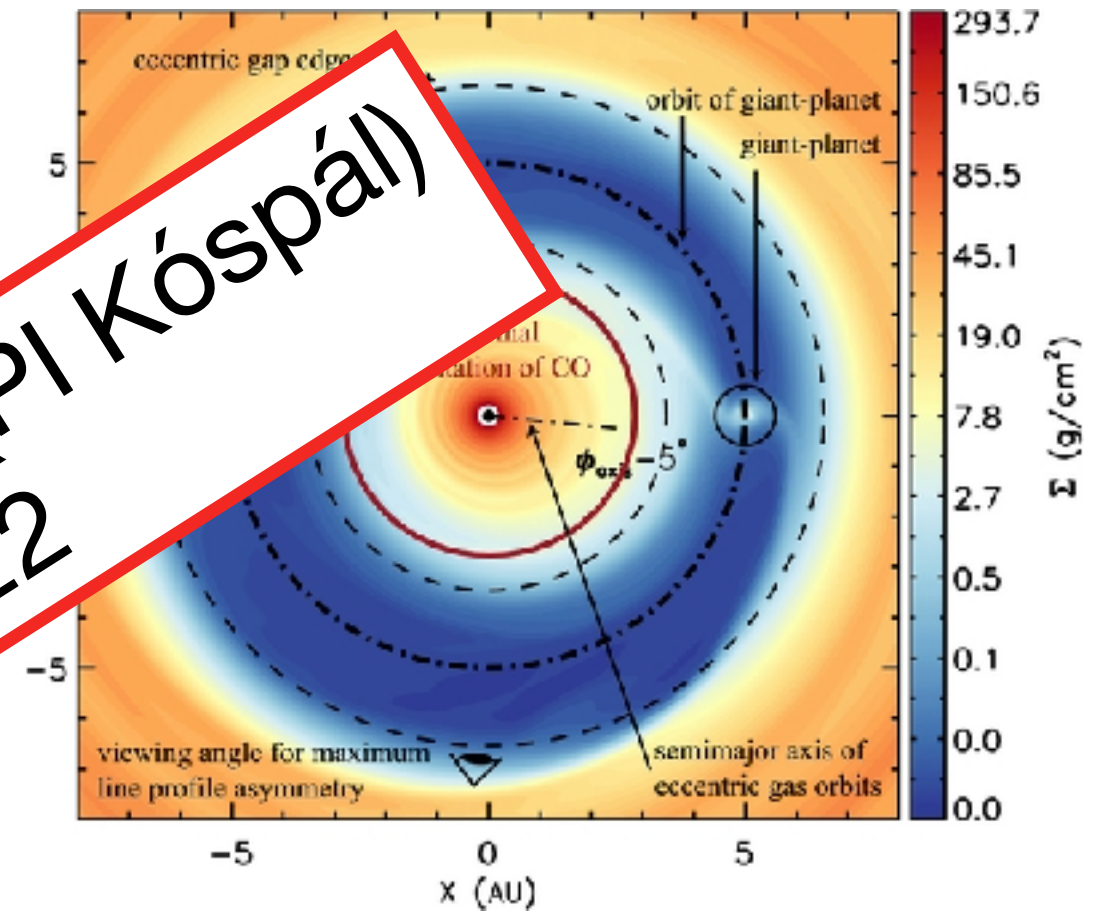
Theory and observations of protoplanetary disks

Young stars, interstellar matter

Infrared space telescopes, interferometry, VLTI, ALMA



# Star formation



ERC Starting Grant (PI Kóspál)  
2017-2022

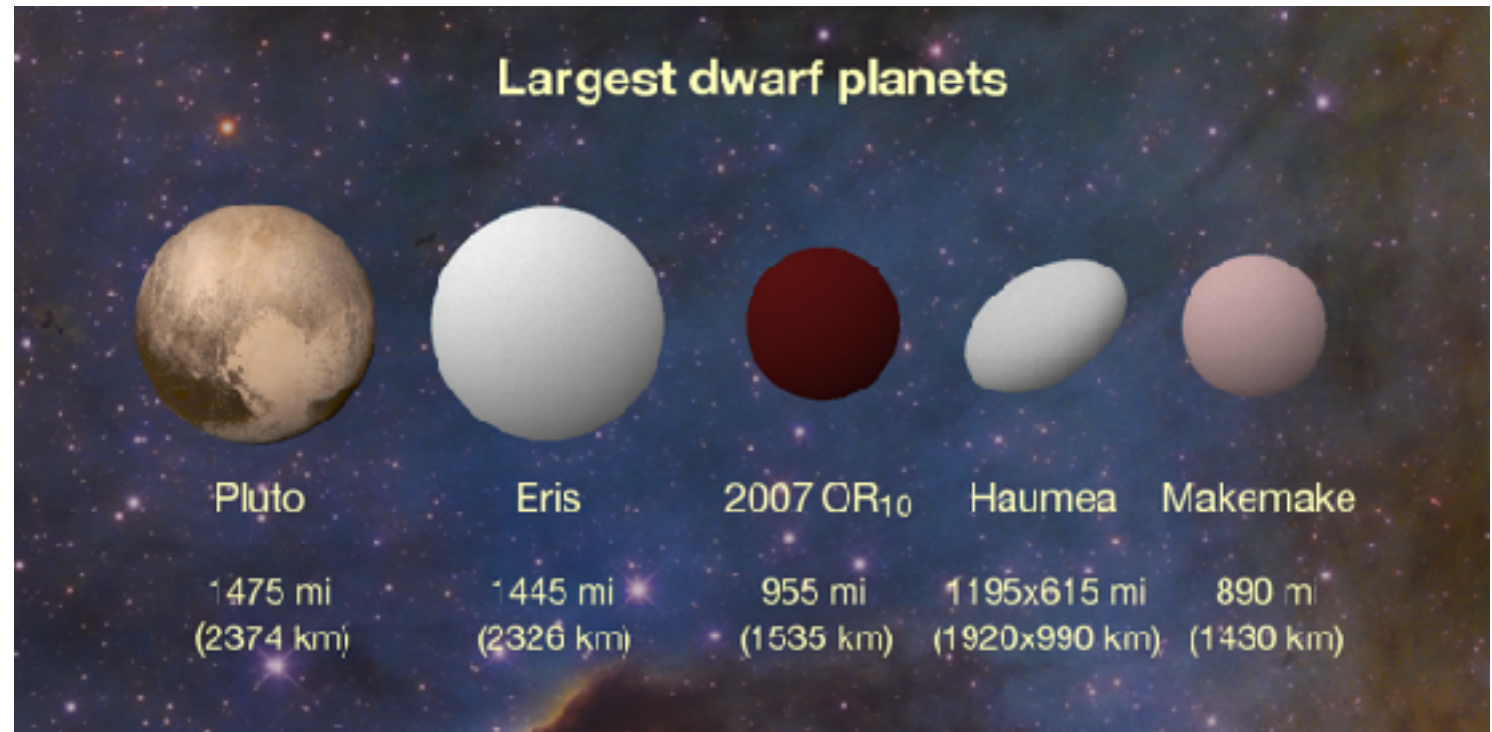
Star and planet formation

Theory and observations of protoplanetary disks

Young stars, interstellar matter

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# Small bodies in the Solar System



NASA press release, 11 May, 2016  
Largest Unnamed World in the Solar System  
'Gonggong'

