

28 JULY 2023

# 2023 Sagan Summer Workshop Wrap Up



Caltech



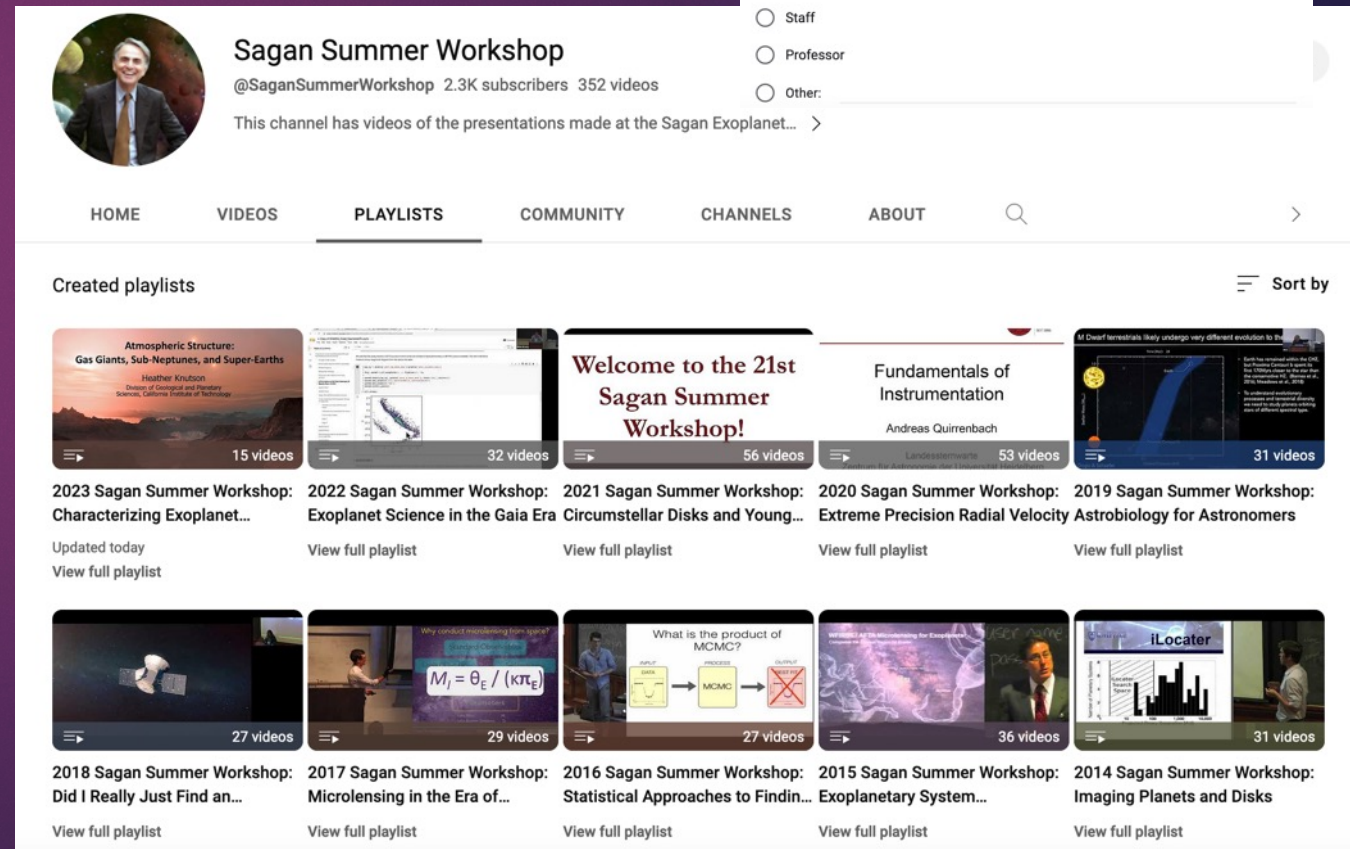
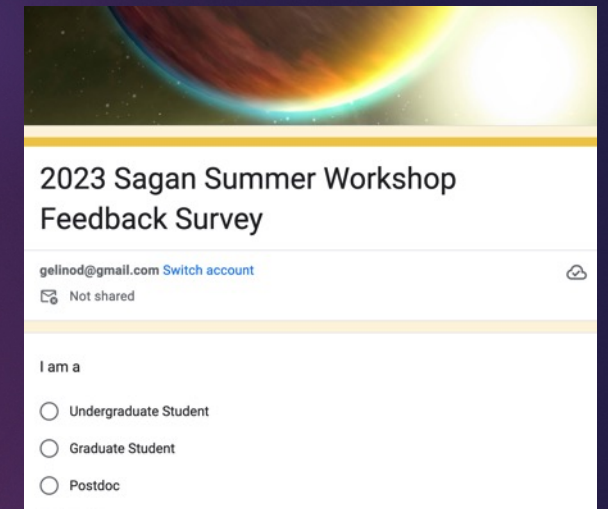
# Feedback Survey & Resources

