

The Araucaria Project and Rolf Chini Cerro Murphy Observatory



Grzegorz Pietrzynski CAMK

Araucaria
PROJECT

The Araucaria team members (17 countries, 5 continents)



4 new members in November



Goals

Improve the **cosmic distance scale** (not just H_0) based on observations of several primary distance indicators in the MW, nearby galaxies, and clusters.

Understand physics of distance indicators

Always collect the **best data** (homogenous)

Long term project.



Centrum Astronomiczne
im. Mikołaja Kopernika
Polskiej Akademii Nauk

Synergy with several missions, surveys, big telescopes

Gaia mission very useful to:

=> Achieve accuracy in the absolute calibration of different techniques

=> Calibrate SBCR with eclipsing binaries

=> Calibrate p factor (BW)

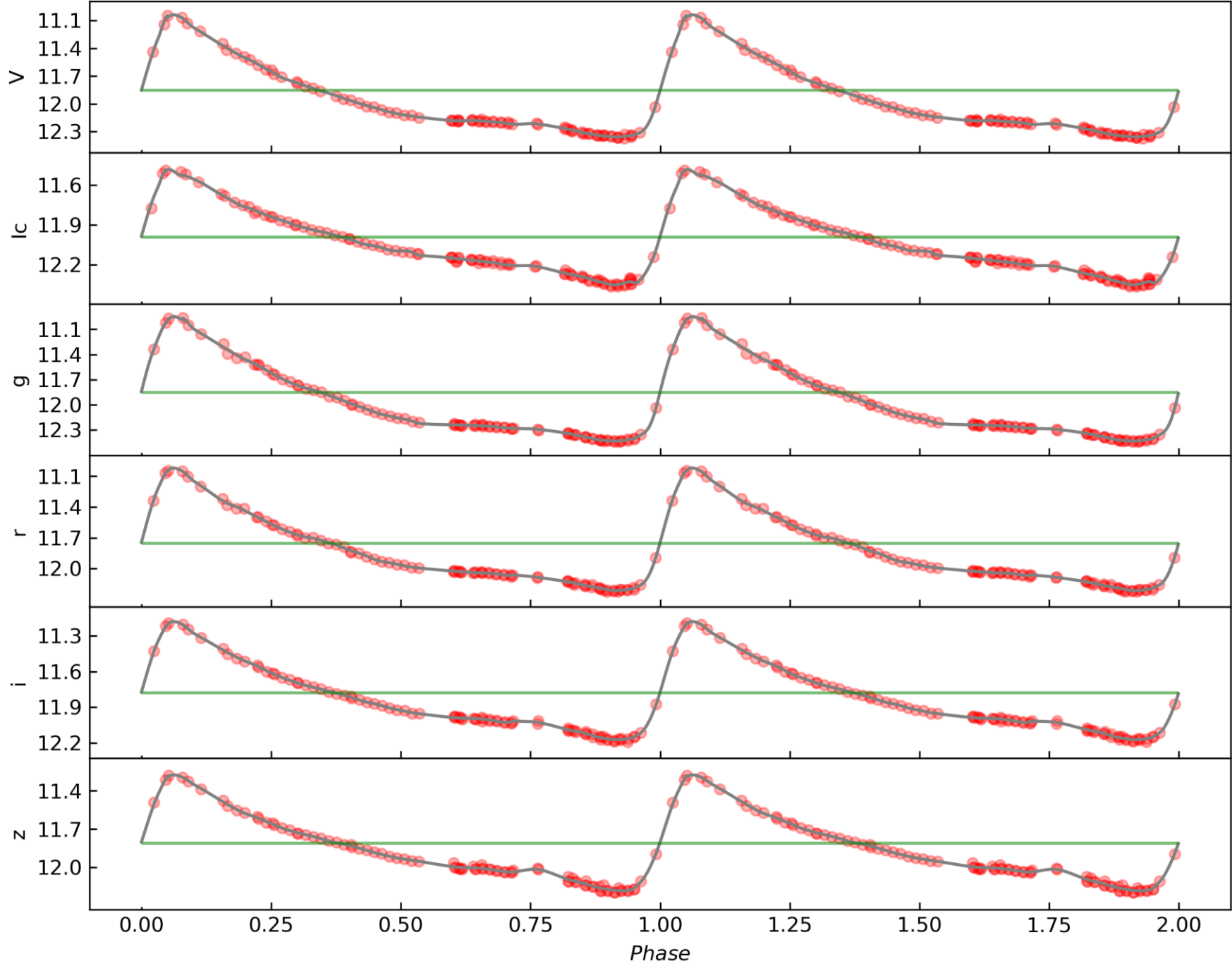
=> Calibrate metallicity effect on the PLs

Preparing for DR4 ...

