Updates from the NASA Exoplanet Science Institute (NExScI)

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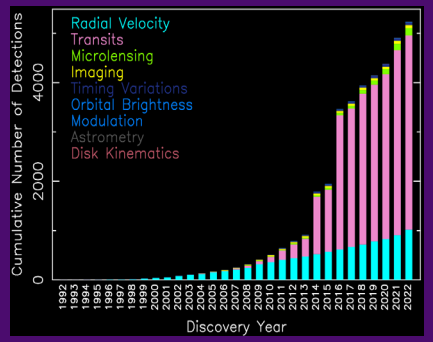
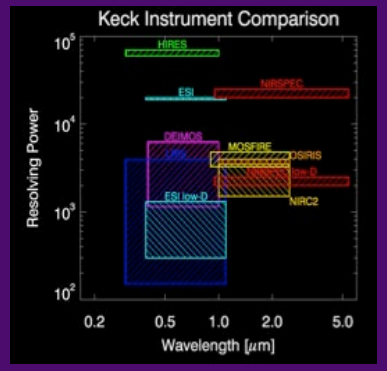
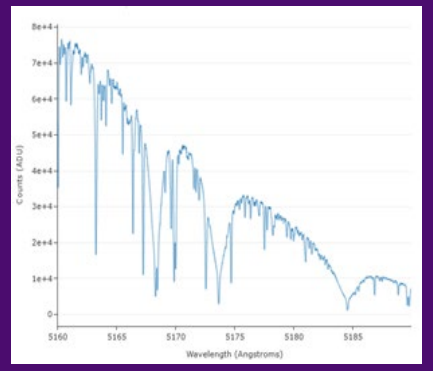
On Behalf of the NExScI Team
ExoPAG-27 07 Jan 2023

Sagan Program & Community Support	Exoplanet Archive and ExoFOP	Long Term Archives	Keck Operations and Archive (KOA)	NN-Explore NEID, Southern PRV, HR Imaging

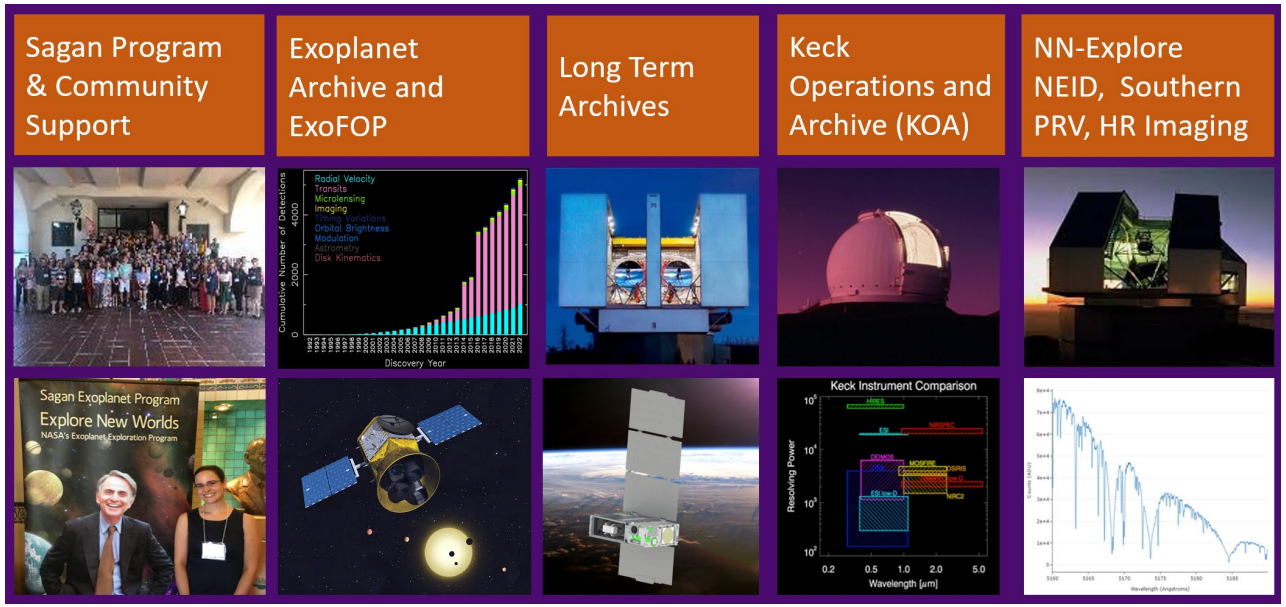






NExScI: NASA's ExEP Science Center

- Support the scientific community in their use of NASA missions to explore questions about the formation and evolution of planetary systems
- NExScI serves as the science center implementation arm of NASA's EXEP
- Located on Caltech campus as part of IPAC

