Informational Session on Minerva-Australis

David Ciardi, Duncan Wright, Eric Mamajek

21 September 2022

Connection Information

- 1 hour information session
- Wednesday 21st September at 3pm US PDT = 6pm US EDT = 8am AEST (Thursday)
- Join the Zoom meeting here
  - Meeting ID: 821 5113 3478/Passcode: 333560

NN-Explore Observing Opportunities

- NASA and the National Science Foundation have established the NASA-NSF Exoplanet Observational Research (NN-Explore) partnership to support community exoplanet research
  - WIYN 3.5m: NEID, NESSI, WHIRC, Hydra, ODI
  - SMARTS 1.5m: CHIRON
  - Minerva-Australis 4x0.7m: PRV spectrograph/photometer
- Proposals for NN-Explore time submitted through NOIRLab (30 September 2022)
  - https://noirlab.edu/science/observing-noirlab/proposals/nn-explore

Informational Session: Minerva-Australis

- The goal of this session is to help the community learn about the capabilities of the Minerva-Australis array
- Presentation by Duncan Wright of University of Southern Queensland which runs the M-A array for the M-A science consortium and the NN-Explore time
- 300 hours per semester available to the US community for general exoplanet-related science
  - All data taken in queue mode
  - M-A will deliver raw data 1-d extracted spectra, and RVs
  - Data obtained for US community observers will be archived at NExScI –through the ExoFOP service.
  - There are M-A collaboration targets listed that if you wish to observe with M-A, you need to collaborate with the M-A science collaboration

Other Resources

- Information at NExScI
  - https://nexsci.caltech.edu/missions/Minerva/
- Information at NOIRLab
  - https://noirlab.edu/science/observing-noirlab/proposals/nn-explore