Comets, minor planets, TNOs

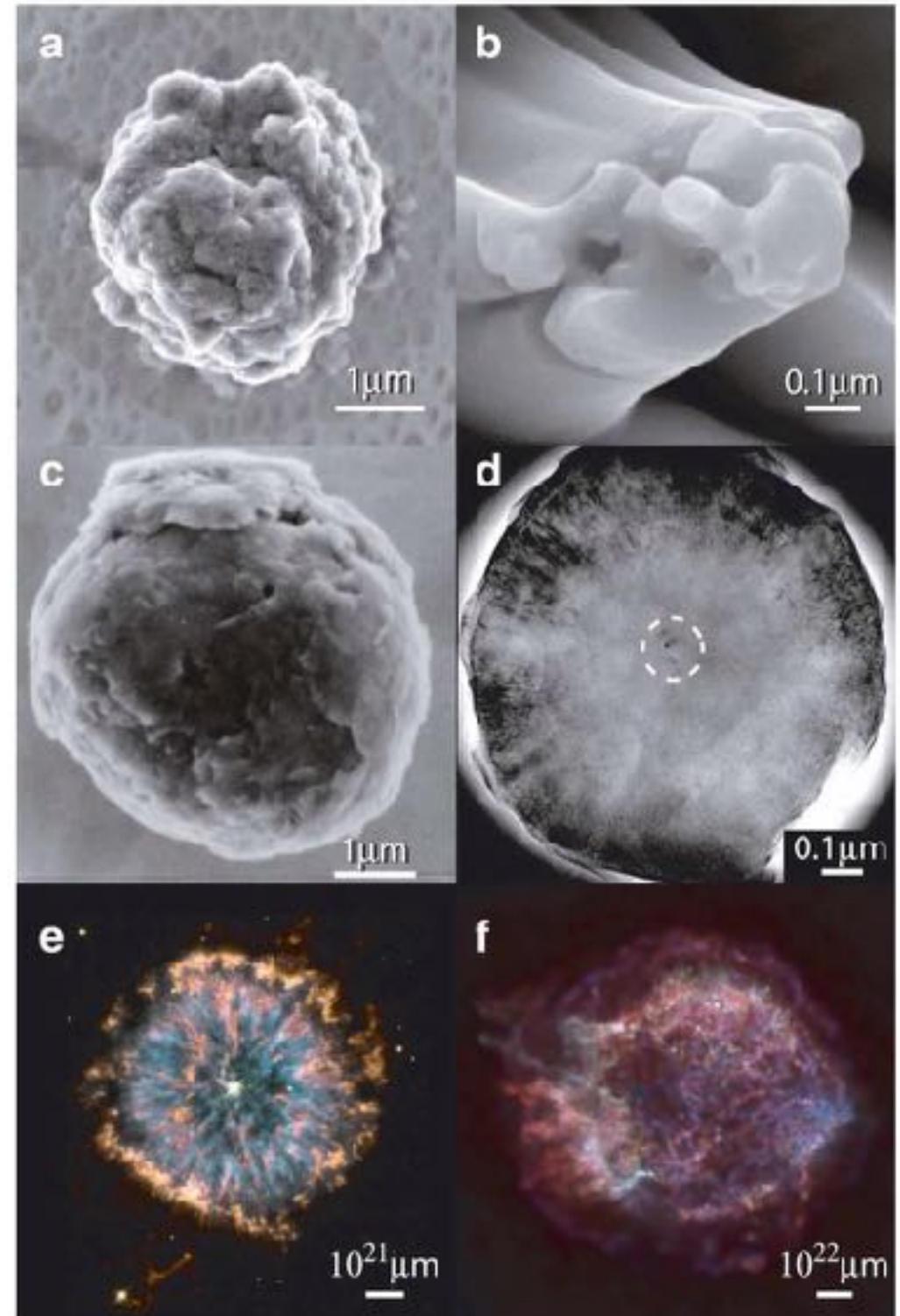
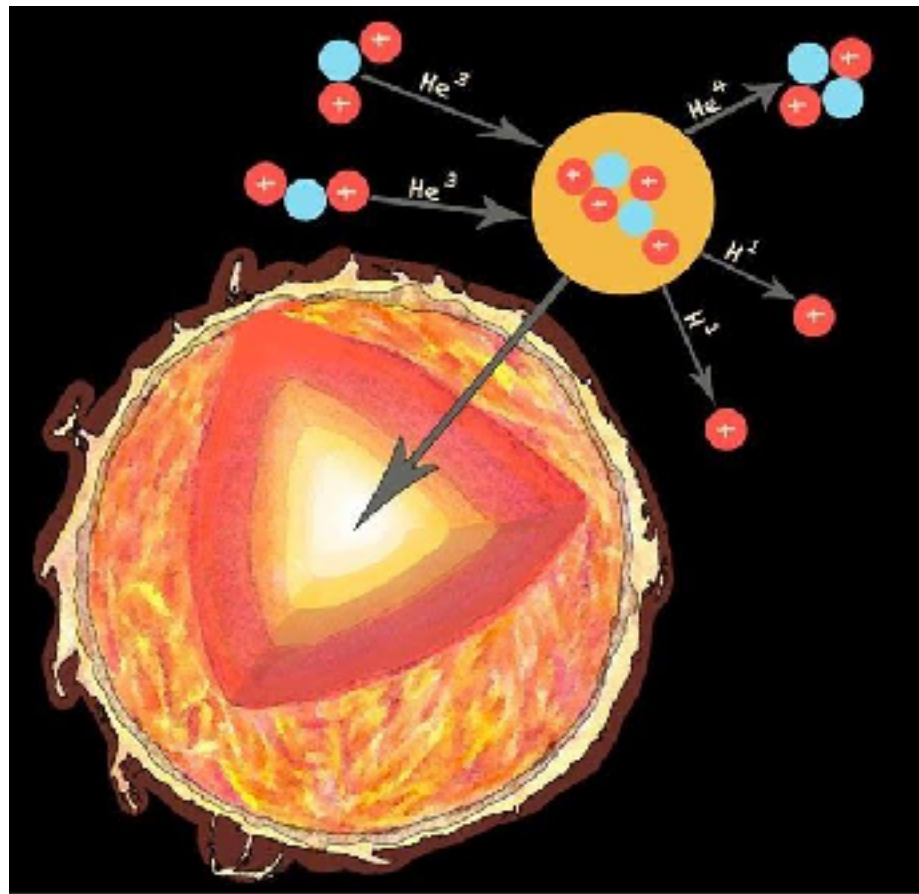
Photometry, HST-imaging – cometary nuclei

