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# Updates from the NASA Exoplanet Science Institute

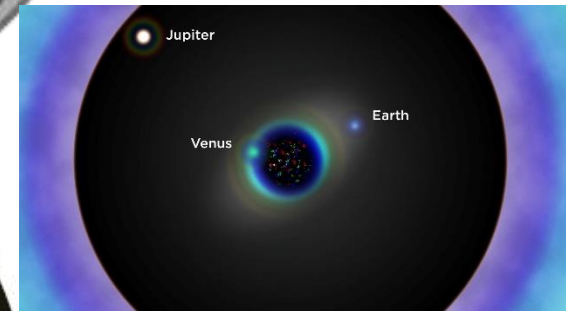
Jessie Christiansen  
& Chas Beichman  
Caltech/IPAC

ExoPAG 31 – January 11<sup>th</sup> 2025



# NExSci: NASA's ExEP Science Center

- Serves exoplanet community as focused science center for NASA's Exoplanet Exploration Program. Located on Caltech campus as part of IPAC
- Supports the broad scientific community in its use of NASA's and other facilities with telescope access, data archives and analysis tools
- Plays key role in community training through the Sagan Program and Summer Workshop



# 2025 Sagan Summer Workshop

## Silver Jubilee – Exoplanet Demographics

*How techniques from Radial Velocities and transits to imaging, astrometry and microlensing contribute to our understanding of the demographics of exoplanet systems*

- July 21-25, 2025
- Fully hybrid (~200 in person, many more online)
- Hands-on data and software exercises
- Attendee posters and pops
- In-person and virtual lunches with the speakers
- Registration opens February 3<sup>rd</sup>
- Travel support requests due by March 20<sup>th</sup>

<https://nexsci.caltech.edu/workshop/2025/>



**Scientific Organizing Committee**  
 Alan Boss (co-chair) Carnegie Science/EPL  
 Courtney Dressing (co-chair) UC Berkeley  
 Chas Beichman, Caltech/IPAC-NExSci  
 Sarah Dodson-Robinson, Univ. of Delaware  
 Debra Fischer, Yale University  
 Scott Gaudi, Ohio State University  
 Todd Henry, Georgia State University  
 Eve Lee, UC San Diego  
 Eric Nielsen, New Mexico State University  
 Leslie Rogers, University of Chicago  
 Jason Rowe, Bishop's University



# Community Observing Resources

Community access to observing resources for exoplanets and more

## Keck

- Supports strategic programs from all areas of astrophysics, solar system
- All instruments, both telescopes

## NN-Explore

- WIYN
  - NEID (PRV and daily solar data); <https://neid.ipac.caltech.edu/>
  - NESSI (HRI); WHIRC (NIR imaging/time series); HYDRRA (MOS)
- Southern Hemisphere PRV
  - SMARTS-CHIRON (stellar spectra, ~10 m/s)
  - Minerva-Australis (4x0.7m; ~10 m/s)
- Gemini-North/South
  - 'Alopeke (North) and Zorro (South)
  - High resolution imaging speckle cameras

[https://nexsci.caltech.edu/tools/obs\\_res.shtml](https://nexsci.caltech.edu/tools/obs_res.shtml)

## Observing Resources

NExSci provides access to a variety of observing resources in support of community research primarily in exoplanets, but also general astrophysics and planetary science.

### NASA Time on the Keck Observatory

The cornerstone of the NExSci supported observing resources is the NASA Keck Time. NExSci manages NASA's partnership with the W. M. Keck Observatory. Both Keck 1 and Keck 2 telescopes and all instruments are available to the community for exoplanet, astrophysical, and planetary science observations. More information on Keck instrumentation and how to apply for NASA Keck time can be found [here](#). in Waimea, Hawaii. The Keck telescopes are two 10-meter aperture telescopes whose primary mirrors are each composed of thirty-six 2 meter mirror segments.



### NN-Explore Program

NASA and the National Science Foundation have established the NASA-NSF Exoplanet Observational Research (NN-Explore) partnership to support community exoplanet research. The NN-Explore program was created in response to the community need for observational resources for exoplanet discovery and characterization. There are multiple resources available to the community through this partnership; more information on how to apply for time through the NN-Explore Program can be found at the [NOIRLab Call for Proposals](#)



### WIYN

The cornerstone of the NN-Explore Program is the NASA partnership on the WIYN telescope located at Kitt Peak Observatory. The premiere instrument on the telescope is the high precision radial velocity machine NEID which is a high resolution spectrometer capable of radial velocity precisions of 30 cm/s. The NEID Data Archive is operated by NExSci. Also available on WIYN is the high spatial resolution optical speckle imager NN-Explore Exoplanet Stellar Speckle Imager (NESSI). Other instruments available to the community include WHIRC, Hydra, and ODI.