LSST, ELT, JWST ...

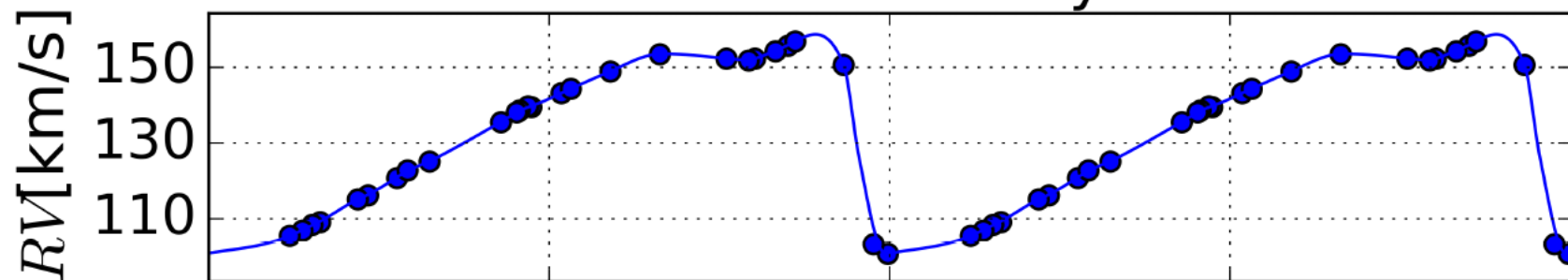


AA_Aql P=0.3617877d

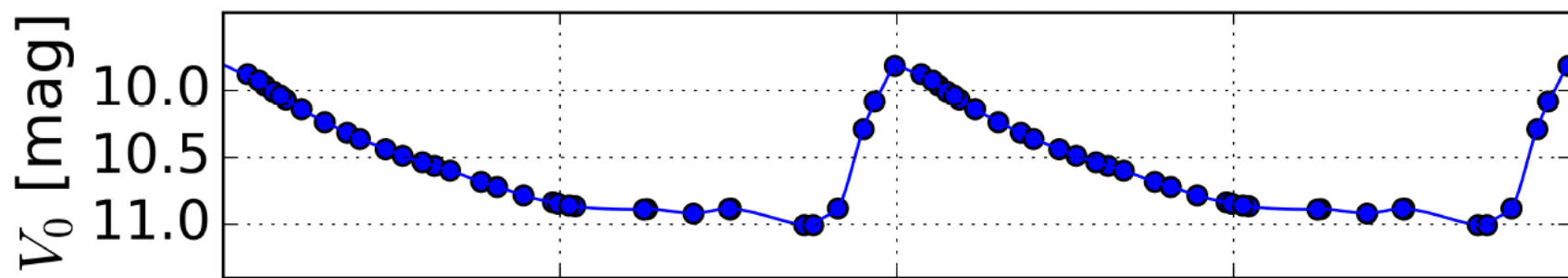


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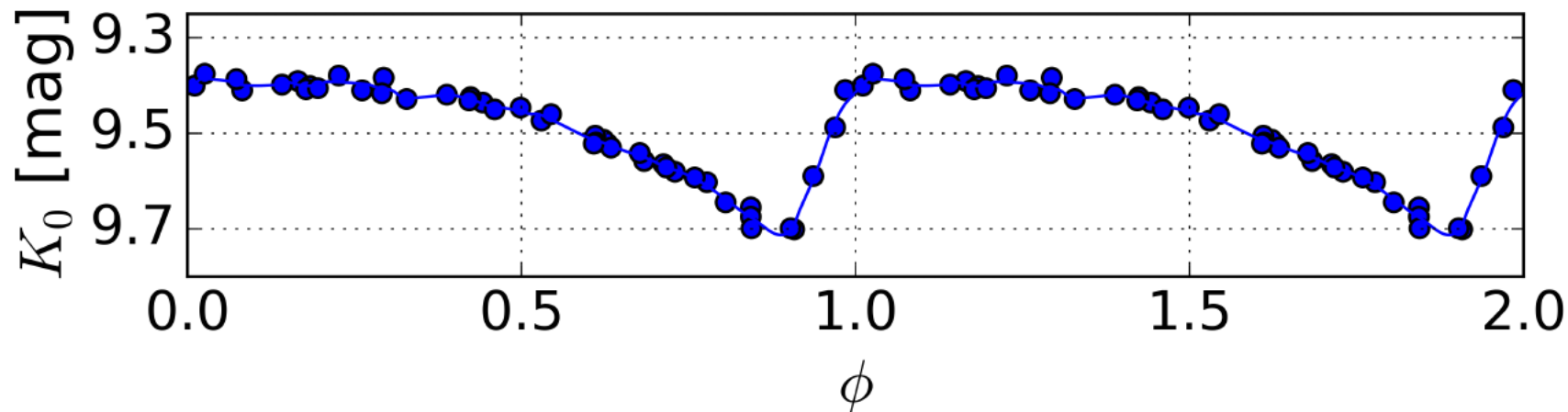
radial velocity