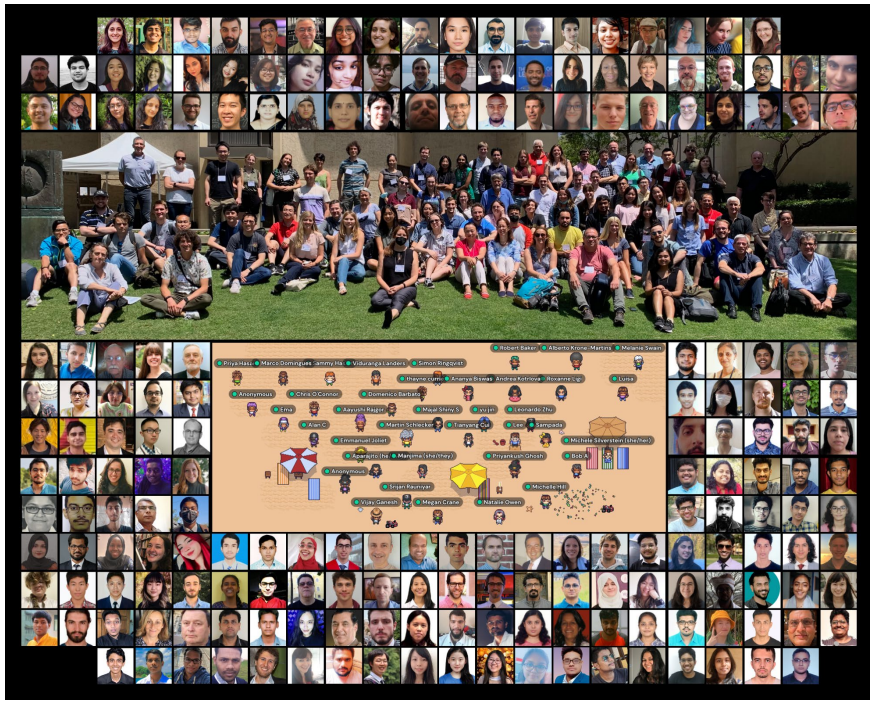


Sagan Summer Workshop

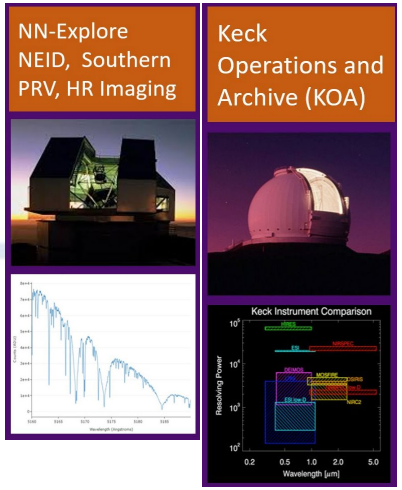
Characterizing Exoplanet Atmospheres: The Next Twenty Years

- 2023 July 24 – 28
- Theoretical modeling, interpretation, and observations of exoplanets using a variety of telescopes and techniques
- Hands-on data and software exercises
- Attendee posters and pops
- In-person and virtual “lunch” with the speakers

- Registration opens mid-February 2023
- https://nexsci.caltech.edu/workshop/2023/