“TNO’s Are Cool” Herschel key project, thermophysical parameters

K2 applications in the Solar System, rotations



# Nuclear astrophysics

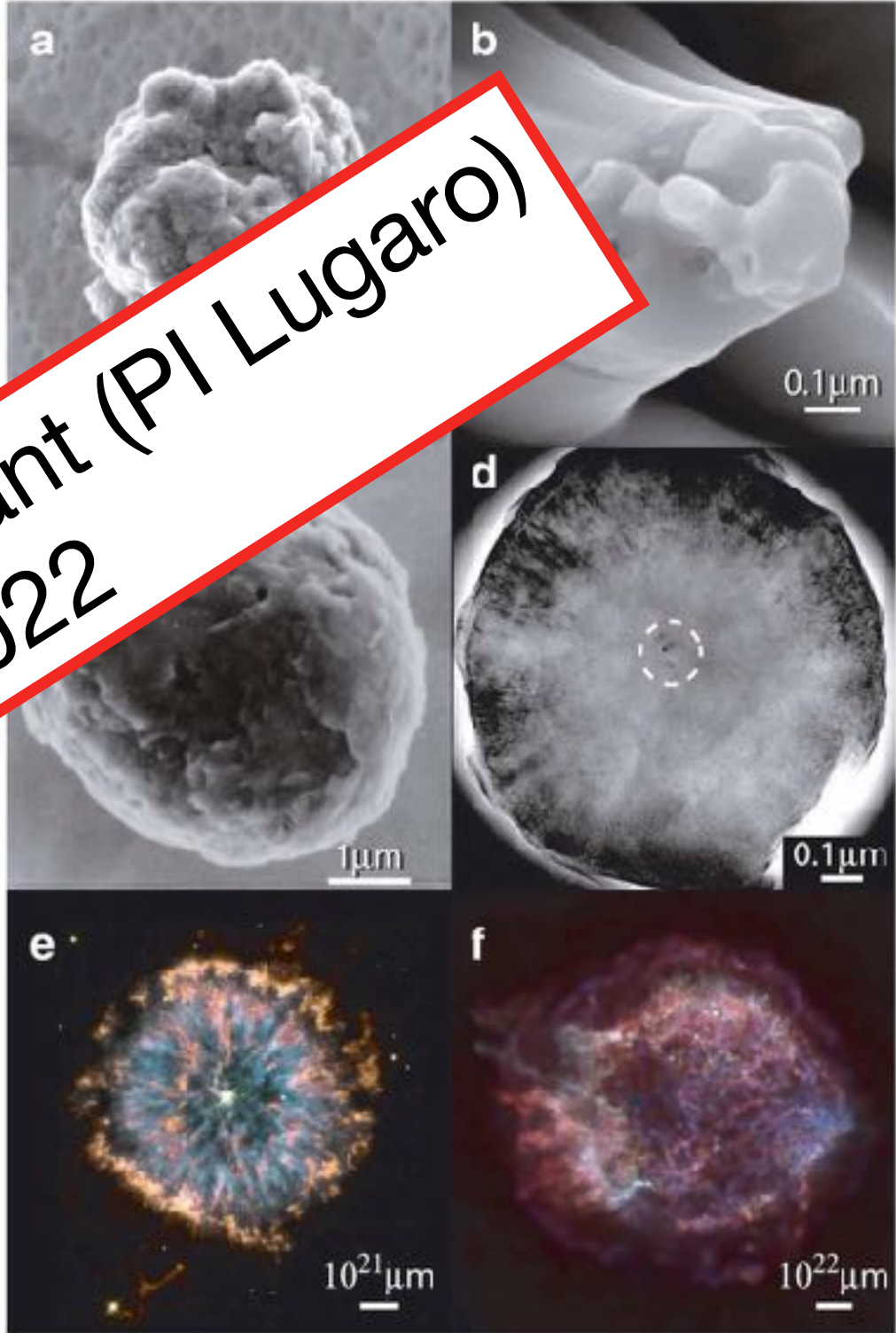
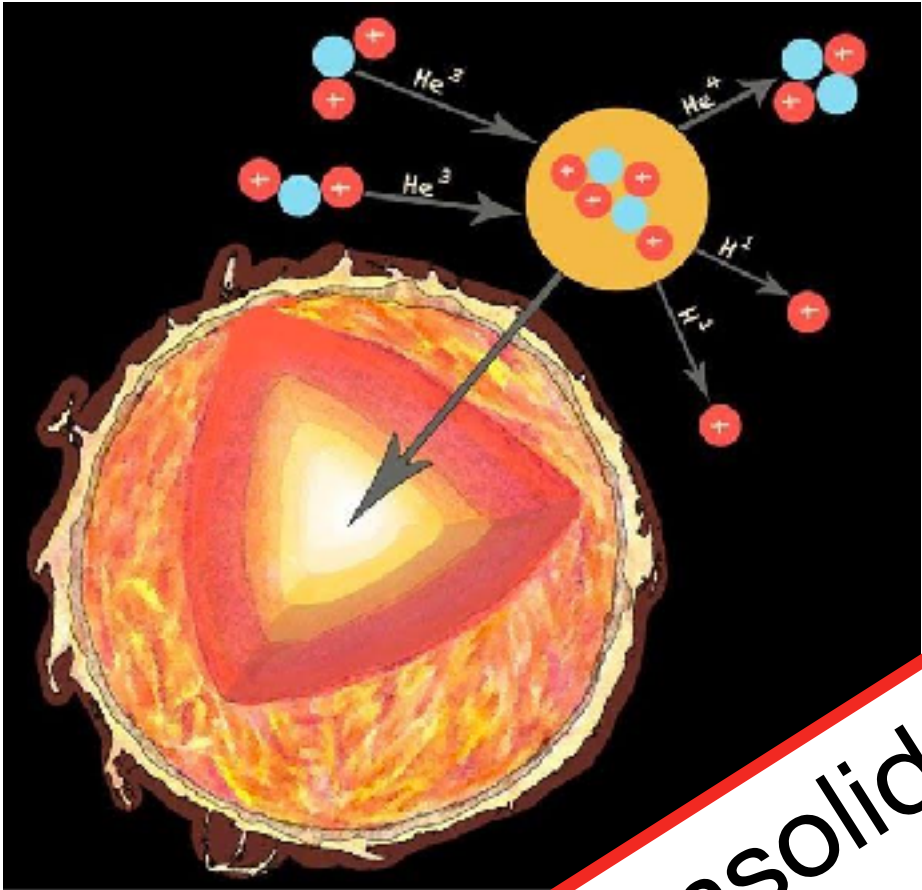


- Galactic chemical enrichment
- Structure and evolution of AGB stars
- Isotopes in star dust and meteorites
- Production of radioactive nuclei
- Spectroscopic surveys

PN

SNR

# Nuclear astrophysics



ERC Consolidator Grant (PI Lugaro)  
2017-2022

- Galactic chemical evolution
- Structure and evolution of AGB stars
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- Spectroscopic surveys