V band



K band



Publications



500 nearby pulsating stars:

PL relations, p factor determination, SBCR

⇒ Bras et al. 2024

⇒ Wielgorski et al. 2024

⇒ Zgirski et al. 2024

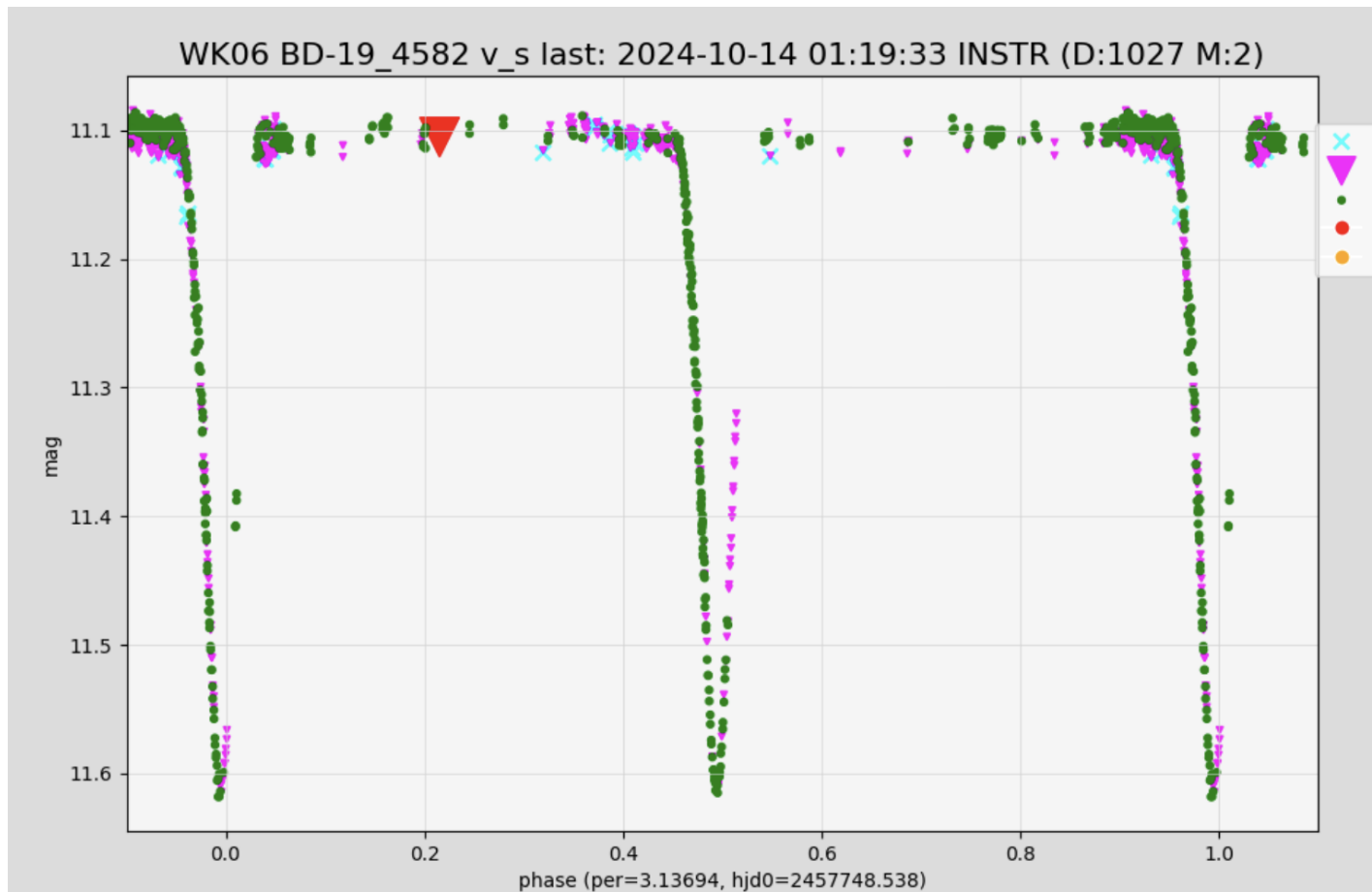
⇒ Nardetto et al. 2024

⇒ Narloch et al. 2024

3 papers submitted ...