- ▶ Please fill out the feedback survey:

<https://tinyurl.com/sagan2023>

- ▶ Videos of the presentations are posted both on the workshop agenda page and on our Sagan Summer Workshop YouTube channel

- ▶ Now includes 10 years of workshop videos!





# Many Thanks...

...to the **SOC** for a great agenda and choice of diverse and dynamic speakers:

- ▶ **Ian Crossfield, Co-Chair (University of Kansas)**
- ▶ **Tiffany Kataria, Co-Chair (NASA JPL)**
- ▶ Chas Beichman (Caltech/IPAC-NExSci)
- ▶ Jayne Birkby (University of Oxford)
- ▶ Jonathan Fortney (UC Santa Cruz)
- ▶ Dawn Gelino (Caltech/IPAC-NExSci)
- ▶ Tom Greene (NASA Ames)
- ▶ Renyu Hu (NASA JPL)
- ▶ Laura Kreidberg (MPIA)
- ▶ Kevin Stevenson (Johns Hopkins University/APL)





# ...to those behind the scenes...

## NExSci Science Affairs Team (L to R)

- ▶ Elise Furlan
- ▶ Melanie Swain
- ▶ Dawn Gelino
- ▶ **Ellen O'Leary**
- ▶ Megan Crane
- ▶ Tracy Chen





# ...to those behind the scenes...

## IPAC

- ▶ Frank Aragon
- ▶ Mari Castillo
- ▶ Teresa Molano
- ▶ Nancy Solis
  
- ▶ Wendy Burt
- ▶ Alex Hui
- ▶ Niles McElveney
- ▶ Daniel Pina-Muro



## Caltech

- ▶ Laurel Auchampaugh (Baxter/HSS)
- ▶ Hanna Ramsey (Dabney/HSS)
- ▶ Becca Rose (Academic Media Technologies)

