

**Observations of gravitational lenses  
at high quality conditions  
of the Maidanak observatory**

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**Maidanak Users Meeting - 6**

**01/11/2021**

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# Requirements for gravitation lenses research

## **Astroclimate**

Maidanak median seeing 0.67" (DIMM)

A large number of observational nights

## **Telescope**

1.5m AZT-22 telescope with good optics

A clean mirrors

## **Processing methods**

Methods of pipe-line reductions

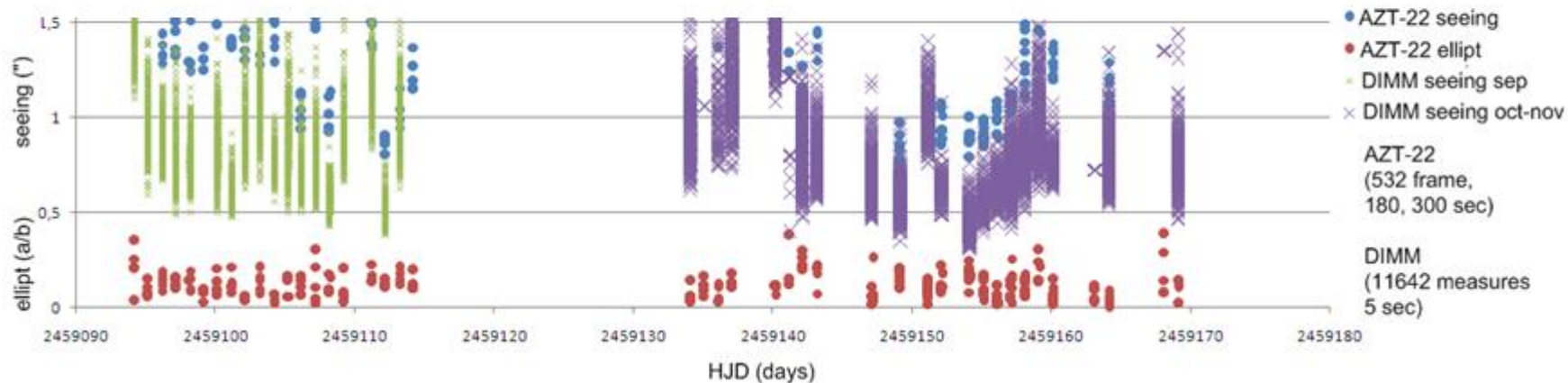
Deconvolution method

# Astroclimate



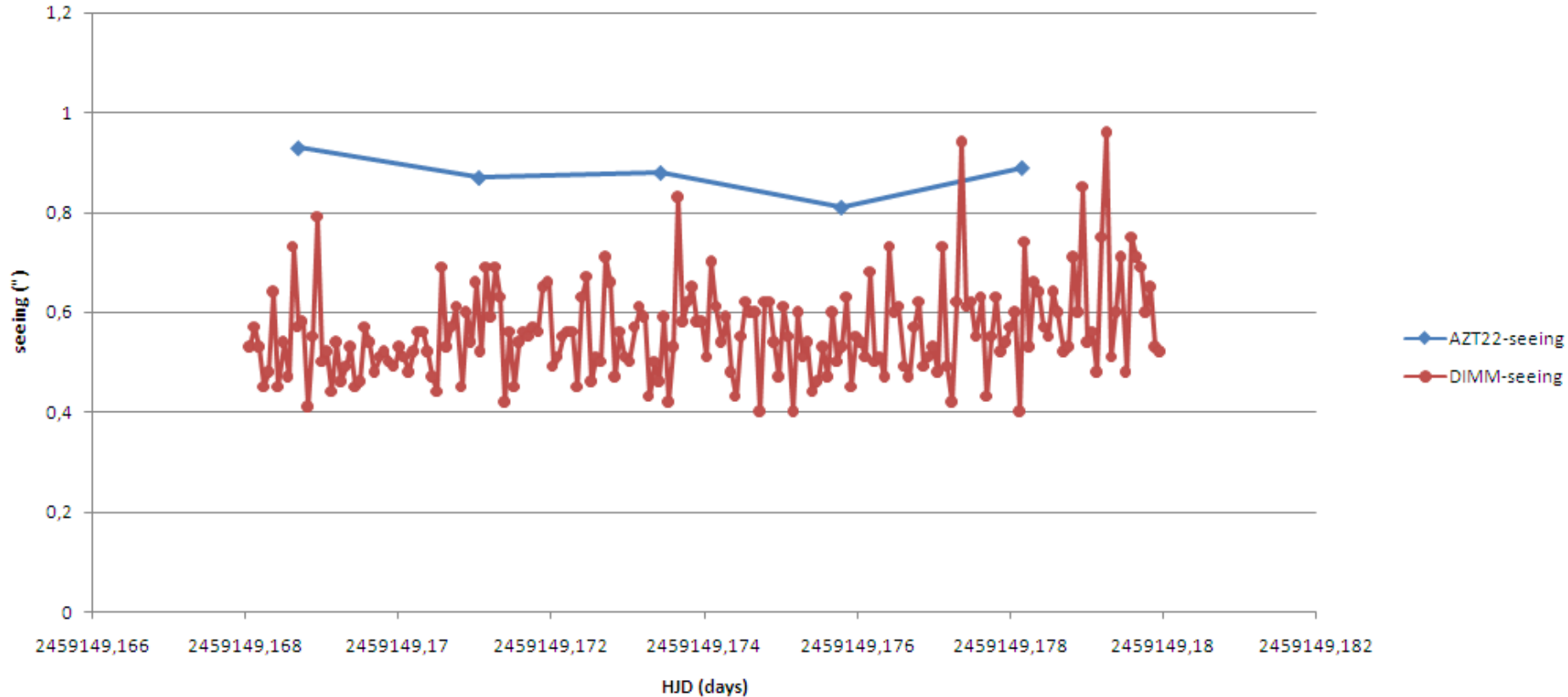
DIMM telescopes

Seeing AZT-22 and DIMM  
(SDSS J1721+8842, sep01-nov15 2020, Maidanak obs.)