Community Observing Resources



Community access to observing resources for exoplanets and more

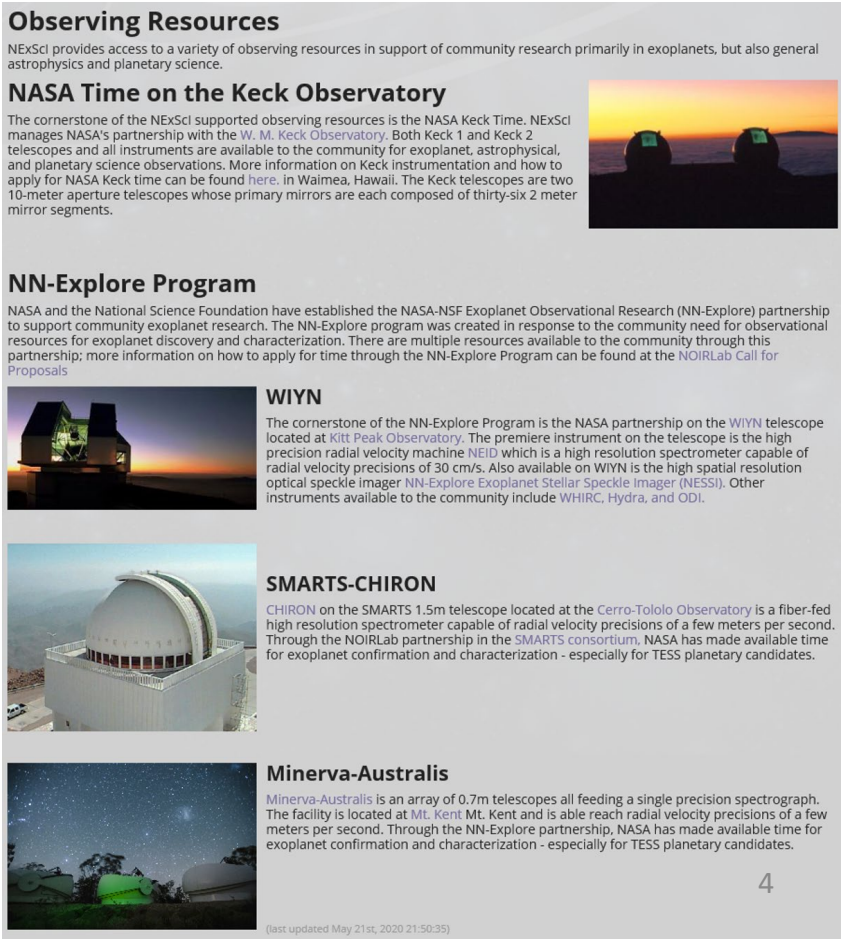
Keck

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

NN-Explore

- WIYN
  - NEID (PRV and daily solar data); NESSI (HRI); WHIRC (NIR imaging/time series); HYRDRA (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



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. 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

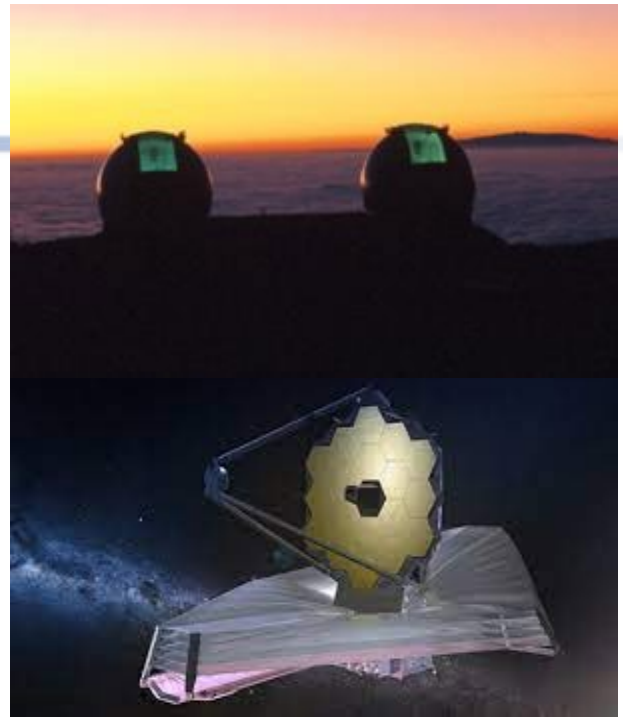
CHIRON on the SMARTS 1.5m telescope located at the Cerro-Tololo Observatory is a fiber-fed high resolution spectrometer capable of radial velocity precisions of a few meters per second. Through the NOIRLab partnership in the SMARTS consortium, NASA has made available time for exoplanet confirmation and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

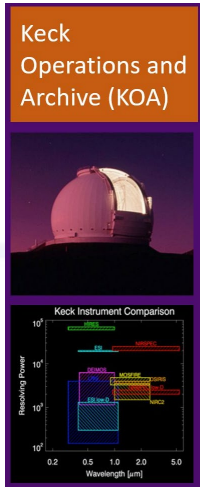
Minerva-Australis

Minerva-Australis is an array of 0.7m telescopes all feeding a single precision spectrograph. The facility is located at Mt. Kent 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.