PN

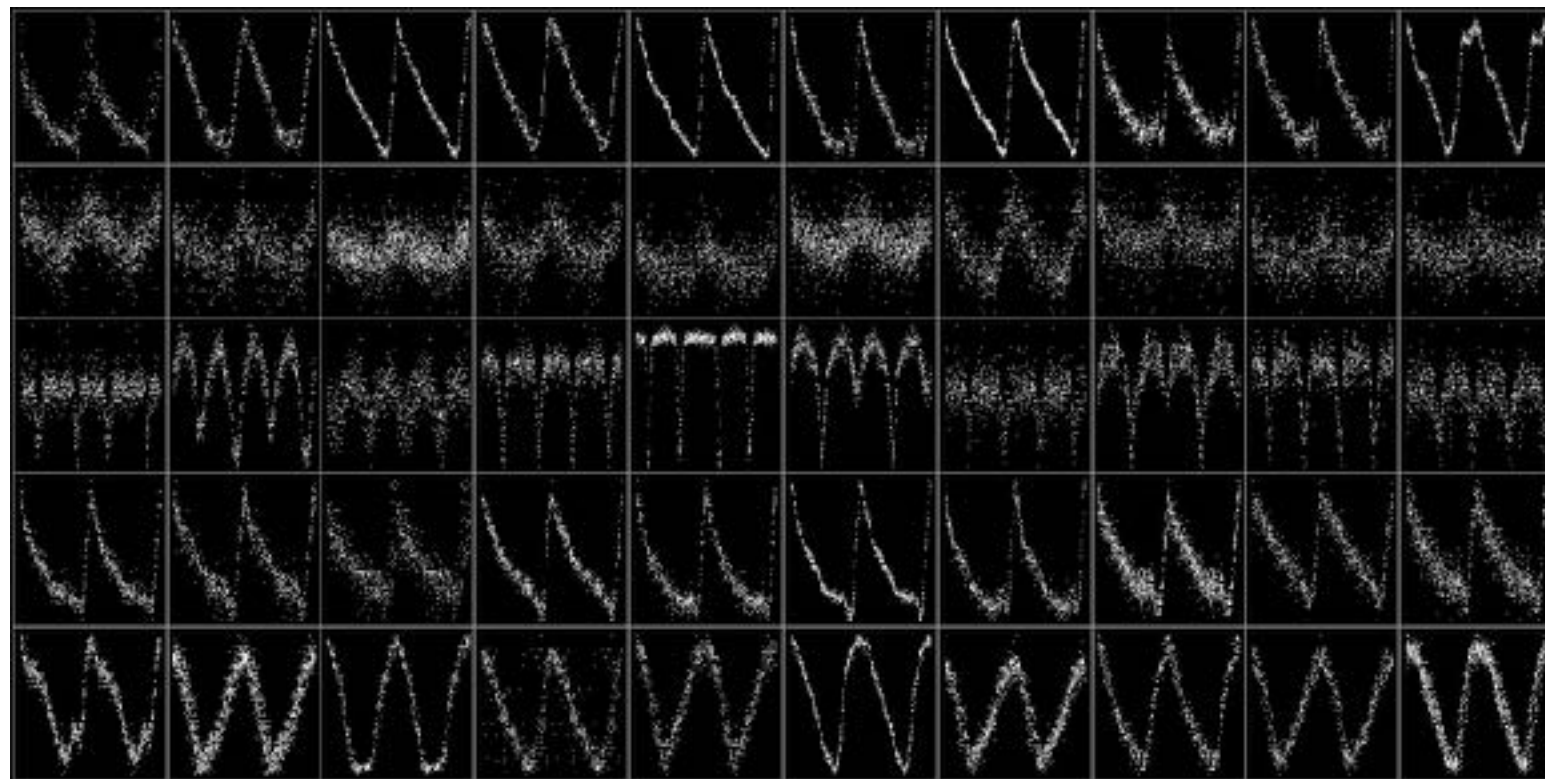
SNR



# Machine learning

## MTA CSFK Lendület Near-field Cosmology Research Group

Image (light curve) based classification of variable stars

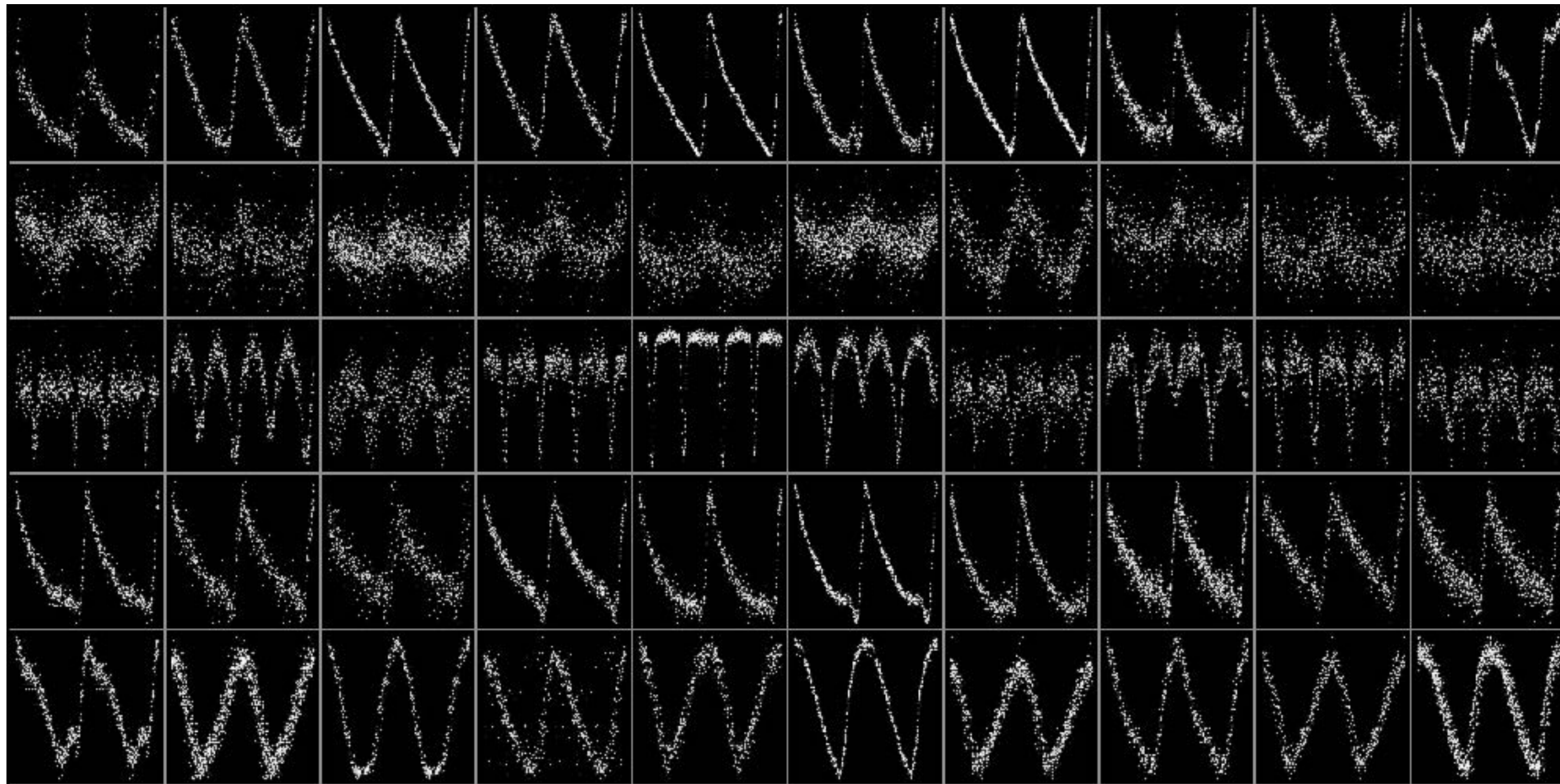


	ACEP	DSCT	ECL	FRLYR	T2CEP
ACEP	80.2	0.6	0.0	17.3	1.8
DSCT	0.2	94.0	0.8	4.7	0.4
ECL	0.0	1.1	98.8	0.1	0.1
FRLYR	0.9	2.7	0.0	95.8	0.5
T2CEP	1.2	0.7	0.0	13.6	79.5