### SMARTS-CHIRON

CHIRON on the SMARTS 1.5m telescope located at the Cerro-Tololo Observatory is a fiber-fed high resolution spectrometer capable of radial velocity precisions of a few meters per second. Through the NOIRLab partnership in the SMARTS consortium, NASA has made available time for exoplanet confirmation and characterization - especially for TESS planetary candidates.

A more complete description about the CHIRON instrument and its capabilities can be found [here](#).



### Minerva-Australis

Minerva-Australis is an array of 0.7m telescopes all feeding a single precision spectrograph. The facility is located at Mt. Kent and is able reach radial velocity precisions of a few meters per second. Through the NN-Explore partnership, NASA has made available time for exoplanet confirmation and characterization - especially for TESS planetary candidates. Please read more information [here](#).



## 2025B Proposals Due to NExSci March 13

- Supports all astrophysics and planetary science
- 2025A GO oversubscription rate:
  - Keck1 - 5.43; Keck2-- 4.9
- Five Keck Strategic Mission Support programs selected through 2026A
- Keck Planet Finder (KPF) available for community proposals
- DAPR-compliant evaluations
- <https://nexsci.caltech.edu/missions/KSA/>



## Joint JWST-NASA Keck Proposal Opportunity in Cycle 4

- Up to 10 nights could be allocated by JWST TAC (2025B and 2026A)
- Data from both observatories are required to meet the science goals
- <https://nexsci.caltech.edu/missions/KeckSolicitation/jwst-keck.shtml>

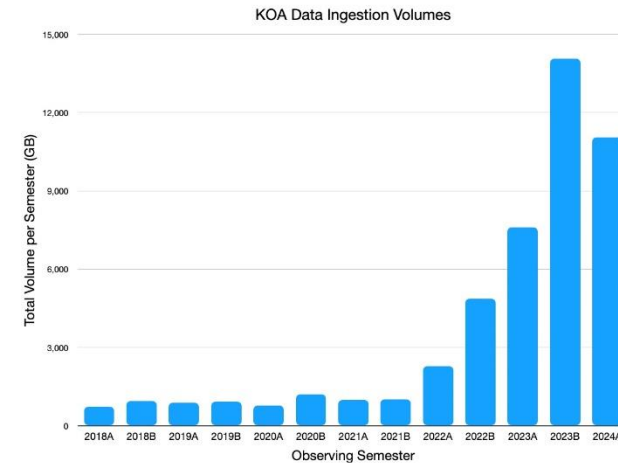


# Keck Observatory Archive

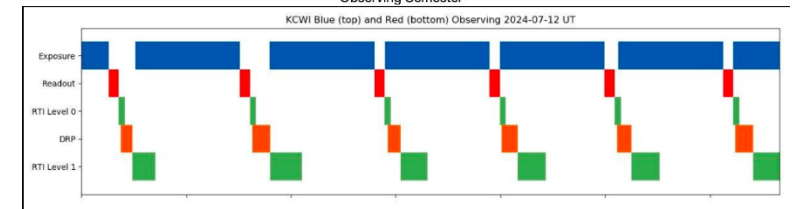
- KOA ingests raw data from all Observatory instruments, quick look data from 5 instruments, science-ready data from 7 instruments.
  - Ingest volume per semester has increased dramatically since 2022A.
  - All data ingested immediately after creation (usually < 1 minute)
- Science-ready data from KPF and NIRES awaiting release by instrument teams.
- Contributed data set “Exploring the Compositional Diversity of Small Exoplanets from K2” (A. Howard, PI) released.
- Peer reviewed papers citing KOA now represent ~20% of the WMKO’s science output.
- NASA PIs have option of requesting extension to their 12-month period of exclusive access
  - 59 programs notified; 1 extension granted
- Prototyped new Python based query infrastructure that uses R-tree index which speeds up spatial queries by x20 (*Moseley et al. at <https://arxiv.org/pdf/2412.12356>*)