Eclipsing binaries

- Late typed (giants) in the LMC Rojas et al. 2024
- Early typed LMC series of papers by Taormina et al. 2024, 2025. (CAMK prize)





Photometry:

Survey of 14 nearby galaxies multiband Cepheid, RR Lyrae, T2Cep
PL relations, variable stars in particular survey for eclipsing binaries,
transients, SN etc ...

Survey of 12 globular clusters: RR Lyrae, SX Phe, T2Cep, DEBs

Survey of open clusters: DEBs, HADS, Beta Cep, SPB etc ...

Soon also HR spectroscopy: SBCR, pulsating stars, binaries

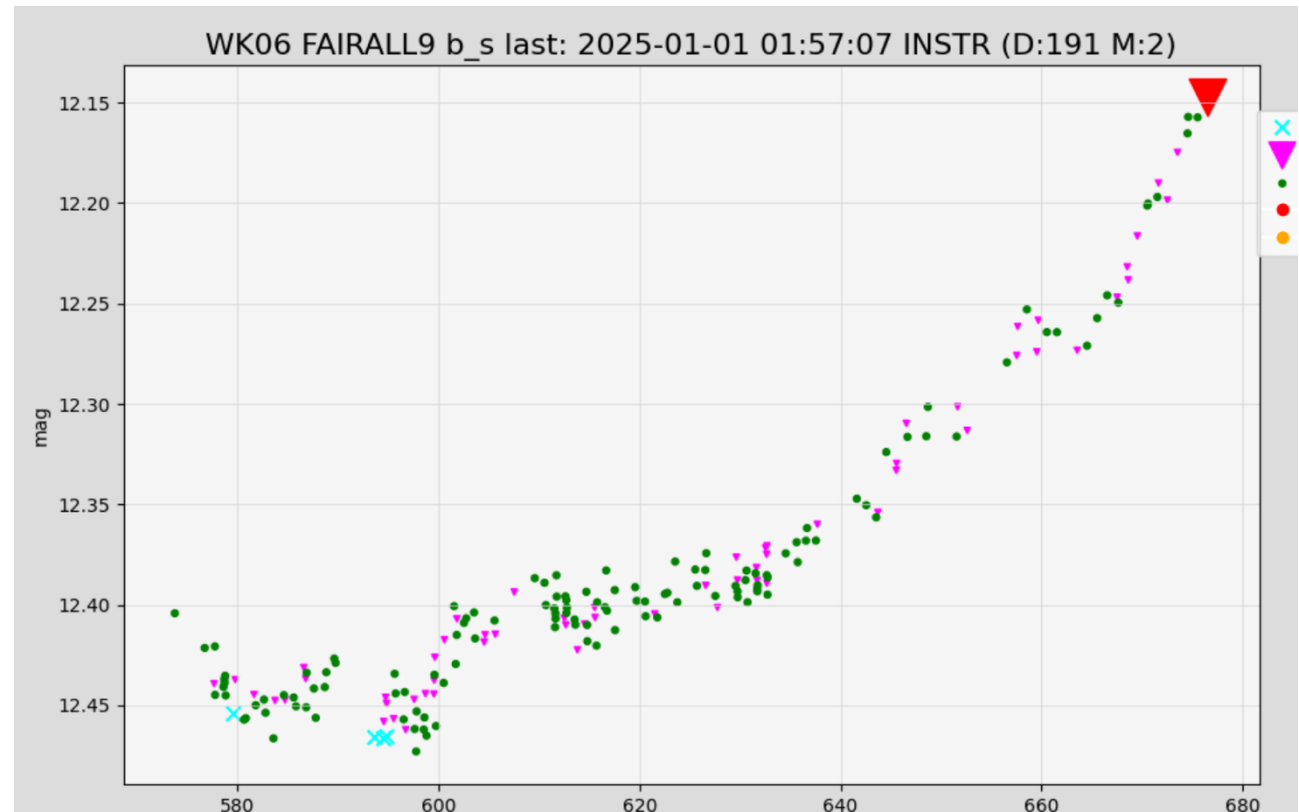
Long range methods

=> Calibration of SN Ia (we can go for SN monitoring)

=> SN II (nearby galaxies)

=> AGNs (Czerny, Pozo)