Szklenár et al. ApJL, 897, L12, 2020

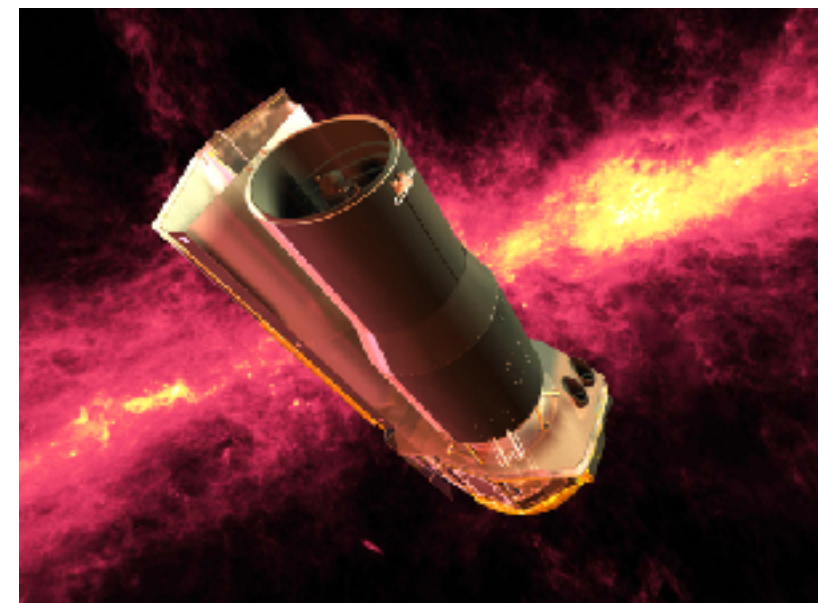
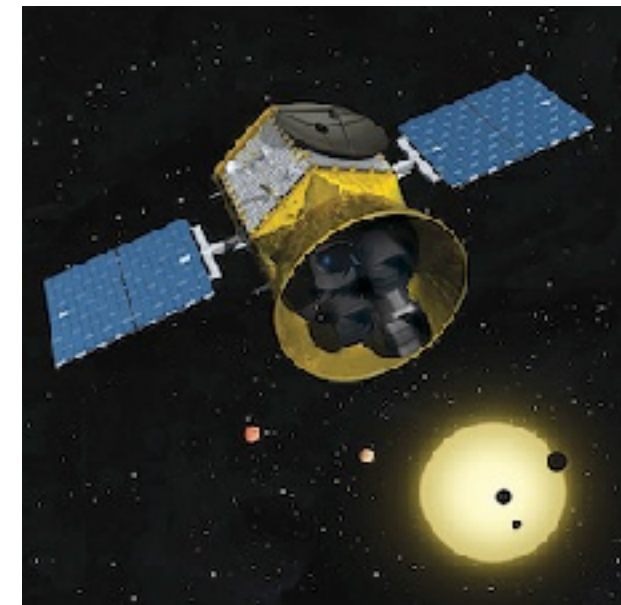
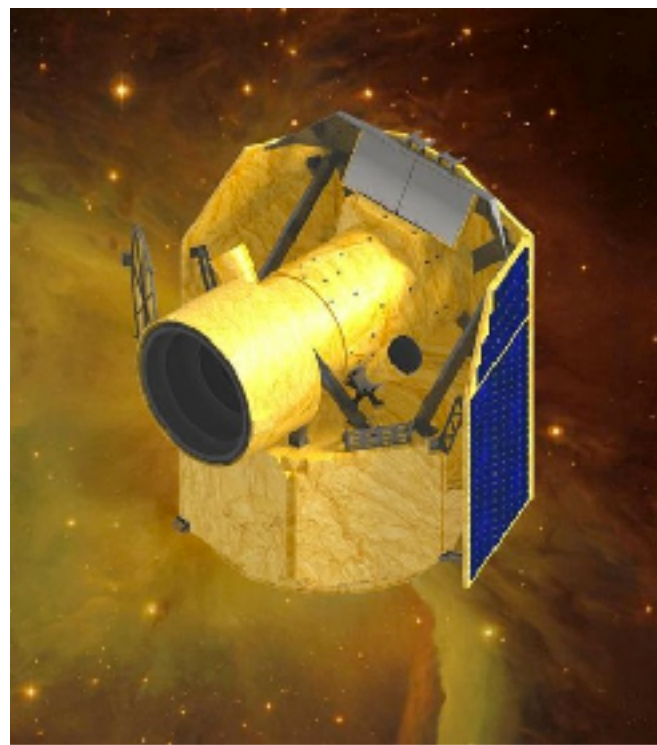
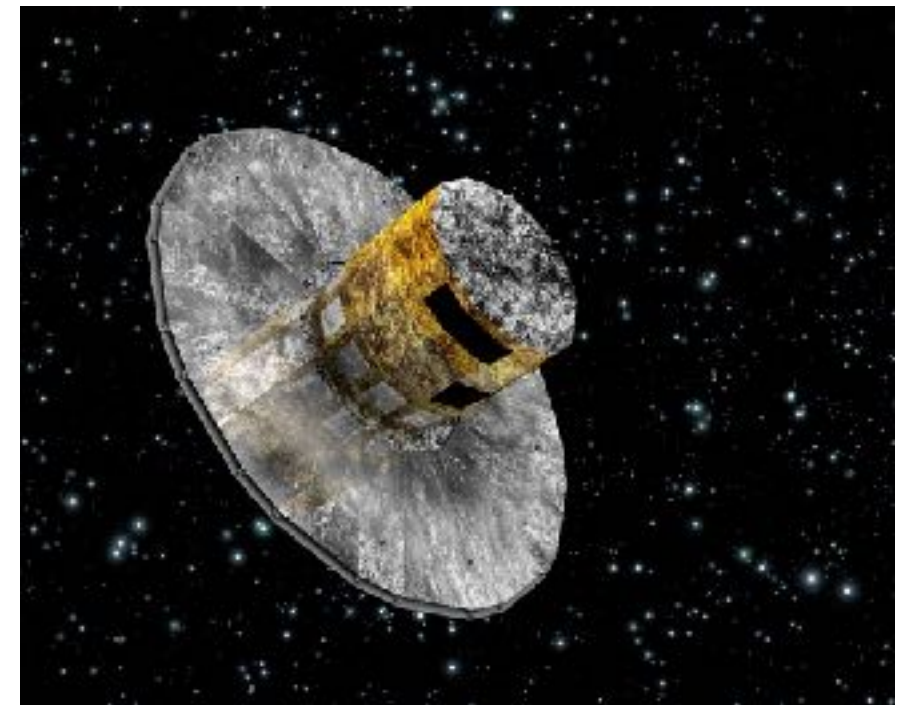
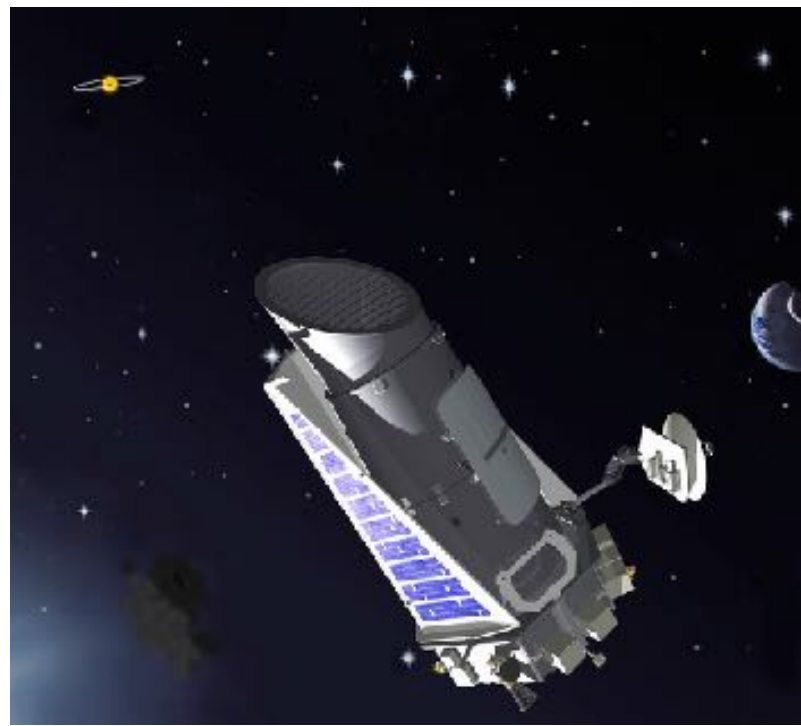
Machine learning