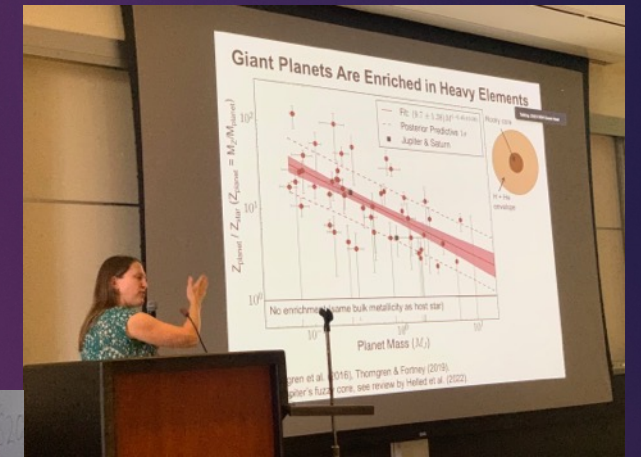
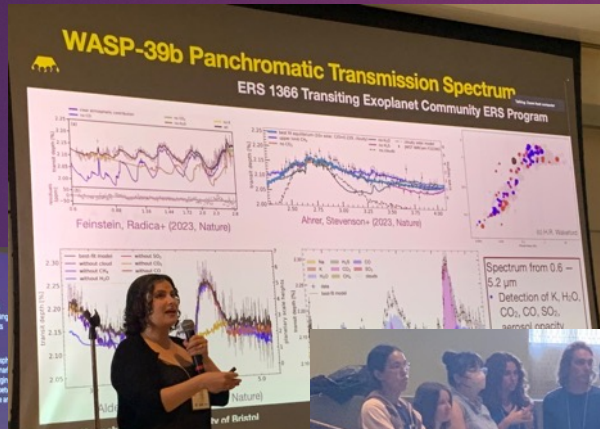




# ...to our Speakers...

Thank you for:

- ▶ Your excellent talks
- ▶ Answering questions in-person and on-line
- ▶ Participating in both in-person and remote "lunches"









# ...and to our Hands-on Session Leaders!

The preparation and technical support in getting ready for the hands-on sessions would not have been possible without the dedicated help from:

- ▶ Natasha Batalha
- ▶ Taylor Bell
- ▶ Laura Kreidberg
- ▶ Paul Molliere
- ▶ Kevin Stevenson
- ▶ Melanie Swain





# ...and to our 60 Hands-on Session Helpers!

- ▶ Qier An
- ▶ Crystal-Lynn Bartier
- ▶ Jonathan Brande
- ▶ Rosario Cecilio-Flores-Elie
- ▶ Roy Forestano
- ▶ Samantha Hasler
- ▶ Sean McCloat
- ▶ Jorge A. Sanchez
- ▶ Evan Sneed
- ▶ Pa Chia Thao
- ▶ Ashley Walker
- ▶ Michael Bess
- ▶ Jordan Ealy
- ▶ Lakeisha Ramos-Rosado
- ▶ Eyup Bedirhan Unlu
- ▶ Xueqing Chen
- ▶ Pengyu Liu
- ▶ Germain Garreau
- ▶ Juan Camilo Zapata Trujillo
- ▶ Anitha Raj Rajkumar
- ▶ Jack Davey
- ▶ Prune August
- ▶ Luke Parker
- ▶ TomásAzevedo Silva

- ▶ Annabella Meech
- ▶ Alexandra Thompson
- ▶ Sean Jordan
- ▶ Arianna Saba
- ▶ Jerry Xuan
- ▶ Tiara Andamari Saraswati
- ▶ Rohan Mukherjee
- ▶ Federico Biassoni
- ▶ Jessica Libby-Roberts
- ▶ Ashley Elliott
- ▶ Vaibhav Baldaniya
- ▶ Avijeet Palit
- ▶ Muhammad Shajahan
- ▶ Viduranga Landers
- ▶ Rajesh Mudaliyar

- ▶ Emeline Fromont
- ▶ Somsubhra De
- ▶ Ayesha Mujtaba
- ▶ Ashutosh Tripathi
- ▶ Doriann Blain
- ▶ Cyril Gapp
- ▶ Shubhonkar Paramanick
- ▶ Yu-Chia Lin
- ▶ Sahpar Ozer
- ▶ Qiao Xue
- ▶ Vera Berger
- ▶ Umadevi Velmurugan
- ▶ Hardik Medhi
- ▶ Evert Nasedkin
- ▶ Zhoujian Zhang
- ▶ Yapeng Zhang
- ▶ Abhisek Mohapatra
- ▶ Laura Mayorga
- ▶ Sagnick Mukherjee
- ▶ Mikołaj Karawacki
- ▶ Sarah Moran