And now …

- here’s Duncan …

MINERVA Australis

DUNCAN WRIGHT

CHELSEA HUANG

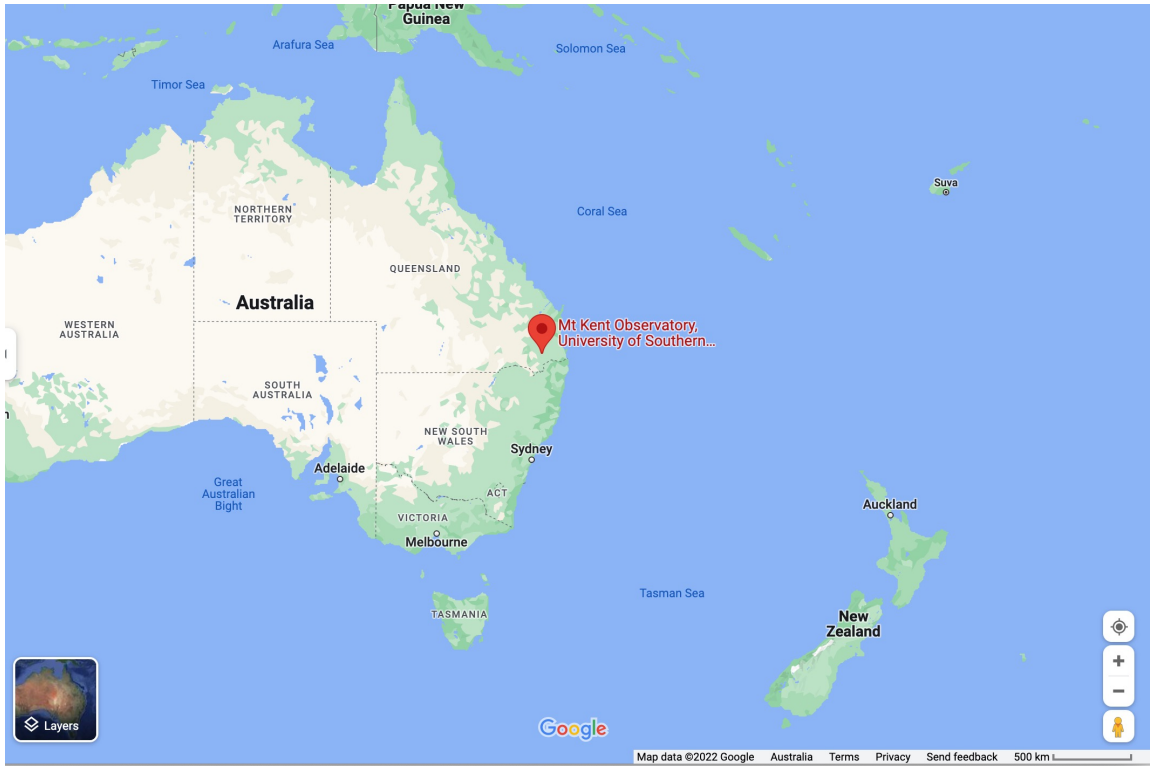
GEORGE ZHOU

University of Southern Queensland

George Mason University, Massachusetts Institute of Technology, University of California Riverside, University of Louisville, University of Florida, Nanjing University, University of New South Wales, University of Sydney, University of Texas

MINERVA Australis Mt Kent Observatory

- Located in South-East Queensland, Australia
- 151° E Lon. -28° Lat.
- Best weather May-Oct
- Current proposals due Sept 30 for period Feb - July



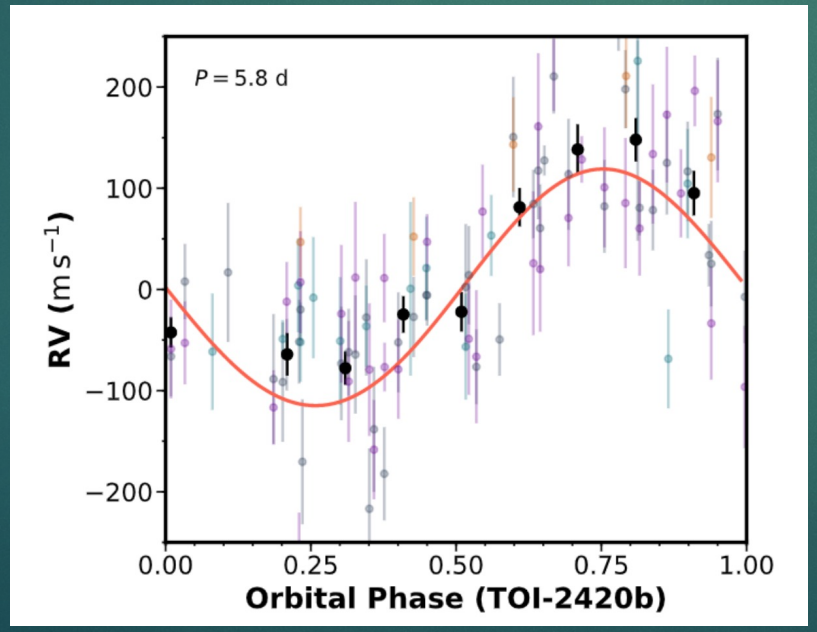
Minerva Australis Spectroscopy

- Fully robotic array of four 0.7m Planewave CDK700 telescopes
- High resolution R>80000, 484 – 627nm
- V<11.5
- Wavelength calibration is a simultaneous white-light back-lit iodine cell (separate fibre, not starlight-through system)
- Short period precision (<20d) on bright RV target <3m/s
  - e.g. tau Ceti 300s exposure
- Typical precision on a fainter or higher Vsini star can be <10m/s