# Astroclimate

SDSS J1721+8842 AZT22-DIMM seeing 26/10/2020



# Telescope AZT-22



# Cleaning the mirror

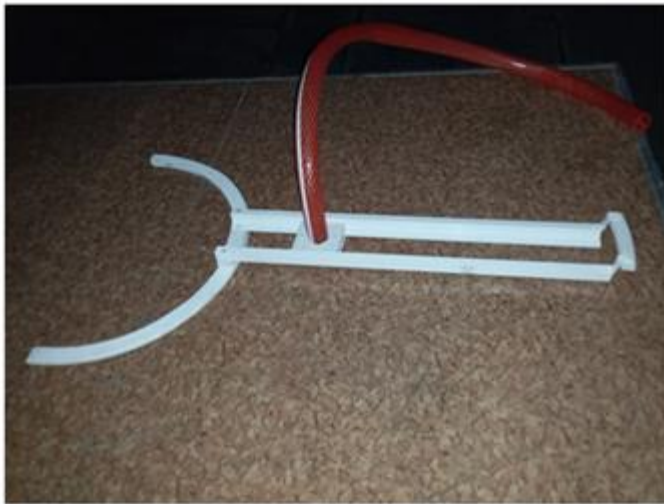


# Cleaning the mirror

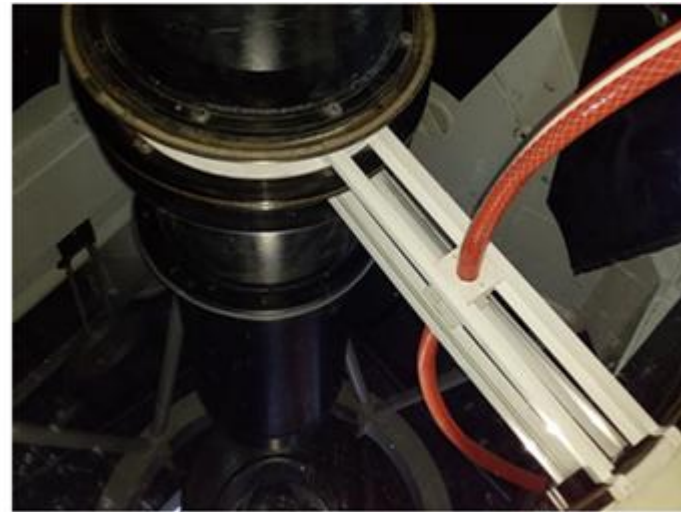
To clean the AZT-22 main mirror, only distilled water (6 liters), a special gel ORVUS for optics, medical eye cotton were used.

We made and use of the radial-rotation system with a movable head to connected to the vacuum cleaner and made possible to quickly remove dust and water from the mirror

Minimized water consumption from 15-20 liters to 6 liters, reduced cleaning time from 4-5 hours to 1.5 hours and allowed to work without removing all the CCD equipment!!!

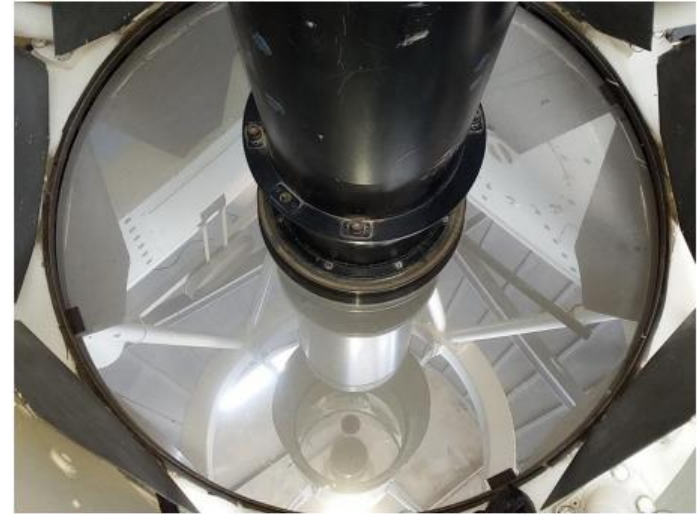


Simple AZT-22 mirror cleaning system (dust and water removal)