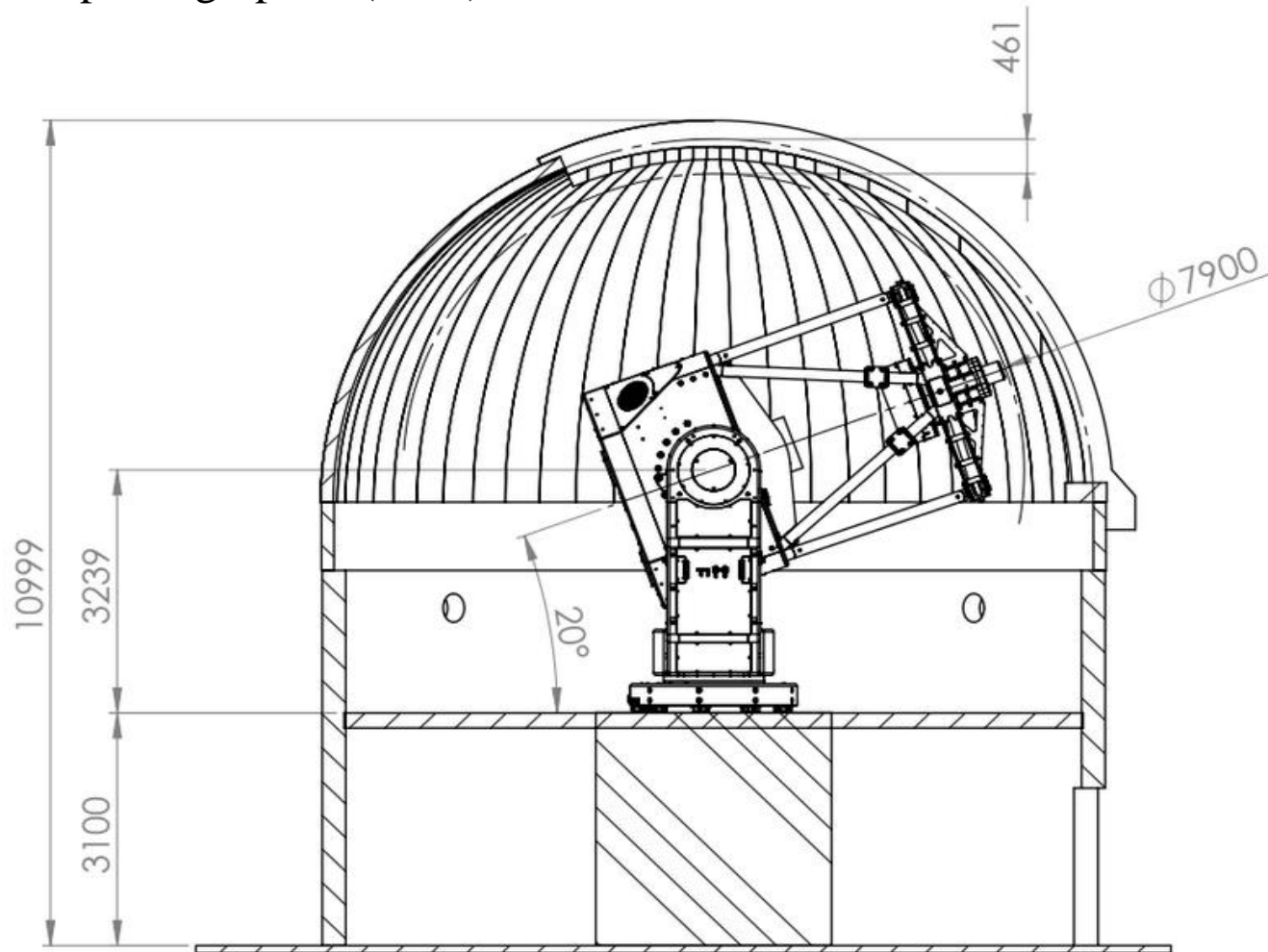
=> Strong lensing

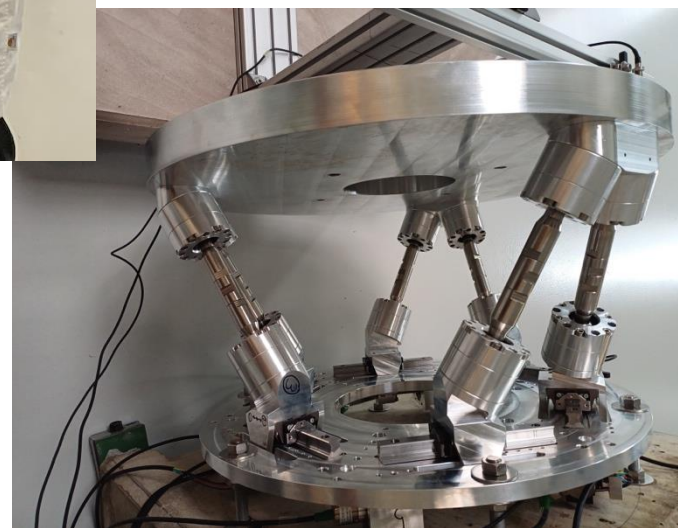


2.5 m telescope (first light expected in 2026)