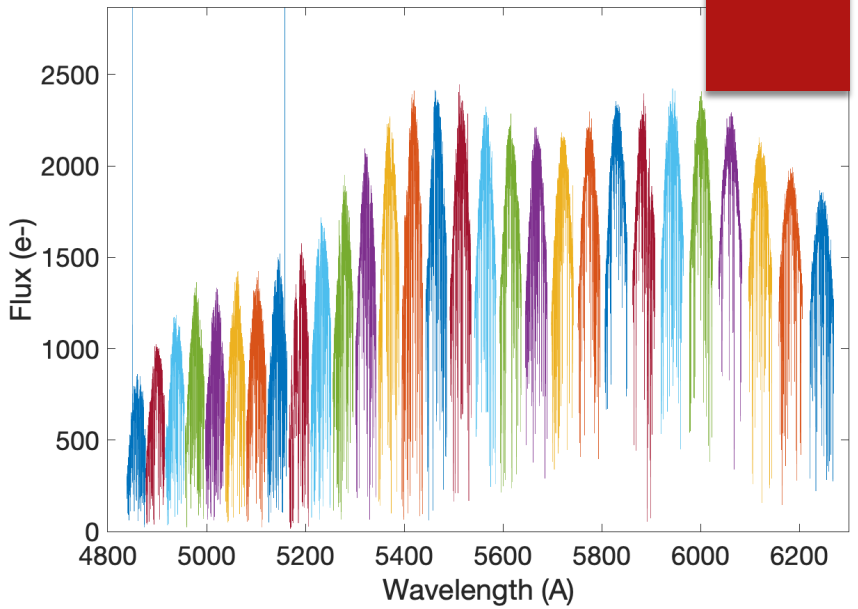
Minerva Australis Spectroscopy

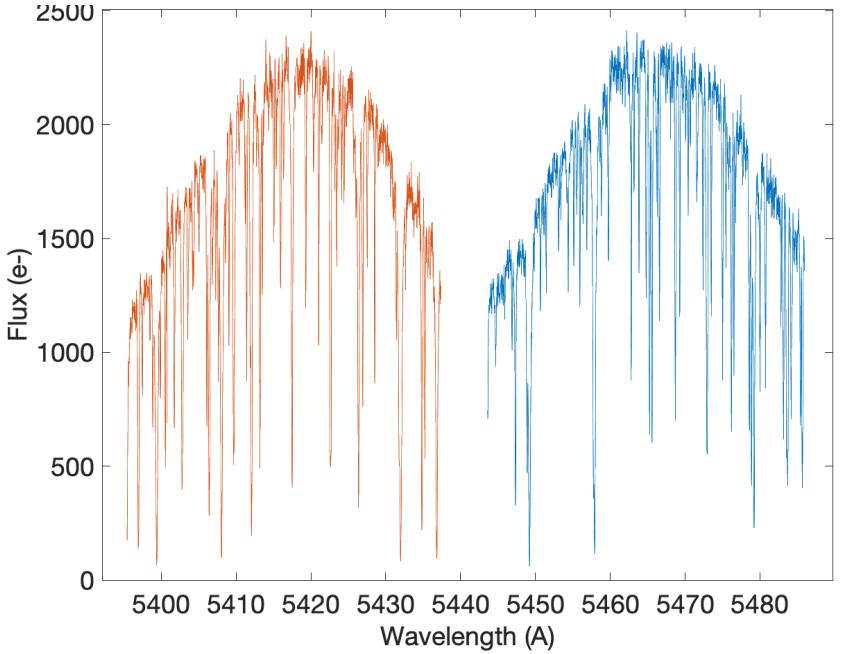
- Data is automatically reduced and RV's obtained every few days
- Each telescope provides an independent spectrum