(last updated May 21st, 2020 21:50:35)

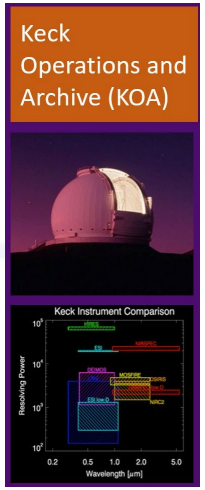
NASA Keck Time



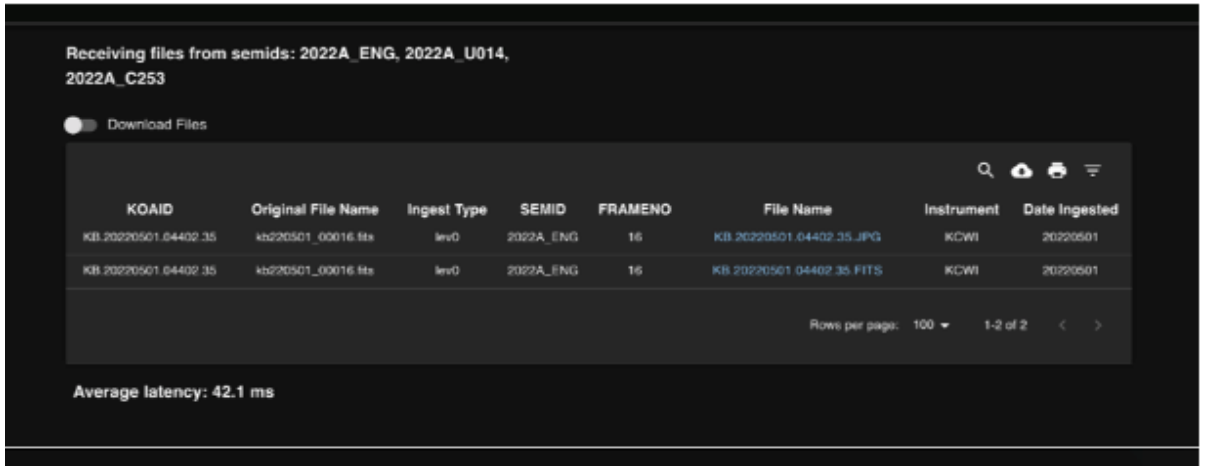


- 2023B Proposals Due to NExScI March 16
  - Supports all astrophysics and planetary science
  - 2023A GO oversubscription rate: 3.6:1
  - KPF expected to be available in 2023B
  - DAPR compliant evaluations
  - https://nexsci.caltech.edu/missions/KSA/
- Joint JWST-NASA Keck Proposal Opportunity in Cycle 2
  - 10-15 nights allocated by the JWST TAC, split between the 2023B and 2024A
  - Data from both observatories are required to meet the science goals
  - https://nexsci.caltech.edu/missions/KeckSolicitation/jwst-keck.shtml

Keck Observatory Archive (KOA)



- Real time ingestion into KOA of raw data during observations (usually within 1 minute of acquisition) operational for all active instruments.
- GUI to enable observers to manage data while observing is in test and being evaluated during night-time observations
- Moving Object Search Service has been incorporated into the KOA Python client and delivered to test.
- KPF data incorporated into KOA as part of commissioning