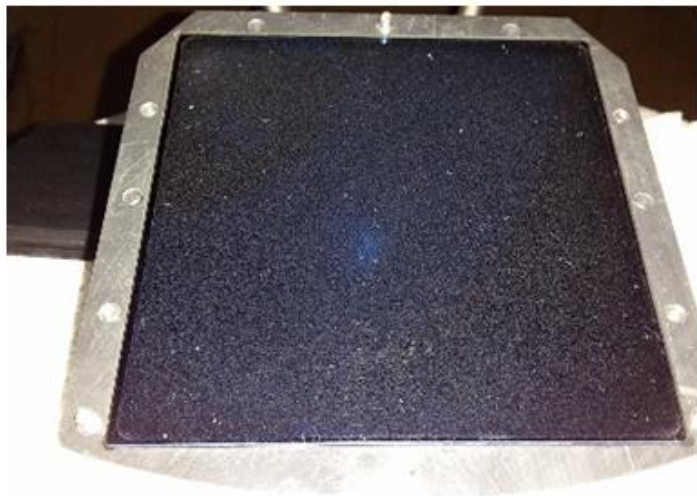
The system is in operation (the distance of the movable head to the mirror in 5 mm is limited by the guides)

# Cleaning the mirror





# Cleaning the filters



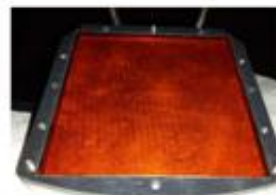