Instruments:

- 1) **10k x 10k WF imager (0.12"/pix resolution) purchased !**
- 2) NIR 2kx2k camera (2027)
- 3) HR spectrograph. (2027)





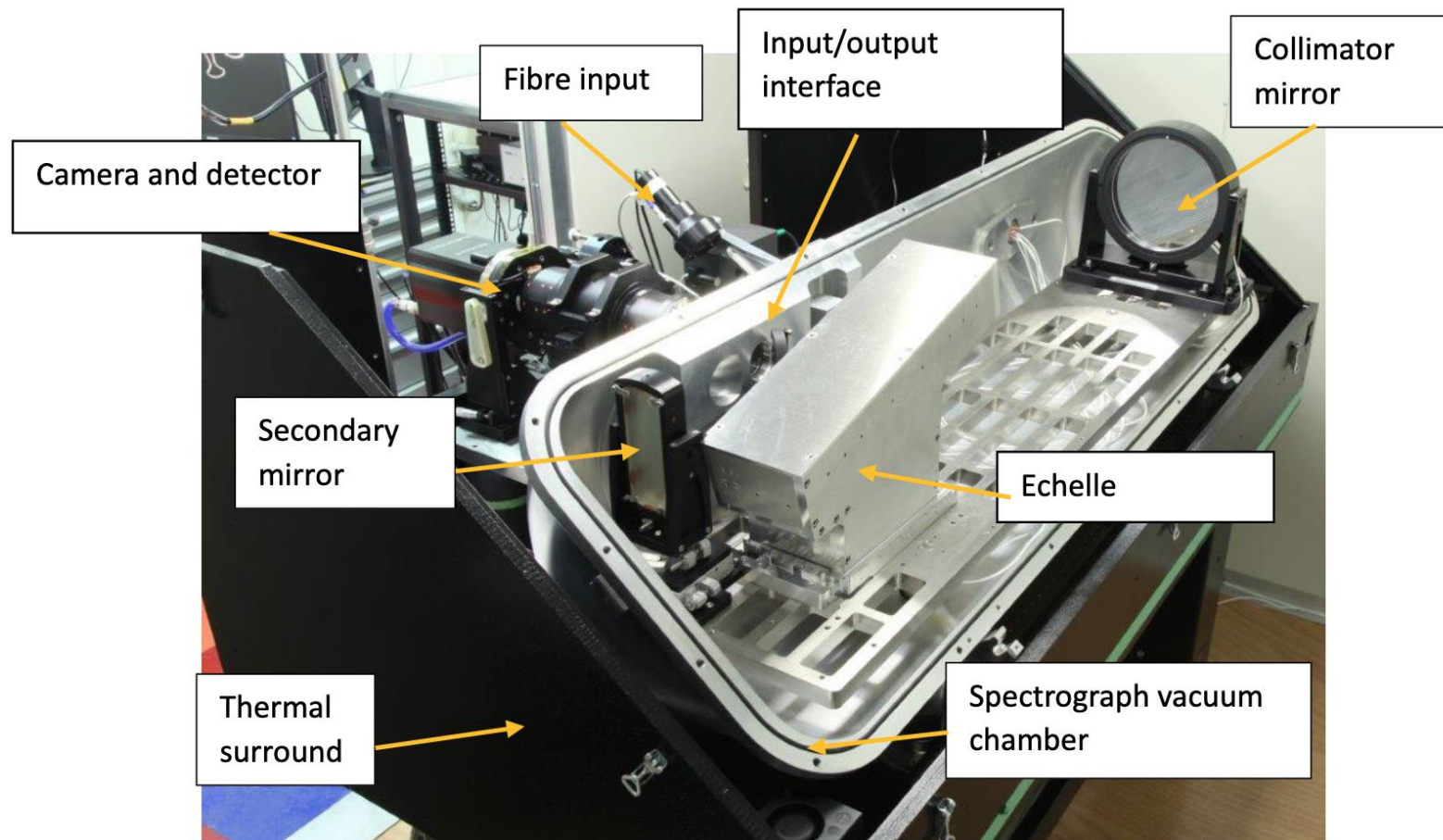
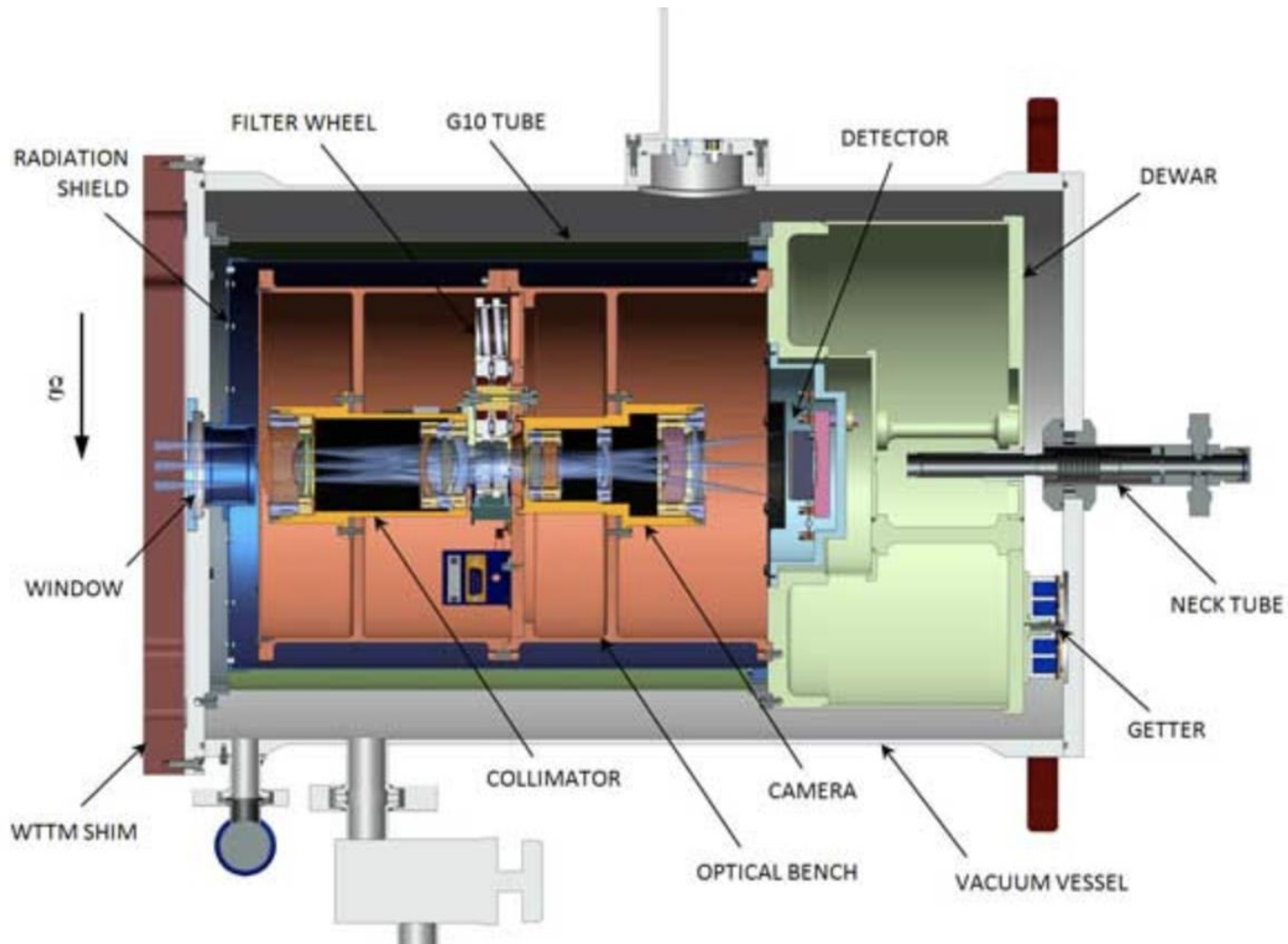