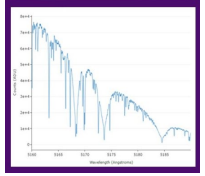


https://koa.ipac.caltech.edu

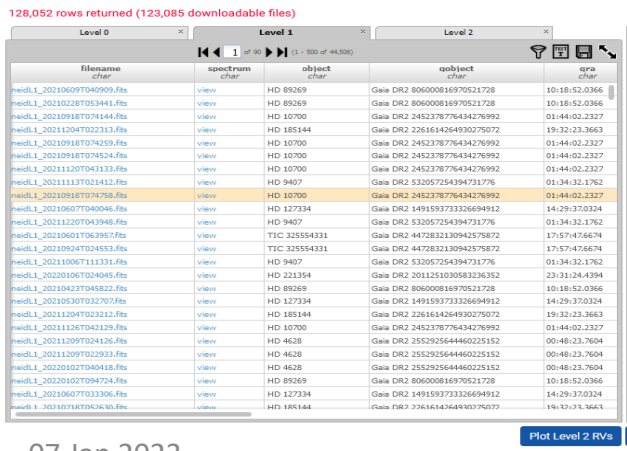
NEID Stellar and Solar Data Archive

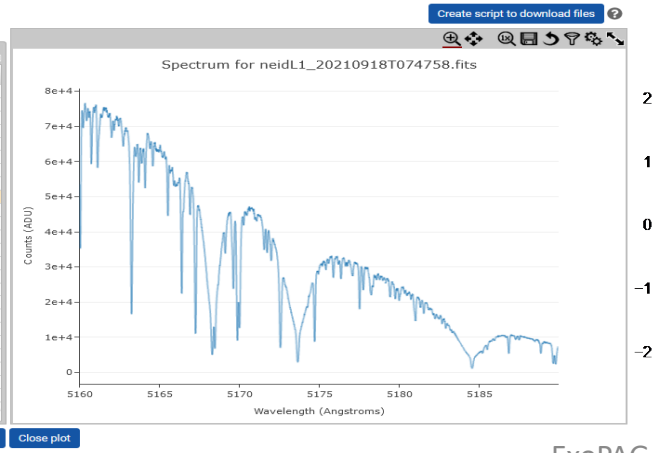
https://neid.ipac.caltech.edu/

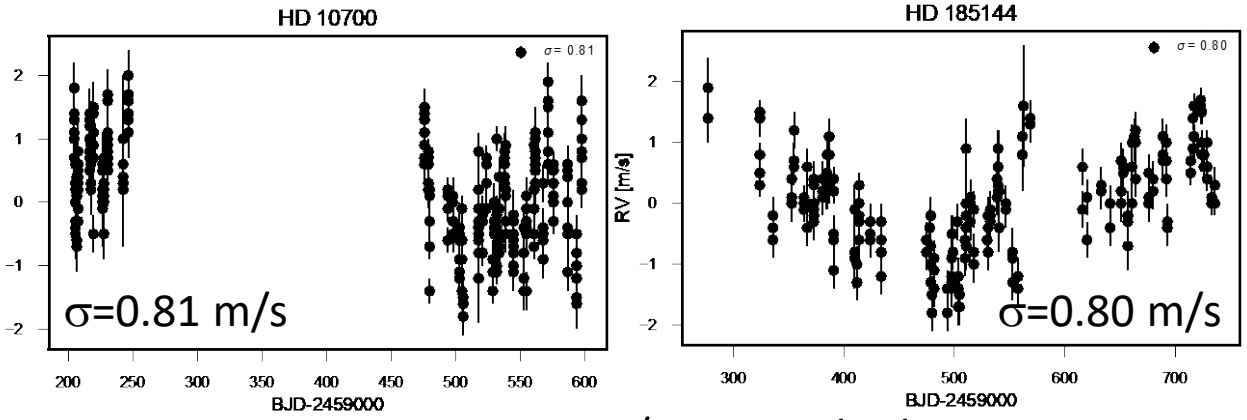
NN-Explore
NEID, Southern
PRV, HR Imaging



- NEID PRV spectrometer on WIYN 3.5 available to public through NN-Explore/NOIRLab observing time; proposals due 31 March 2023 https://noirlab.edu/science/observing-noirlab/proposals
- Contreras fire reached KPNO in June
  - NEID pre-emptively shut down and put into safe mode
  - Power and internet lost on mountain
  - Operations and instrument checkout started up in October; full operations restored in December
  - 22B programs currently begin done
  - Data will be transferred, processed, and archived starting end of January 2023 when internet fully restored