MTA CSFK Lendület Near-field Cosmology Research Group









Herschel  
CHEOPS

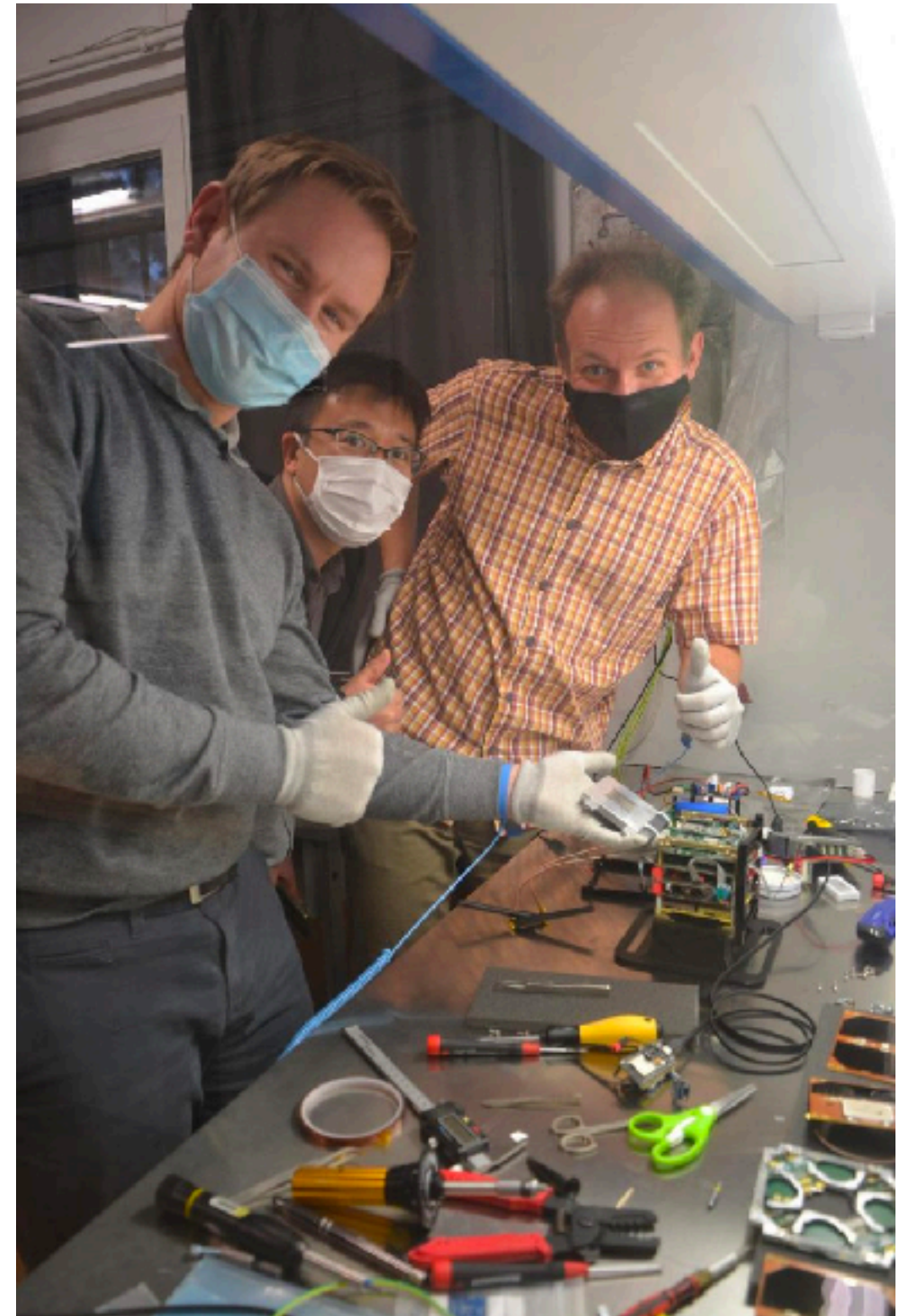
Kepler/K2  
CoRoT

Gaia  
TESS  
Spitzer



# Nanosatellite: GRBAAlpha built at Konkoly Observatory in international collaboration (HU, SK, CZ, JP)

1U cubesat  
to detect gamma-ray bursts  
with a CsI scintillator detector  
Launch: 22 March 2021  
Baykonur, Soyuz-Fregat



# Modern astronomical institute

- Largest astronomical institute in Hungary.
- One of the astro-hubs in Central-Eastern Europe.
- International staff (1/4 from foreign countries).
- Official languages: Hungarian and English.
- Modern, renewed research topic portfolio.
- Participation in cutting-edge international projects: ESA missions, LUNA, Vera C. Rubin Obs., ...



# Observatory Assistant program

The program started in 2017.

Currently we have 15 assistants (undergrad students)

- observators, numerical methods, engineers

Scholarship for 1 year, competitive selection process.

## Aims:

- attract the best students,
- they participate in ongoing research programs,
- learn how to use telescopes,
- write telescope time applications,
- do students projects



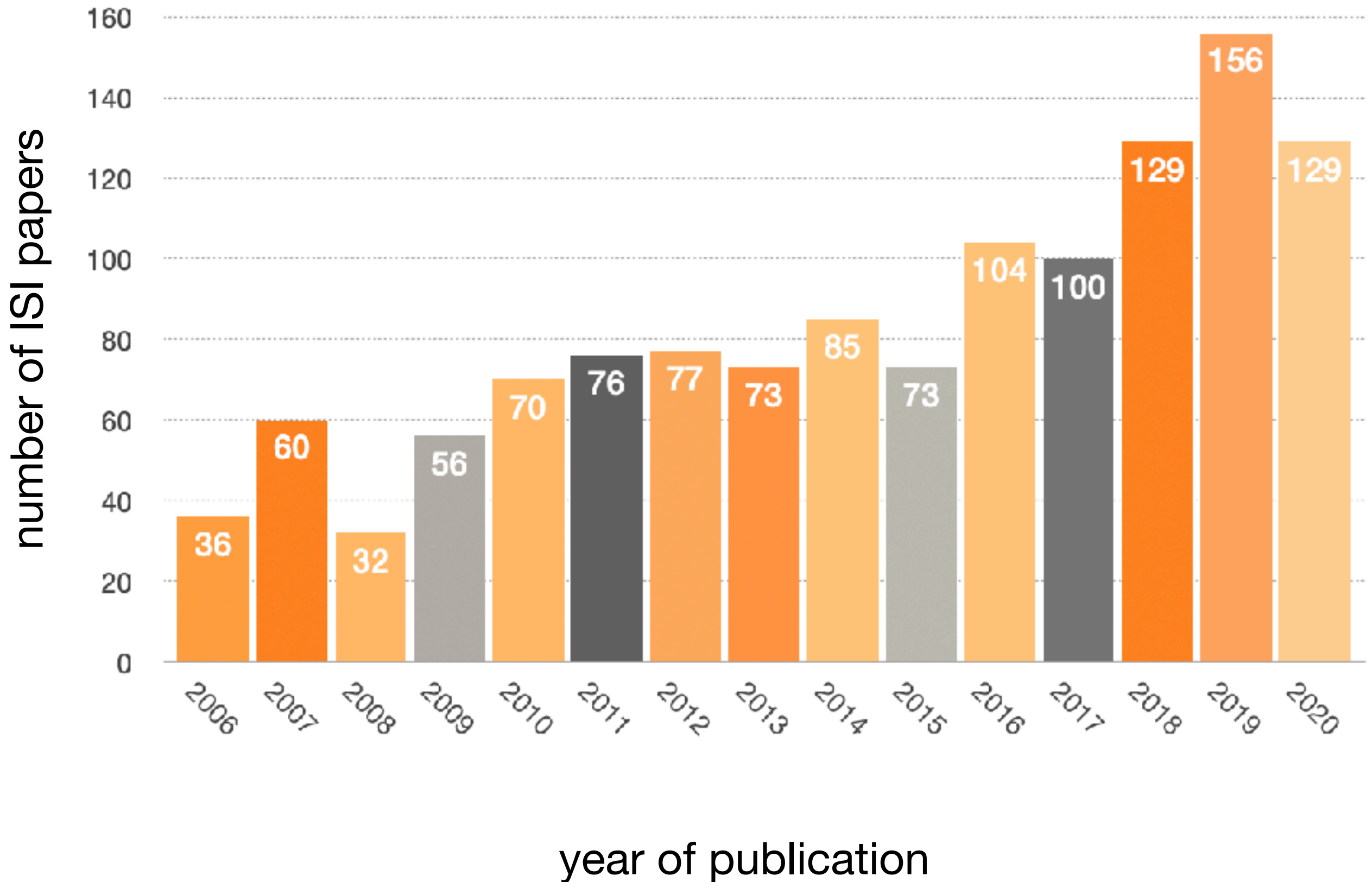
# **Key performance indicators in 2020**