U



B



V



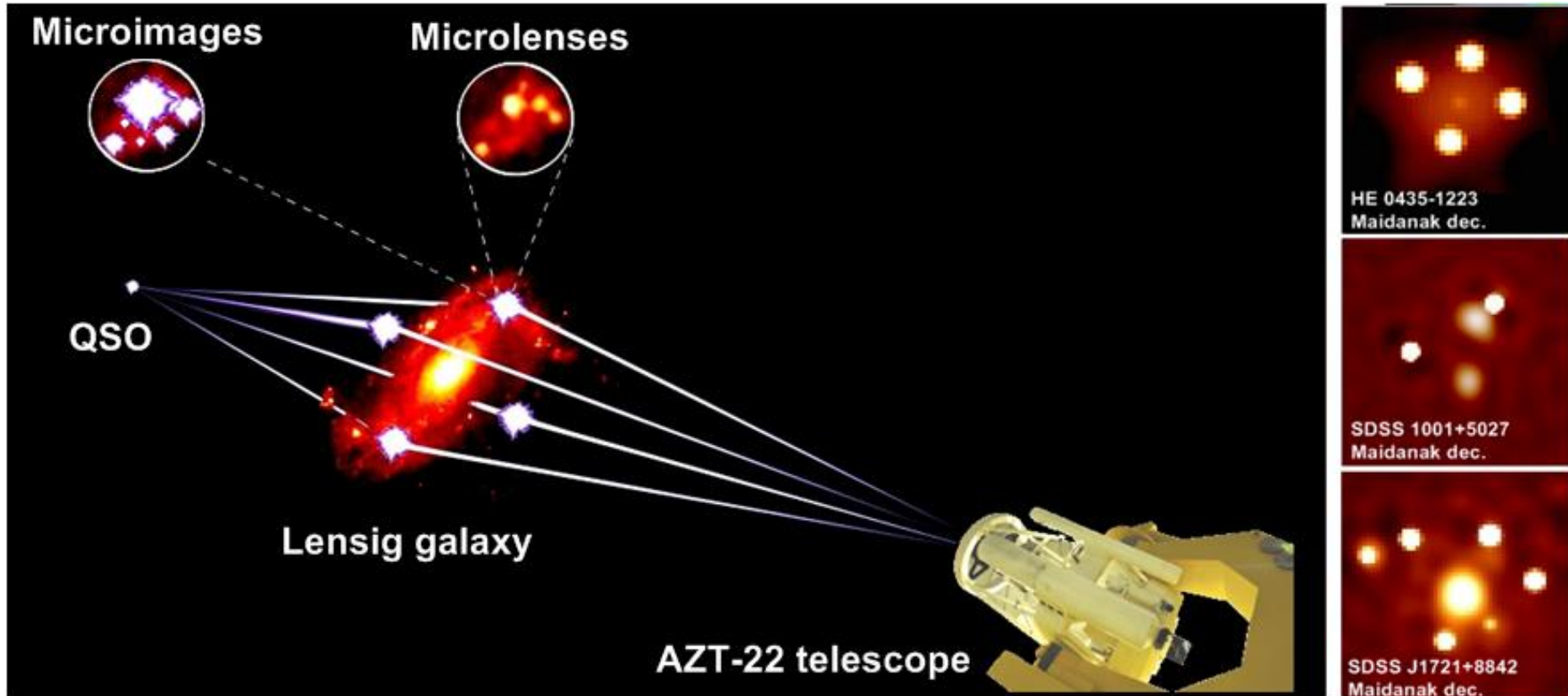
R



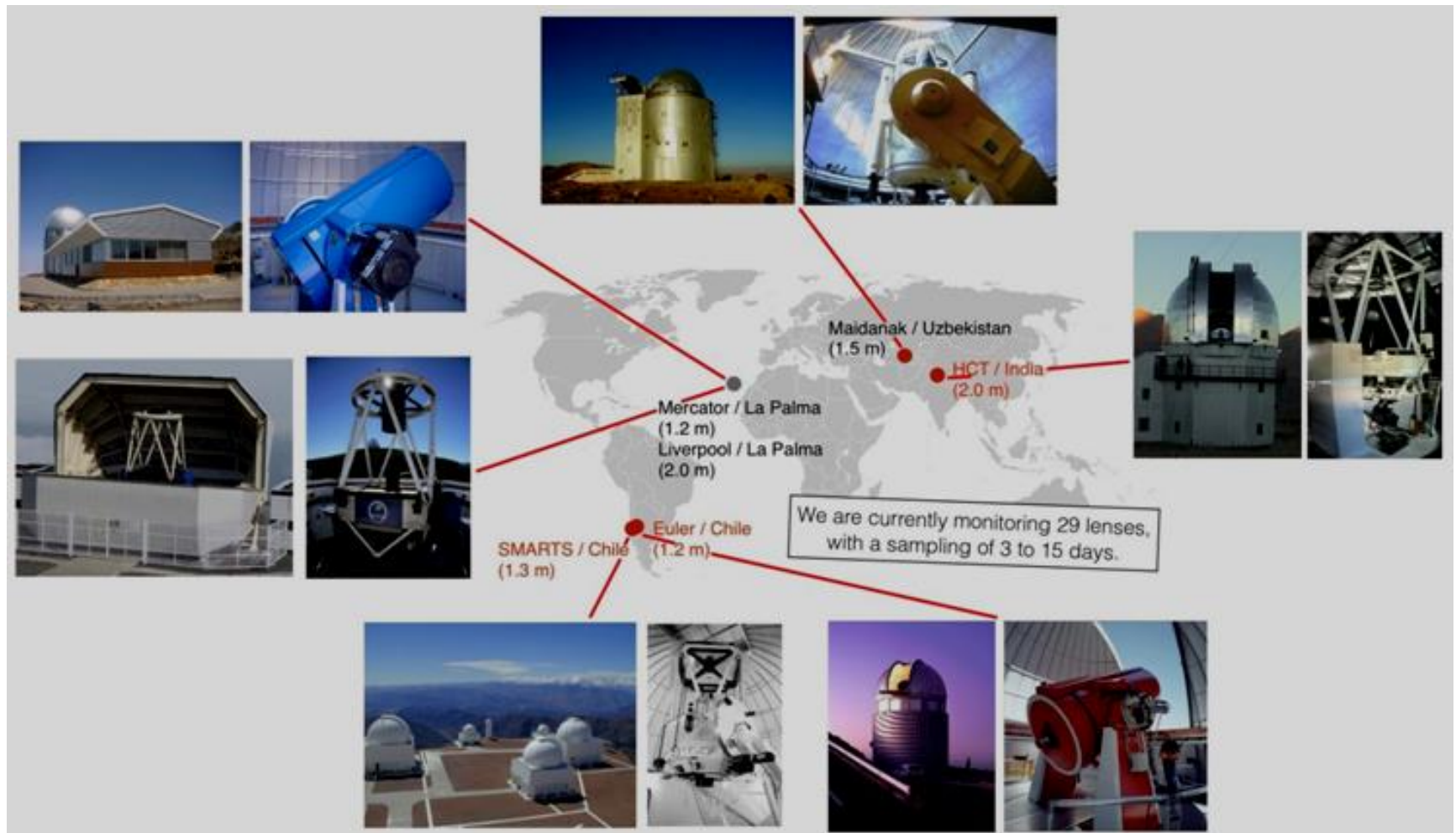
I



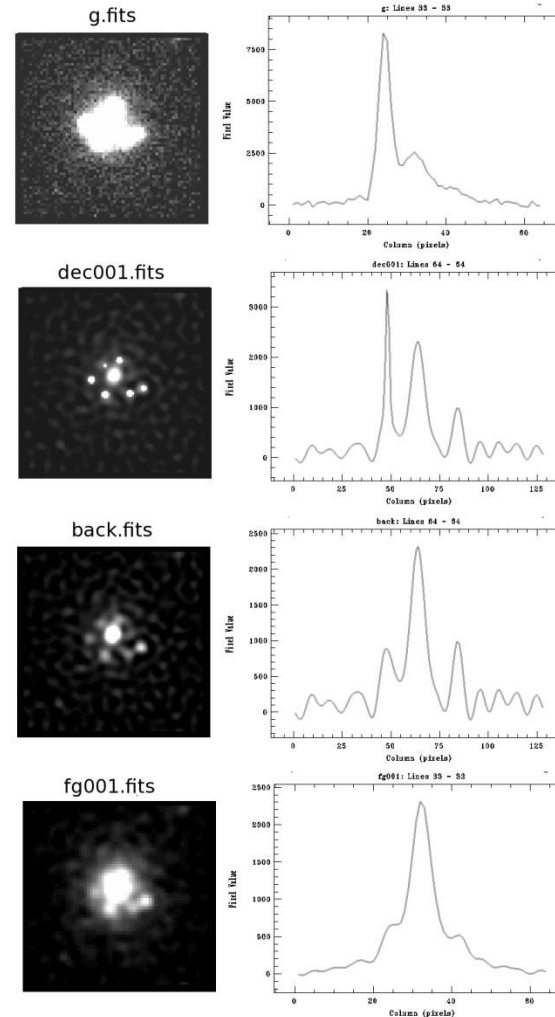
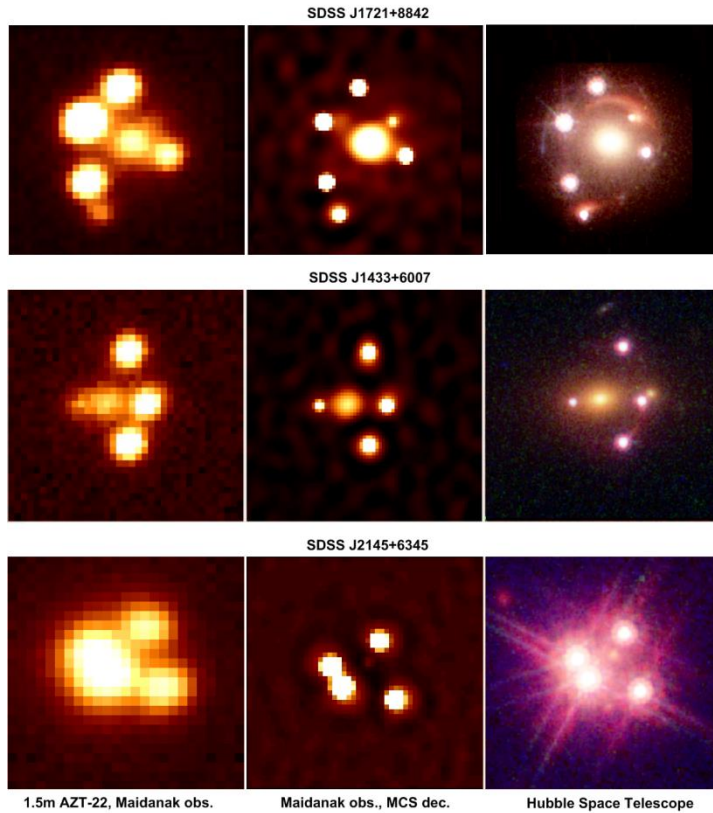
# Gravitational lensed systems