TOI2420
Teff=5700K
V = 11.57
60min exposures
Vsini < 5km/s



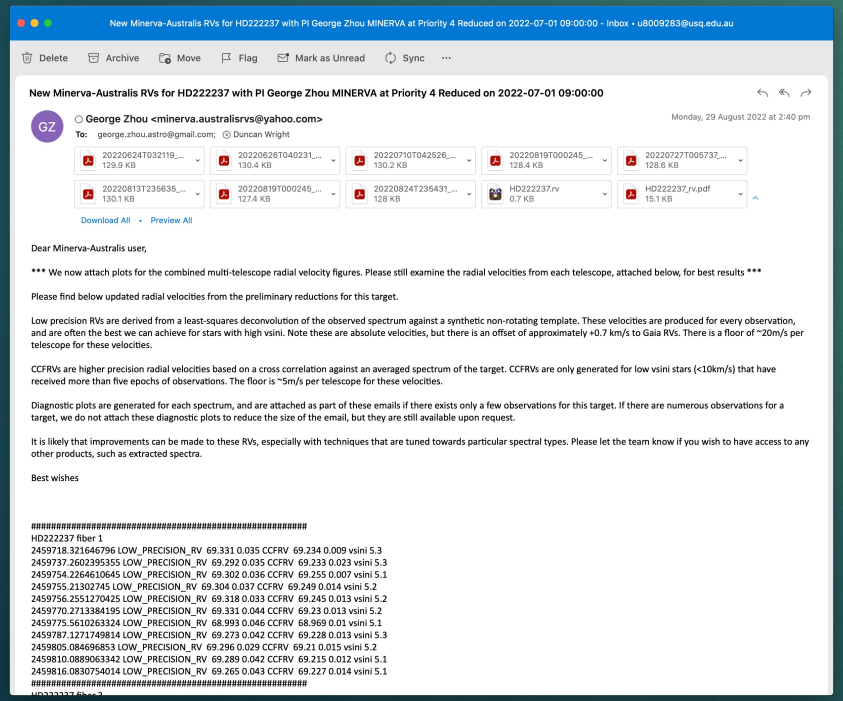
TOI2474 Teff=5000K V = 8.7
30min exposure Vsini < 5km/s





Minerva Australis Spectroscopy

- As your data is reduced you will receive an automated email
- Most TESS targets are V>8 and $V_{rot} \sin i > 5$ km/s



New Minerva-Australis RVs for HD222237 with PI George Zhou MINERVA at Priority 4 Reduced on 2022-07-01 09:00:00 - Inbox • u8009283@usq.edu.au

Delete Archive Move Flag Mark as Unread Sync ...

New Minerva-Australis RVs for HD222237 with PI George Zhou MINERVA at Priority 4 Reduced on 2022-07-01 09:00:00

GZ ○ George Zhou <minerva.australisrvs@yahoo.com> Monday, 29 August 2022 at 2:40 pm

To: george.zhou.astro@gmail.com; Duncan Wright

20220624T032119_... 129.9 KB | 20220626T040231_... 130.4 KB | 20220710T042526_... 130.2 KB | 20220819T000245_... 128.4 KB | 20220727T005737_... 128.6 KB

20220813T235635_... 130.1 KB | 20220819T000245_... 127.4 KB | 20220824T235431_... 128 KB | HD222237.rv 0.7 KB | HD222237_rv.pdf 15.1 KB

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Dear Minerva-Australis user,

*** We now attach plots for the combined multi-telescope radial velocity figures. Please still examine the radial velocities from each telescope, attached below, for best results ***

Please find below updated radial velocities from the preliminary reductions for this target.

Low precision RVs are derived from a least-squares deconvolution of the observed spectrum against a synthetic non-rotating template. These velocities are produced for every observation, and are often the best we can achieve for stars with high vsini. Note these are absolute velocities, but there is an offset of approximately +0.7 km/s to Gaia RVs. There is a floor of ~20m/s per telescope for these velocities.