# Publications in 2020

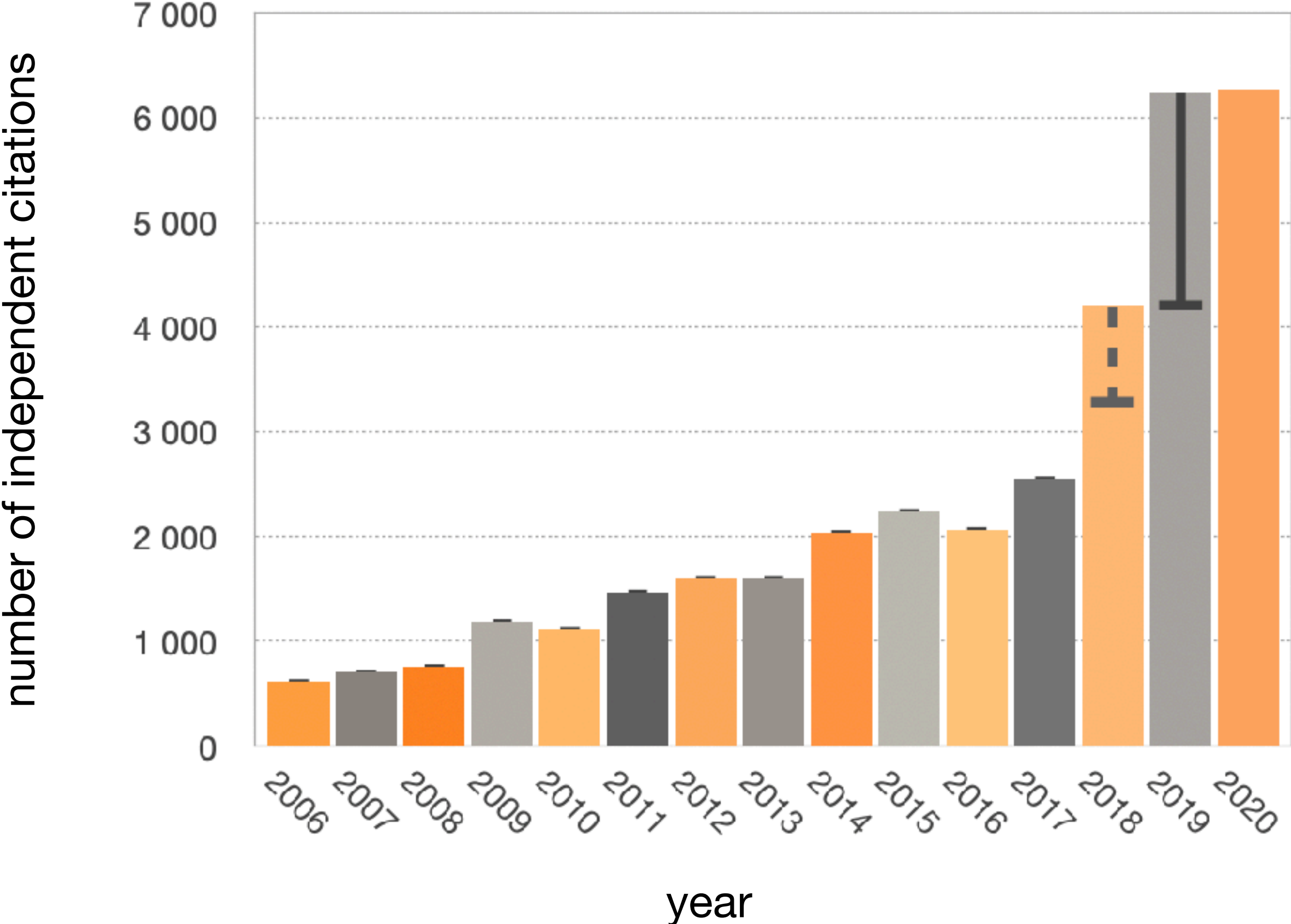
- **129** papers in ISI/JCR journals, cumulative i.f. **712 (5.52/paper)**
- **317** scientific publications (105 circulars)
- First authored refereed papers: **42**
- Research staff: 68(62) (1 member of the MTA, 6 emeriti, 9(8) DSc, 35(29) PhD, 19 without PhD)

# Konkoly ISI/JCR papers 2006-2020

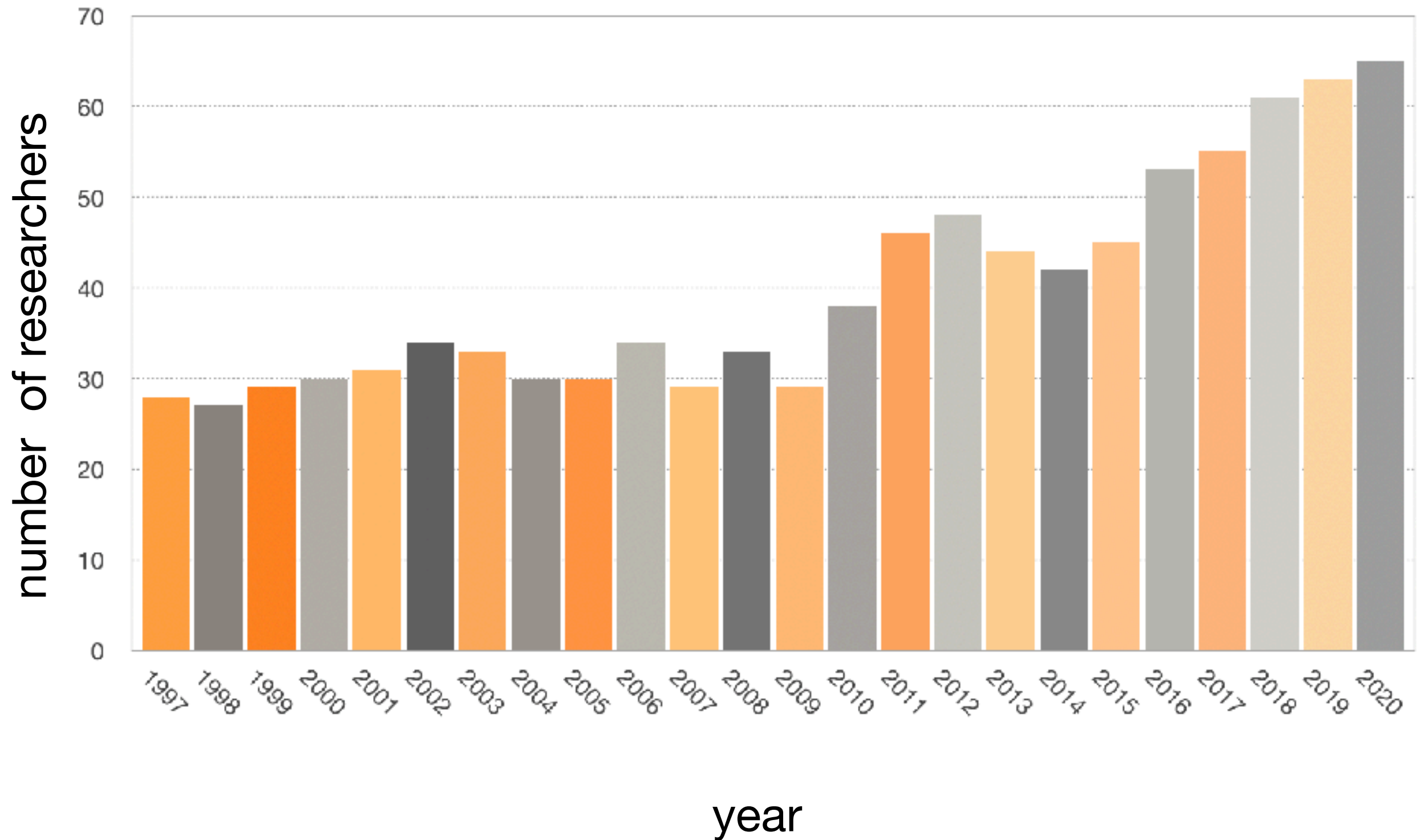




# Konkoly independent citations 2006-2020



# Number of research staff in the Konkoly Obs.





# Large grants

2 GINOP grants

- Cosmic Effects and Risks (large CCD-camera, camera network for meteor observations)
- Transient Astrophysical Objects (80 cm robotic tel.)