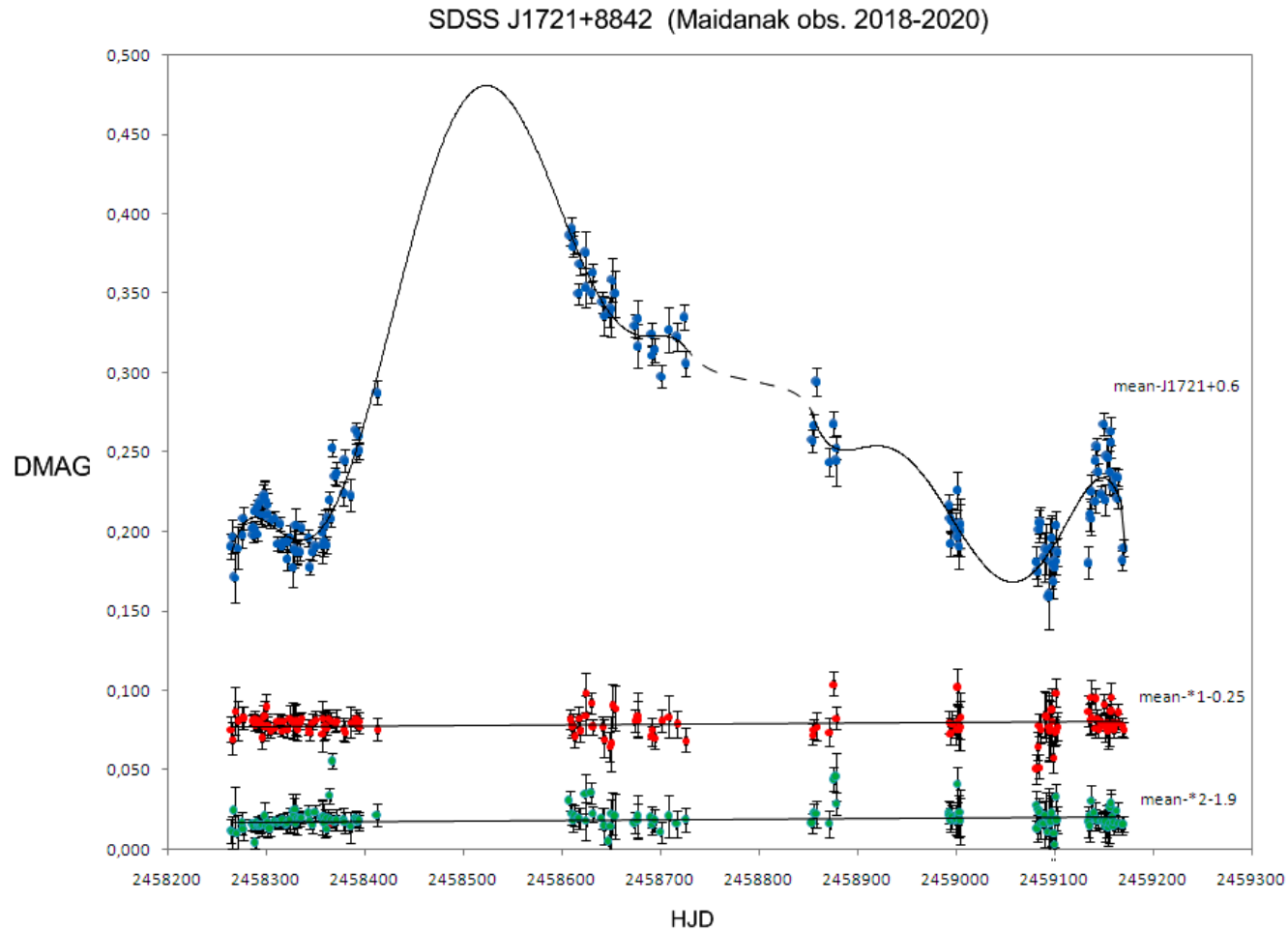
# Optical observations of lensed quasars by the COSMOGRAIL project