Figure 1 KiwiStar Spectrograph with top thermal surround and top of vacuum chamber removed.

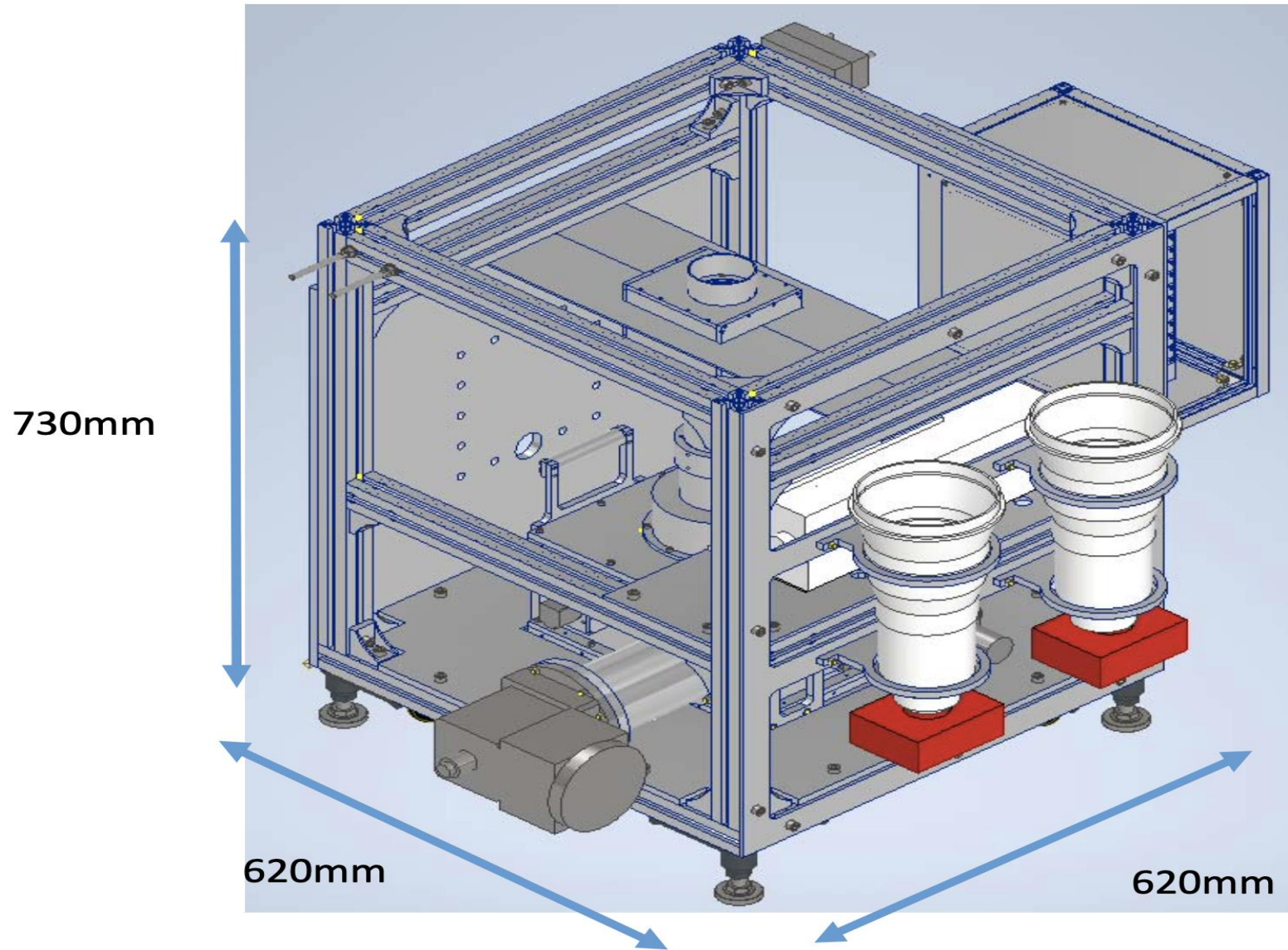
- Atmosphere of pulsating stars, RV curves
- Spectroscopic orbits for many binary systems
- Chemical composition
- Extrasolar planets
- Studies of DIBs and extinction

R = 80,000
2 m/s

NIR Camera



AGN high z survey, distant indicators LMC, SMC, MW



TMMT2 BVIJHK monitoring of bright stars ($1 < K < 6$ at 1%)

OCM Capacity

NIR $1 < JHK < 18$ mag

OPT $4 < ugrizBVIubvy < 25$ mag

Spec < 16 mag HR

2 HR spectrographs

4 Optical direct CCD cameras

3 NIR cameras



Collaboration: UdeC, JH, TU, LFI, UH, CFT, HITS, PO, NICE, Kiwi, ASA, Potsdam, WU, UMK (14 institutions)

Software development

First paper: Kicia et al. 2024 (Springer journal)

ERC POC application for commercialisation

- close but not granted **seal of excellence**
- A very dynamic group lidered by Mikolaj Kaluszynski (our phd student)
- This development is crucial for our observatory; it also creates possibility for many collaborations

Promotion

- Inauguration in Chile (many distinguished guests)
- Presentation in Polish embassy in Chile
- Visit of the Polish ambassador in the observatory
- Publications:
 - 105 years of Polish – Chilean relationships
 - Academia

Movies: astronomarium, TVN ...

Projects with artists, historians, architectures ...

Special thanks to the administration of CAMK !!

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