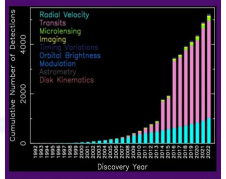




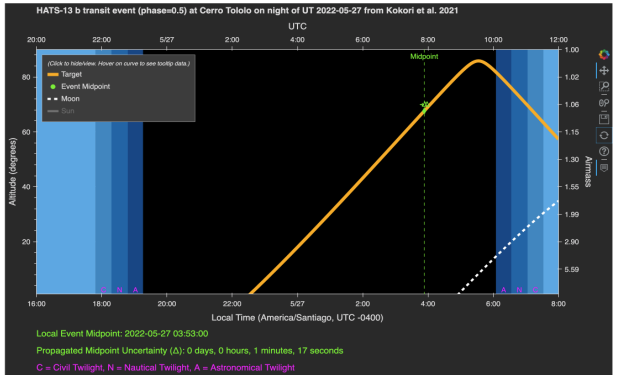
0.7 – 1.25 m/s on standards

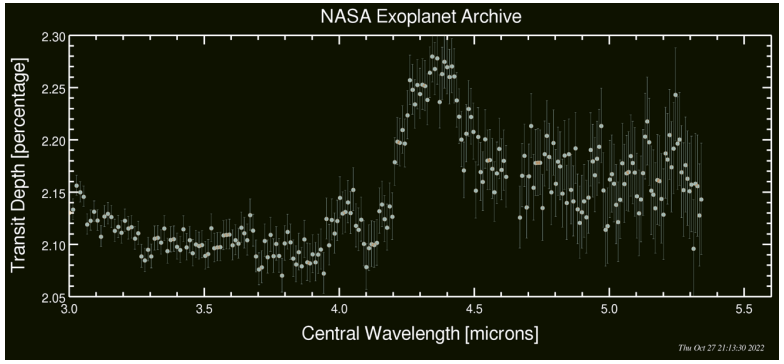
NASA Exoplanet Archive

Exoplanet Archive and ExoFOP



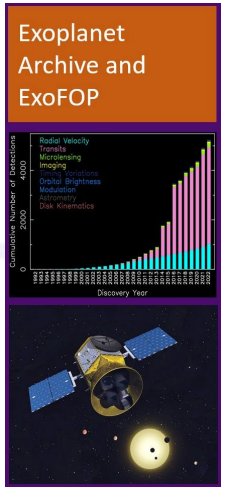
- 5235 Exoplanets
  - 331 new planets in 2022
  - 2235 planetary solutions added or updated in 2022
- System Overviews Updated
  - Kepler and TESS Candidates fully integrated
  - Refuted and controversial planets included
- Transit and Orbit Ephemeris tool updates
  - Support for JWST
  - Airmass visibility plots for ground-based facilities
- System Alias API available
  - All aliases stored in the Exoplanet Archive associated with a given system (star and planets)
  - URL driven programmatic interface
  - JSON output
- Revamp of transmission/emission spectroscopy underway
  - Inclusion of published JWST spectra



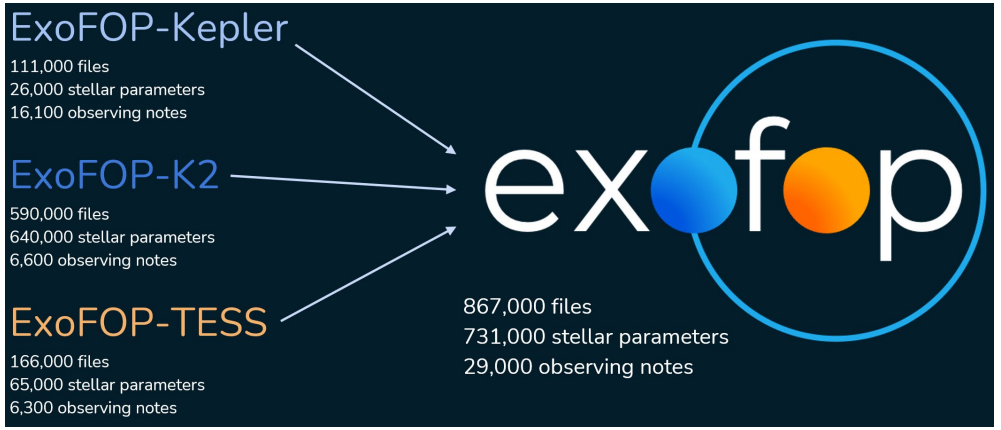


https://exoplanetarchive.ipac.caltech.edu

ExoFOP



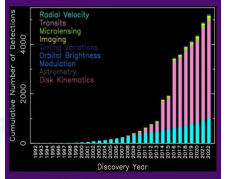
- Enables sharing of observations, data, and information on exoplanets and their host stars on all stars in the TESS Input Catalog including Kepler, K2, and TESS Objects of Interest (TOIs)
- Support TESS mission and TESS Follow-up Observation Program
- TESS Candidates: 6137 TOIs, 2846 cTOIs
- Some new functionality
  - ExoFOP Kepler-K2-TESS consolidation complete
  - Overview pages revamped for better visualization
  - Overview page content available for download in JSON structure through url-based API
  - Transmission and emission spectroscopic metrics (TSM/ESM) and predicted planetary masses calculated
- ExoFOP User Survey coming in early 2023