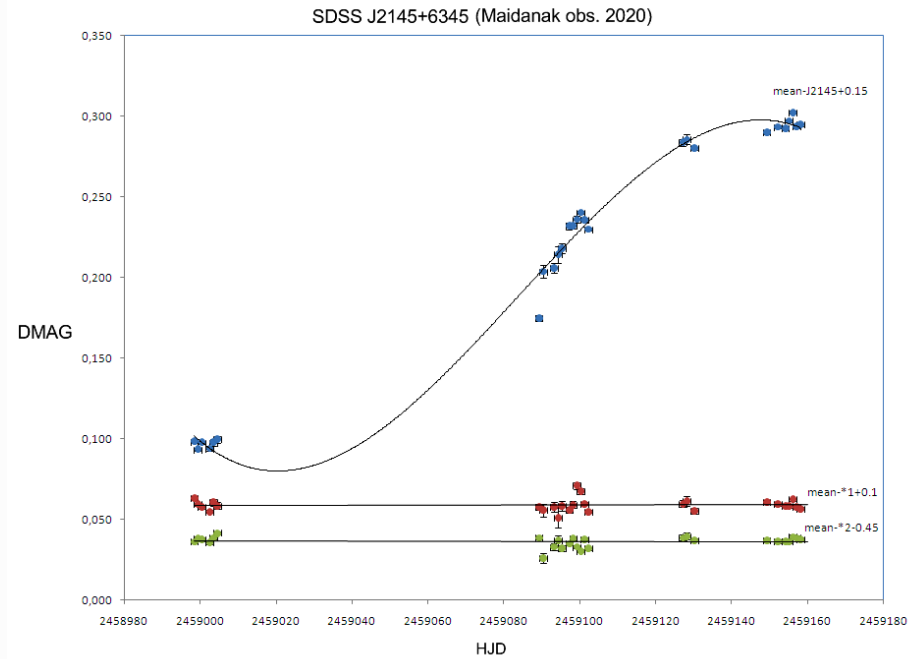
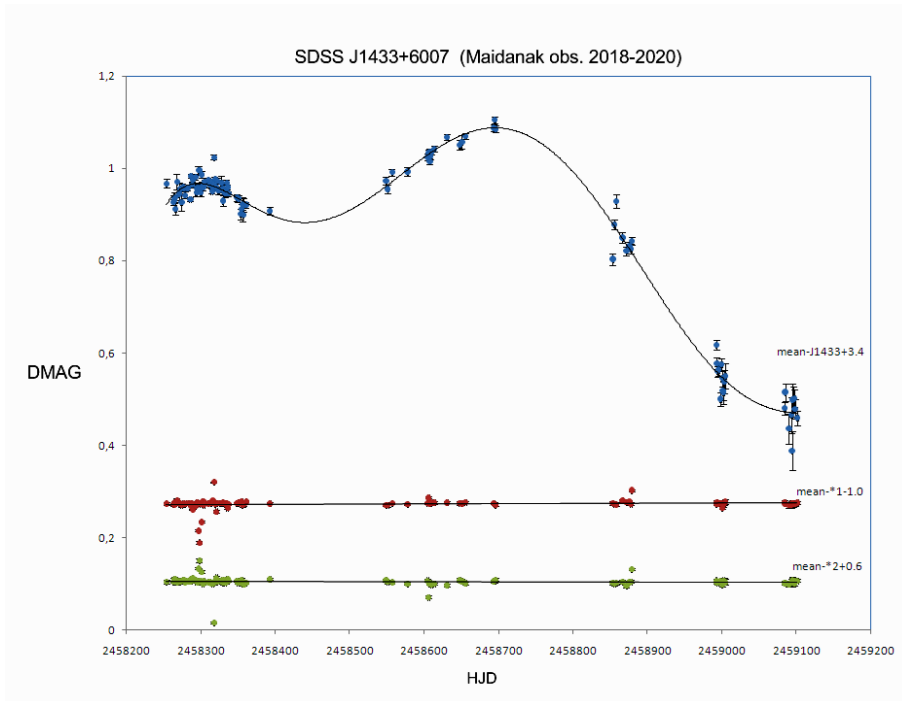
# The results of reduction and compare with HST