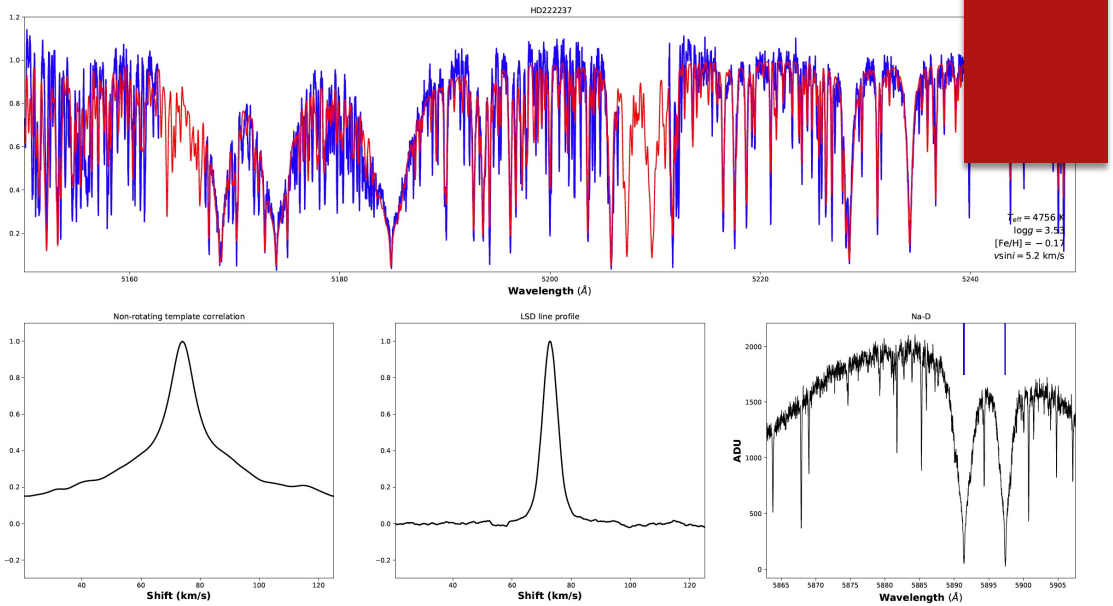
CCFRVs are higher precision radial velocities based on a cross correlation against an averaged spectrum of the target. CCFRVs are only generated for low vsini stars (<10km/s) that have received more than five epochs of observations. The floor is ~5m/s per telescope for these velocities.

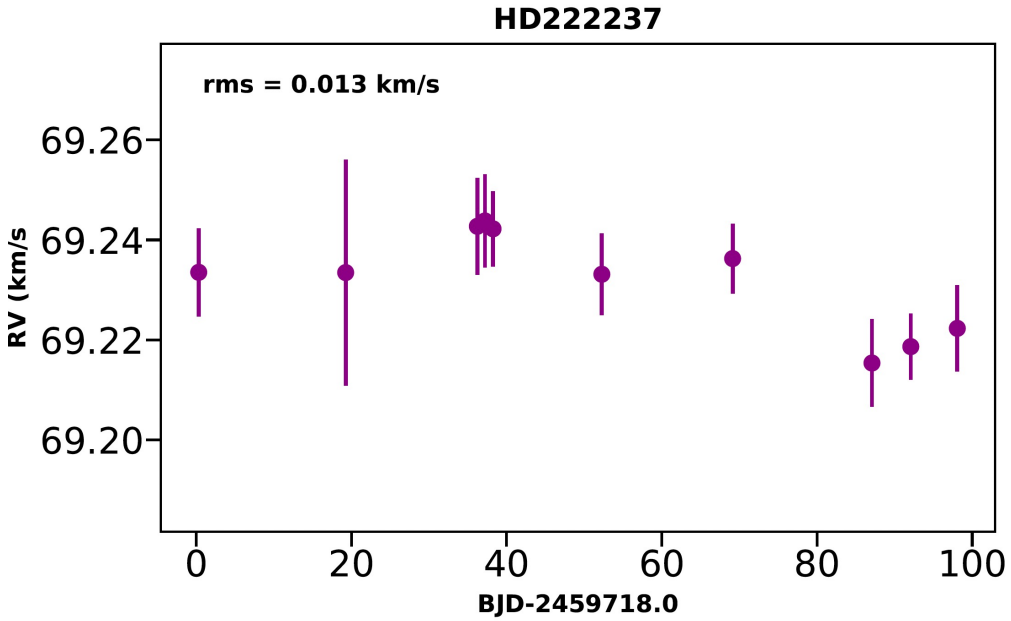
Diagnostic plots are generated for each spectrum, and are attached as part of these emails if there exists only a few observations for this target. If there are numerous observations for a target, we do not attach these diagnostic plots to reduce the size of the email, but they are still available upon request.

It is likely that improvements can be made to these RVs, especially with techniques that are tuned towards particular spectral types. Please let the team know if you wish to have access to any other products, such as extracted spectra.