<https://koa.ipac.caltech.edu>

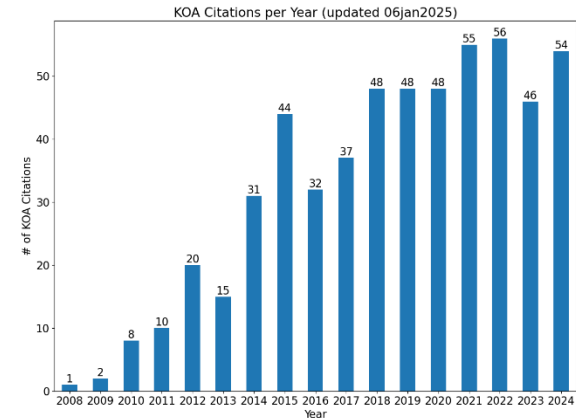
KOA is a collaboration between NExSci and the W. M. Keck Observatory



Growth in ingestion volume



Ingestion times of < 1 minute for level0, quick look, science ready data for KCWI

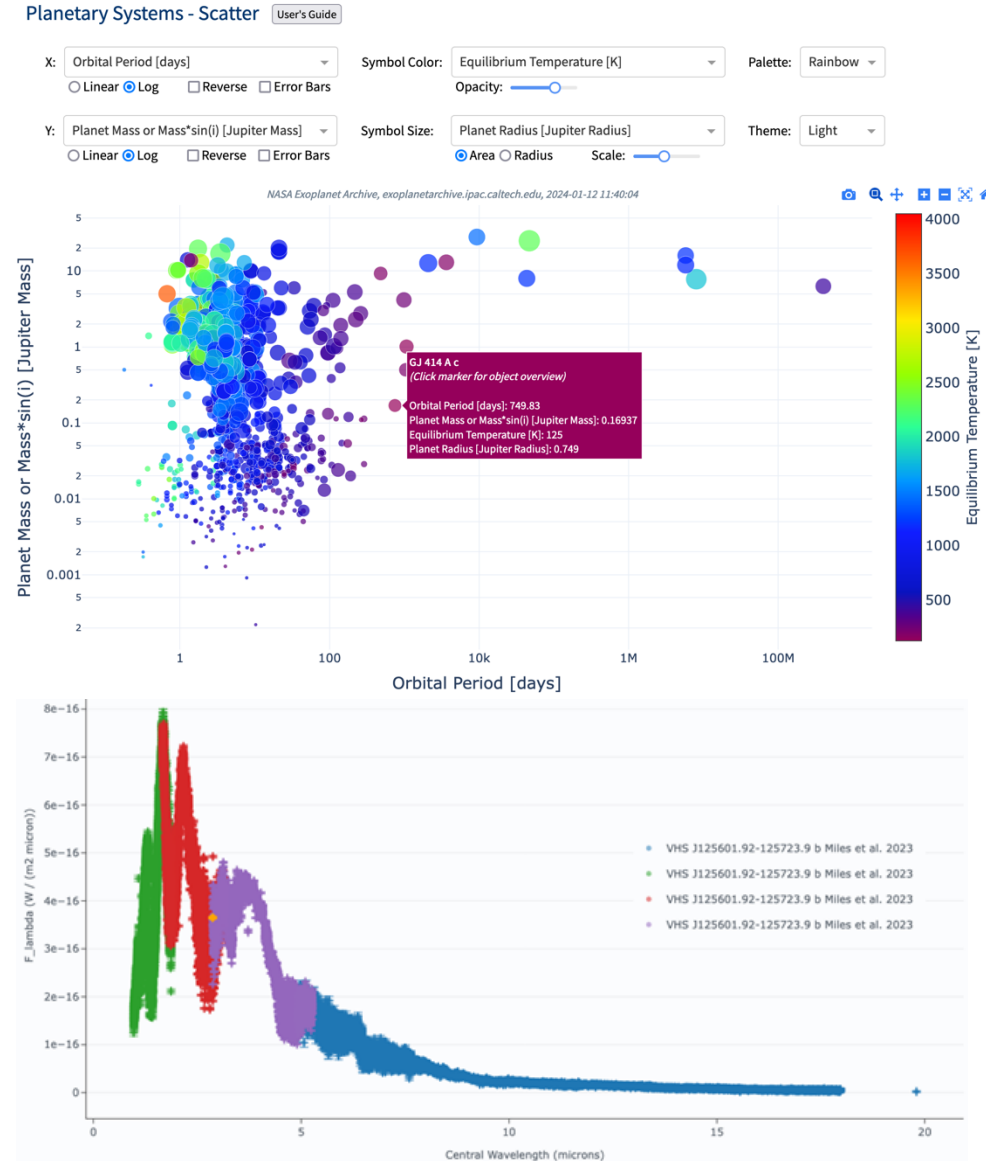


Citation rate for KOA (2008-2024)