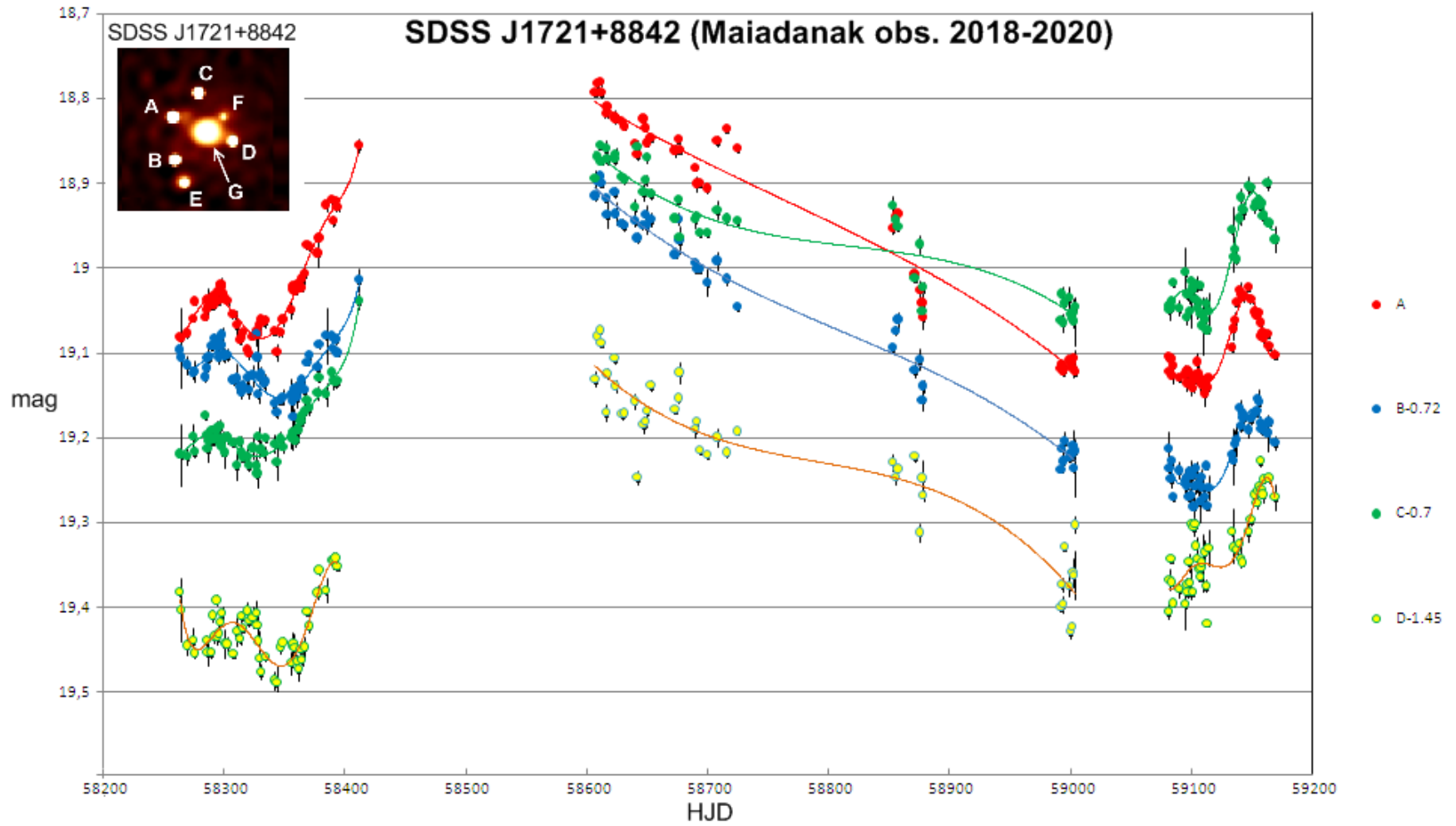
# Detection of active optical variability of four-component GLS



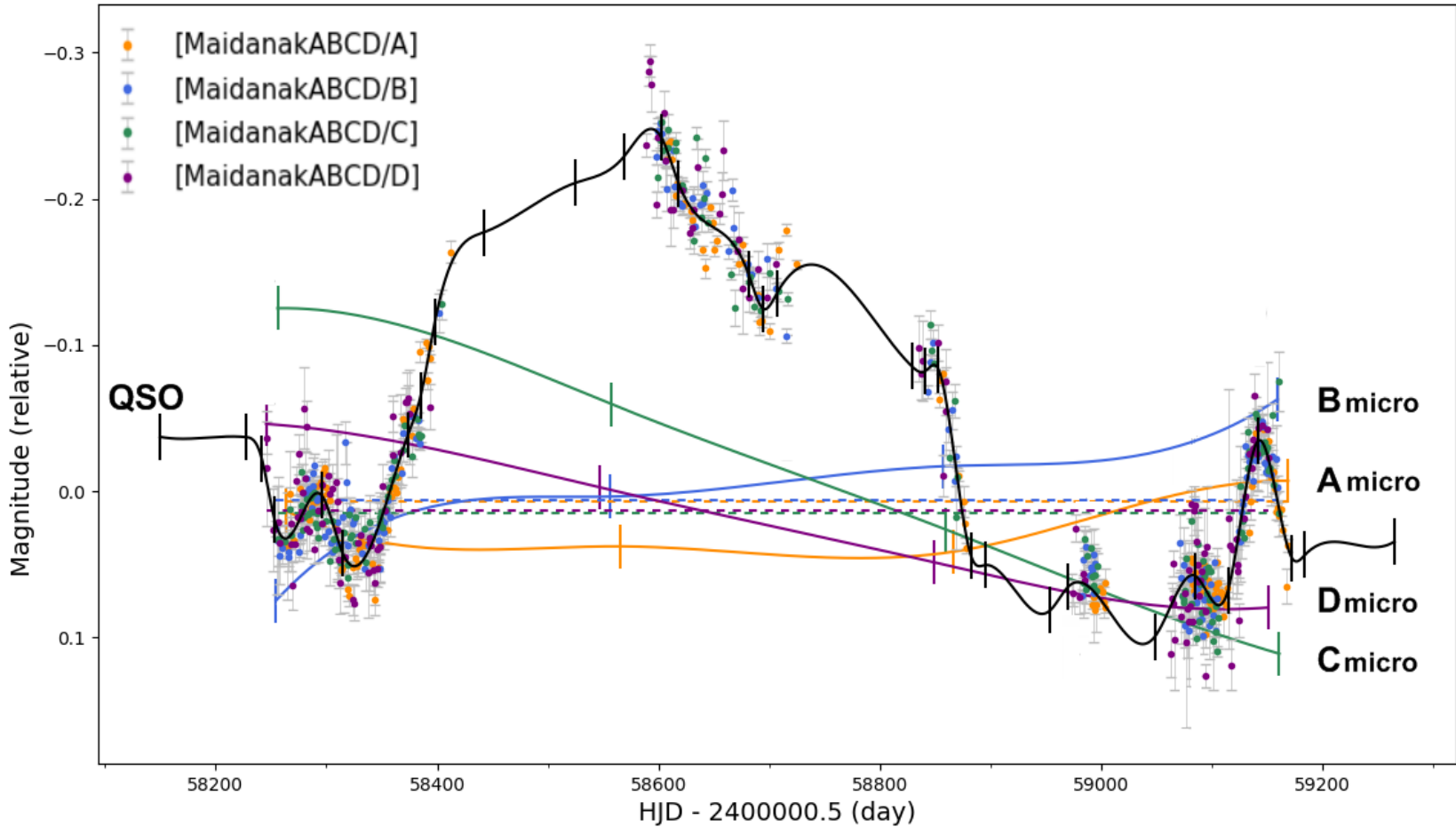
# Detection of active optical variability of four-component GLCs