Best wishes

##########
HD222237 fiber 1
2459718.321646796 LOW_PRECISION_RV 69.331 0.035 CCFRV 69.234 0.009 vsini 5.3
2459737.2602395355 LOW_PRECISION_RV 69.292 0.035 CCFRV 69.233 0.023 vsini 5.3
2459754.2264610645 LOW_PRECISION_RV 69.302 0.036 CCFRV 69.255 0.007 vsini 5.1
2459755.21302745 LOW_PRECISION_RV 69.304 0.037 CCFRV 69.249 0.014 vsini 5.2
2459756.2551270425 LOW_PRECISION_RV 69.318 0.033 CCFRV 69.245 0.013 vsini 5.2
2459770.2713384195 LOW_PRECISION_RV 69.331 0.044 CCFRV 69.23 0.013 vsini 5.2
2459775.5610263324 LOW_PRECISION_RV 68.993 0.046 CCFRV 68.969 0.01 vsini 5.1
2459787.1271749814 LOW_PRECISION_RV 69.273 0.042 CCFRV 69.228 0.013 vsini 5.3
2459805.084696853 LOW_PRECISION_RV 69.296 0.029 CCFRV 69.21 0.015 vsini 5.2
2459810.0889063342 LOW_PRECISION_RV 69.289 0.042 CCFRV 69.215 0.012 vsini 5.1
2459816.0830754014 LOW_PRECISION_RV 69.265 0.043 CCFRV 69.227 0.014 vsini 5.1
##########