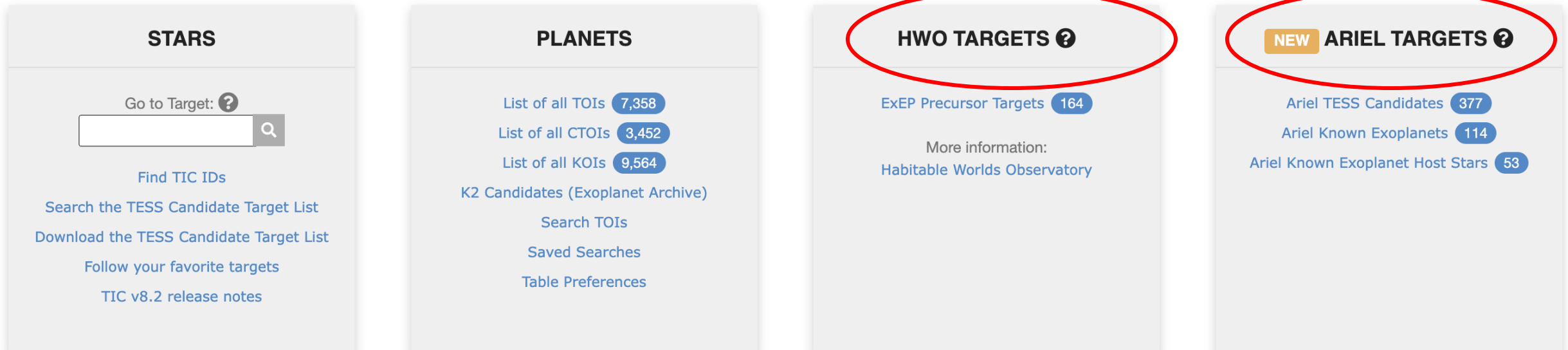


# NASA Exoplanet Archive

- 245 new planets (5811 total), **1460** updated planet parameters sets (38047 total), **360** new atmospheric spectra (910 total), including 157 JWST spectra
- New contributed datasets: PEPSI high-resolution stellar spectra, HOSTS survey for exozodiacal dust
- New mission data: CUTE (Colorado Ultraviolet Transit Experiment), expanded HWO Preliminary Input Catalog
- New tables: Transit Detection Table, Stellar Hosts Table
- Atmosphere environment: added direct imaging spectra, enabled multi-spectrum plotting
- Updated interactive plotting environment (and pre-generated plots, including new TESS plots)
- Migrated API access to TAP protocol for remaining tables



- Nearly one million files (992,191!) uploaded in support of Kepler, K2 and TESS
- Almost all tables now support table preferences (selection and ordering of display columns)
- ExEP HWO Precursor Target list and three Ariel Precursor Target lists (TESS candidates that need to be confirmed, known exoplanets that need improved masses, planet host stars that need characterization) added – *see David Ciardi's later talk re: the Ariel call*



The screenshot displays the ExoFOP interface with four main sections:

- STARS**: Includes a search bar labeled "Go to Target: ?" with a search icon, and links for "Find TIC IDs", "Search the TESS Candidate Target List", "Download the TESS Candidate Target List", "Follow your favorite targets", and "TIC v8.2 release notes".
- PLANETS**: Includes links for "List of all TOIs" (7,358), "List of all CTOIs" (3,452), "List of all KOIs" (9,564), "K2 Candidates (Exoplanet Archive)", "Search TOIs", "Saved Searches", and "Table Preferences".
- HWO TARGETS ?**: Includes "ExEP Precursor Targets" (164) and "More information: Habitable Worlds Observatory". This section is circled in red.
- NEW ARIEL TARGETS ?**: Includes "Ariel TESS Candidates" (377), "Ariel Known Exoplanets" (114), and "Ariel Known Exoplanet Host Stars" (53). This section is circled in red.