https://exofop.ipac.caltech.edu

Response to SAG22

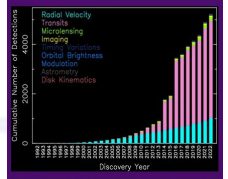
Exoplanet Archive and ExoFOP



- 2021: ExoPAG SAG report on the need for characterization and curation of targets for the future Habitable Worlds Observatory
- SAG22: Main Recommendations
  - There is a need for a centralized repository of curated, detailed stellar, and planetary system data for a relatively small collection of hundreds of nearby FGKM stars.
  - Some key stellar information necessary for target selection, prioritization, and/or characterization is poorly constrained, sparse, or non-existent particularly for time-dependent quantities
    - Uniform, good-quality stellar parameters (e.g., radius, mass, teff, lum)
    - Elemental abundances beyond Fe
    - Stellar activity measurements – particularly time-dependent
    - Well quantified uncertainties on all parameters

Response to SAG22

Exoplanet Archive and ExoFOP



- ExEP has produced an initial potential HWO target list
  - After community review, target list will be served at Exoplanet Archive and ExoFOP (early 2023)
- NExScI will adapt ExoFOP
  - Enables direct community contributions building on success of Kepler and TESS FOP programs
  - Establish working group to define needed ExoFOP changes
  - Partner with community in the context of the HWO precursor science program
    - Community database resources (e.g., Starchive, Hypatia)
    - Community target selection and characterization needs
    - Community data collection

NExScI at the AAS

Come see us at the NExScI Booth

Exoplanet Demographics Plenary by Jessie Christiansen Monday Lunch

Hyperwall talk on Exoplanet Archive and ExoFOP by Jessie Christiansen

NExScI-related science presentations

- 152.03: The Validation of the Top Targets for Atmospheric Characterization with JWST Discovered by TESS
- 160.12: PRIMA: Exoplanet and Brown Dwarf Science in the Far-IR
- 164.06: Search for wide-orbit companions around late-M stars from Subaru/IRD Strategic Program
- 204.04: Exoplanet Atmospheres from the Moon: The LUSTER Program
- 232.03: Detection Sensitivity of Transiting Planets in Single vs Binary Host Stars
- 256.09: Quantifying the precursor photometric and radial velocity observations required for Ariel
- 316.03: The Kepler Giant Planet Survey. I: A Decade of Kepler Planet Host Radial Velocities from W. M. Keck Observatory
- 321.02: Initial Results from the Quad-camera Wavefront-sensing Six-channel Speckle Interferometer: Searching for Unresolved Companions in the Widest Low-mass Binaries
- 321.06: Y Dwarf NIRCam Kernel Phase Interferometric Survey: Hunting for the Coolest Brown Dwarf Companions and Planets with JWST
- 322.03: Different Gas Accretion Pathways for the Two Giant Planets in Kepler-511
- 324.03: Spatially-resolving the terminator: Variation of Fe, temperature and winds in WASP-76b across planetary limbs and orbital phase
- 341.05: The PTI Giant Star Angular Size Survey: Effective Temperatures & Linear Radii
- 345.02: Explaining the Diversity of Cold Worlds with JWST: Part 1
- 345.04: JWST Observations of the Brown Dwarf HD 19467 B
- 345.05: JWST Observations of the Enigmatic Y Dwarf WISE 1828+2650
- 345.06: JWST Time Series Spectra of a Very Rapidly Rotating T-Dwarf
- 347.05: Spectroscopy of TOI-2318 A and B: Towards Precise Radii, Masses, and Bulk Densities of Planets in Multi-Star Systems
- 350.07: Winds and Dynamics Revealed by High-Resolution Transmission Spectroscopy
- 430.03: The Metallicity Cliff: Planet Occurrence Rates in the Metal-Poor Regime