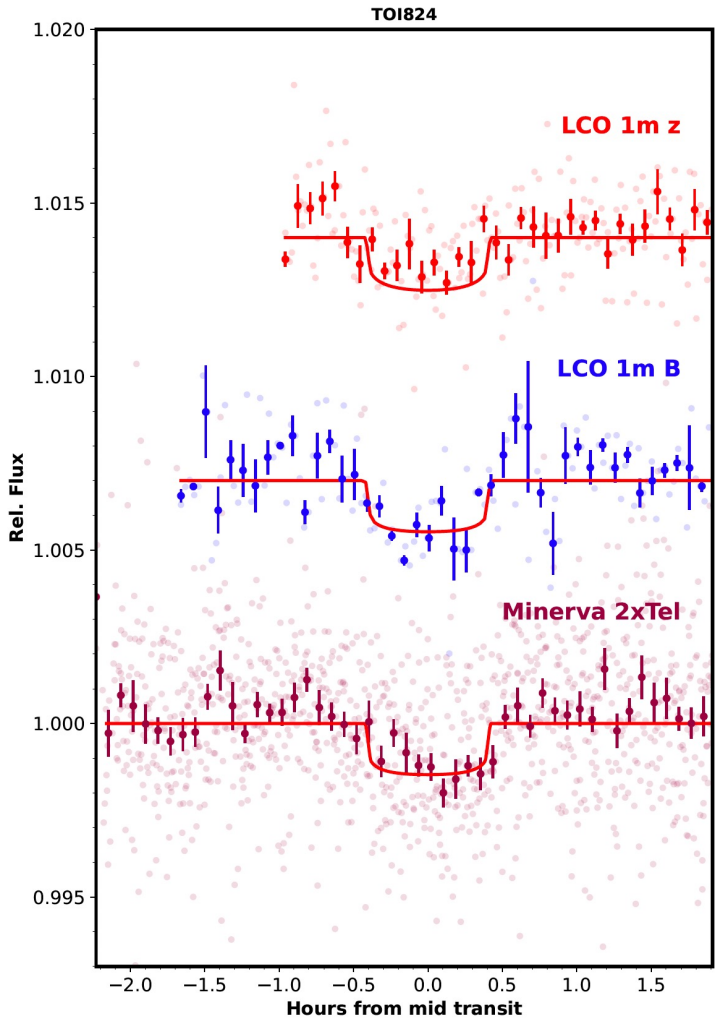




Minerva Australis Photometry

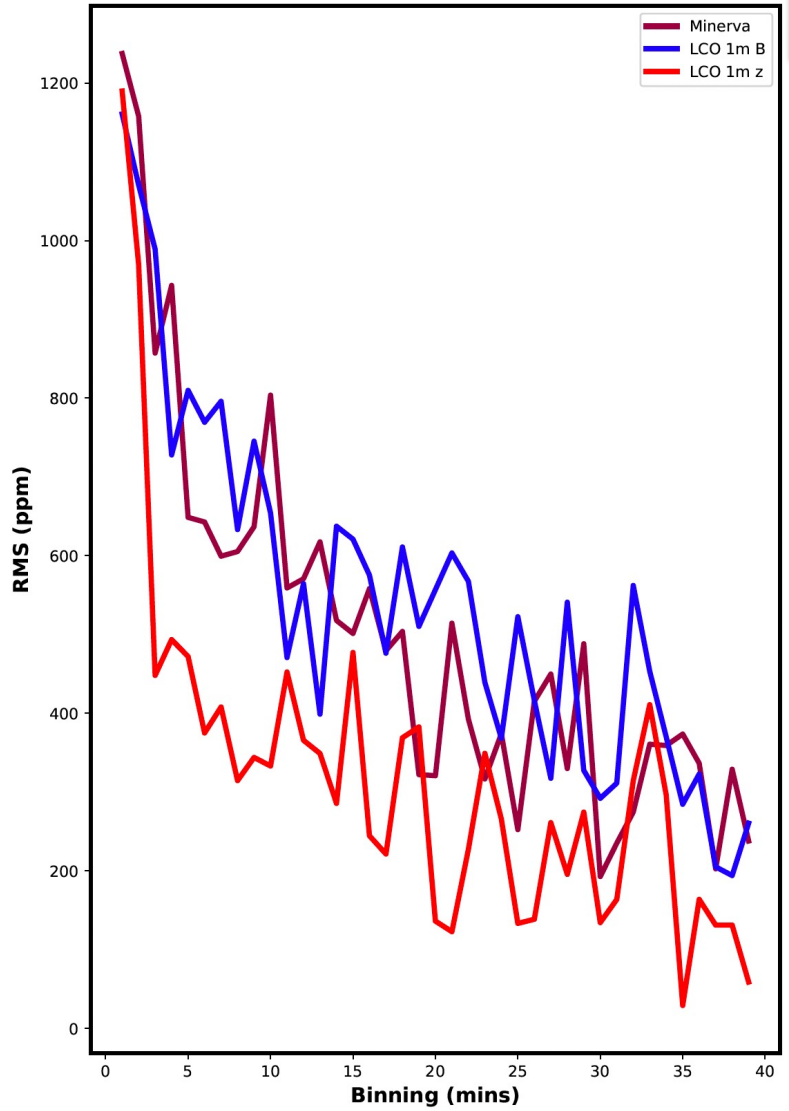
- Fully robotic array of four 0.7m Planewave CDK700 Alt-Az telescopes
- Multicolour photometry (ugriz, UVBRI soon)
- Current best photometric precision using no filter
- We are using Alt-Az telescopes at Nasmyth focus with a derotator-focuser
- Guiding includes RA, Dec and rotation correction using science images

TOI824b transit
Depth 1.49ppt



Minerva Australis Photometry

- Within a day or two of your data being taken we will reduce it and send you a summary email
- Different telescopes can observe different targets simultaneously
- Multiple filters, exposure times, telescope defocusing, other requests



Minerva Australis
NN-Explore Proposals

- Proposals for 2023A (Feb 1 – Jul 31 2023)
- Due 11:59pm MST on 30 September 2022
- Proposals should be submitted using the standard NSF NOIR Lab Observing Proposal Dashboard
- https://time-allocation.noirlab.edu/#/proposal/create/
- Select "NASA Exoplanet TAC" as the proposal type
- Select "MINERVA-A: MINERVA" in the telescope configuration

- Questions: contact Duncan.Wright@usq.edu.au or Rob.Wittenmyer@usq.edu.au