# Detection of microlensing effect in SDSS J1721+8842

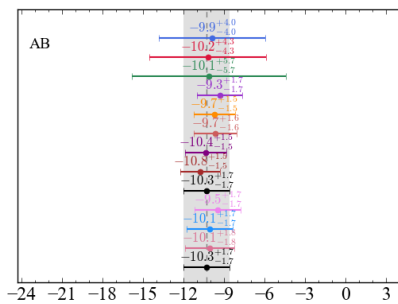


# Comprehensive analysis of the effect of microlensing GLC SDSS J1721+8842





# Calculation of the delay time in SDSS J1721+8842

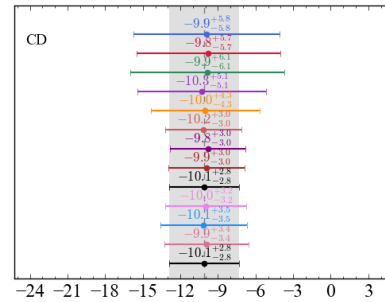
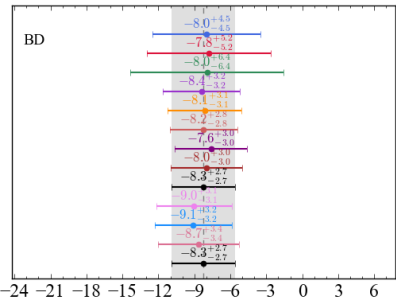
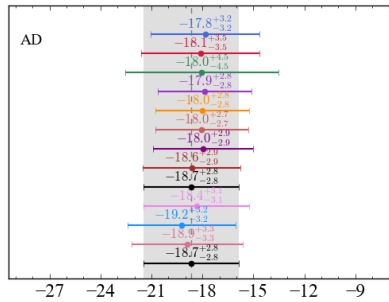
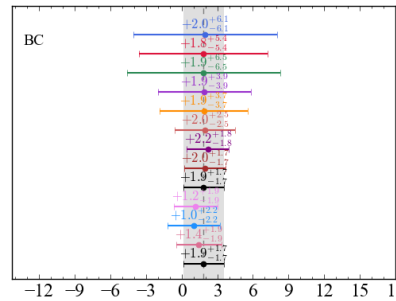
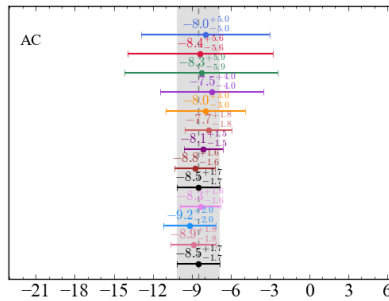


$AB = -10.3^{+1.7}_{-1.7}$   
 $AC = -8.5^{+1.7}_{-1.7}$   
 $AD = -18.7^{+2.8}_{-2.8}$   
 $BC = +1.9^{+1.7}_{-1.7}$   
 $BD = -8.3^{+2.7}_{-2.7}$   
 $CD = 10.1^{+2.8}_{-2.8}$

J1721 + 8842  
PyCS estimates

- MaidanakABCD\_ks25\_nmlspl\_2\_PS
- MaidanakABCD\_ks25\_nmlspl\_3\_PS
- MaidanakABCD\_ks25\_nmlspl\_4\_PS
- MaidanakABCD\_ks35\_nmlspl\_2\_PS
- MaidanakABCD\_ks35\_nmlspl\_3\_PS
- MaidanakABCD\_ks35\_nmlspl\_4\_PS
- MaidanakABCD\_ks45\_nmlspl\_2\_PS
- MaidanakABCD\_ks45\_nmlspl\_3\_PS
- MaidanakABCD\_ks45\_nmlspl\_4\_PS
- MaidanakABCD\_ks55\_nmlspl\_2\_PS
- MaidanakABCD\_ks55\_nmlspl\_3\_PS
- MaidanakABCD\_ks55\_nmlspl\_4\_PS

combined  $\tau = 0.50$



Delay[day]

Delay[day]

Delay[day]

**Thanks for the attention!**