2 ERC grants (StG + CoG)

5 Lendület grants

1 Élvonal grant

Several OTKA, KH, Premium PD, ...

H2020, ESA PRODEX, ...

# **PUBLIC OBSERVATORY**



# SVÁBHEGY OBSERVATORY

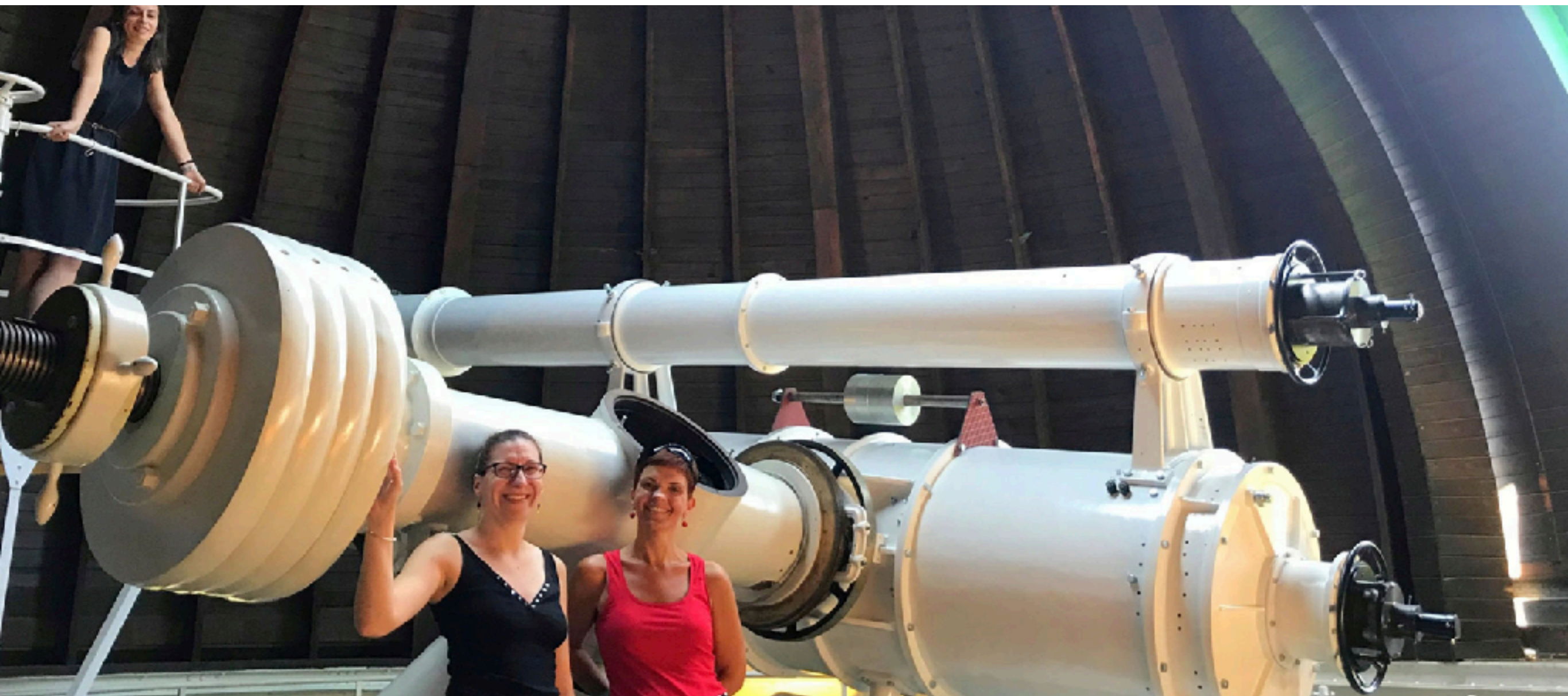


A SVÁBHEGYI CSILLAGVIZSGÁLÓ ÚJRA MEGNYITOTTA KAPUIT!

<https://www.svabhegyicsillagvizsgalo.hu/>



# SVÁBHEGY OBSERVATORY



<https://www.svabhegyicsillagvizsgalo.hu/>



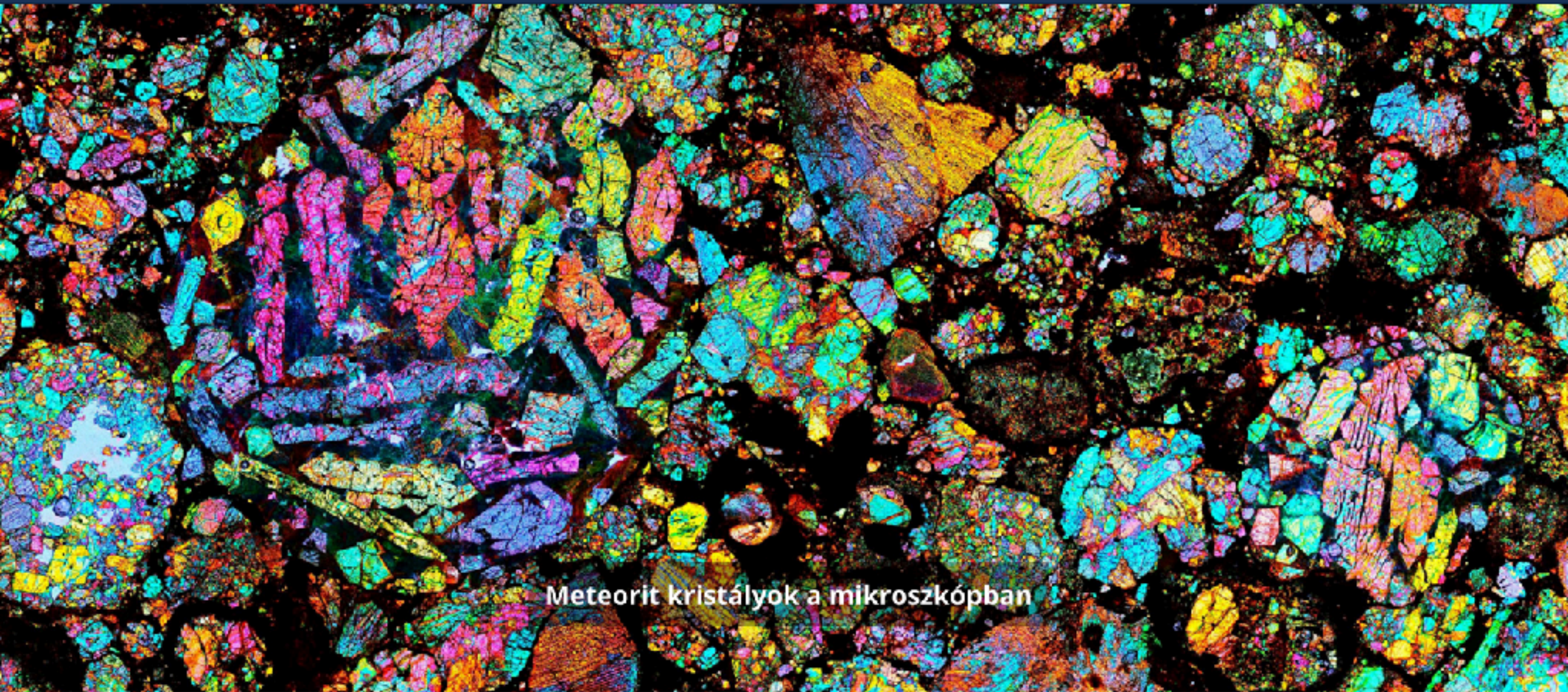
# SVÁBHEGY OBSERVATORY



<https://www.svabhegyicsillagvizsgalo.hu/>



# SVÁBHEGY OBSERVATORY



Meteorit kristályok a mikroszkópban

<https://www.svabhegyicsillagvizsgalo.hu/>