# Thank You In-Person & On-line Attendees!

- ▶ This would not be a success without your interactions and involvement in asking questions and working on the hands-on sessions
- ▶ Spread the word ([#sagan2023](https://twitter.com/sagan2023)) if you enjoyed and learned something from this year's workshop!
- ▶ Feel free to keep interacting on Slack
- ▶ Check out the posters on the website and ask your questions in Slack
- ▶ Submit your headshot to be part of the Class Photo
- ▶ Fill out the survey: <https://tinyurl.com/sagan2023>



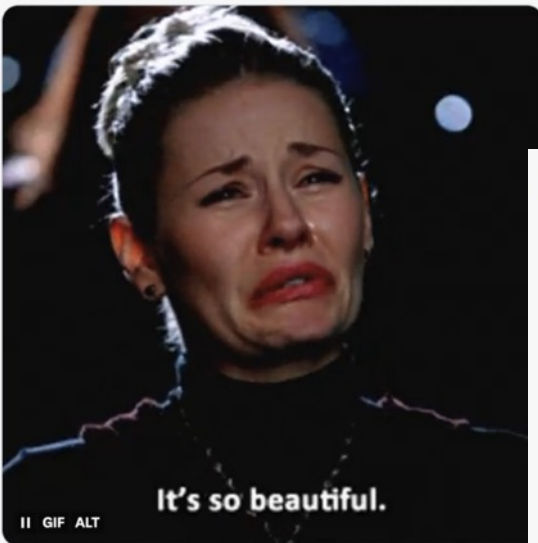


# Thank You for Tweeting/X'ing!!

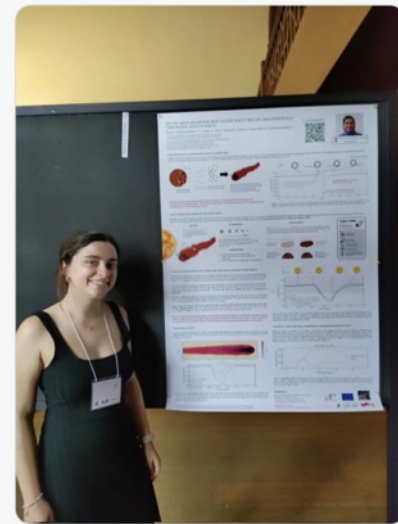
- ▶ [Twitter: #sagan2023](#)
- ▶ Guest takeover of IPAC Twitter @caltechipac
  - ▶ Michael Wong (in-person attendee)
  - ▶ Kevin Hardegree-Ullman (remote attendee)



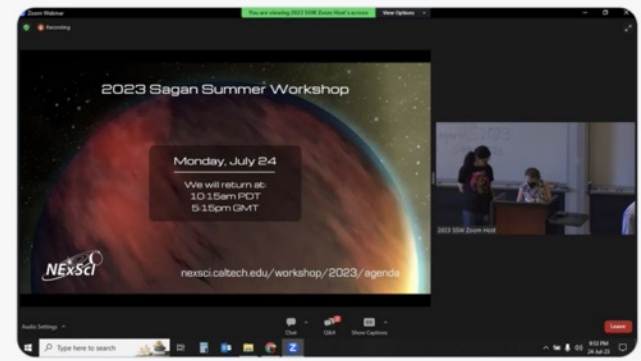
**Natalia the Astronomer** @natalialowson · 2h  
Another day of great talks at #sagan2023. From exploring the research behind lava worlds 🌋 (with @AstroYamila), to clouds/haze 🌫️ (with @PlanetaryGao), 3D mapping 🌐 (with @astronemly), and much more! It just makes me so happy that this workshop exists 😊



**Beatriz Campos Estrada** @exobeatriz · Jul 24  
Currently at #Sagan2023 🍷 Today I did some data reduction for the first time in my life... something I never thought I'd get my hands on as a modeller 😊 Anyways, I do have a poster on how we can use some peculiar objects to constrain the composition of small rocky planets!



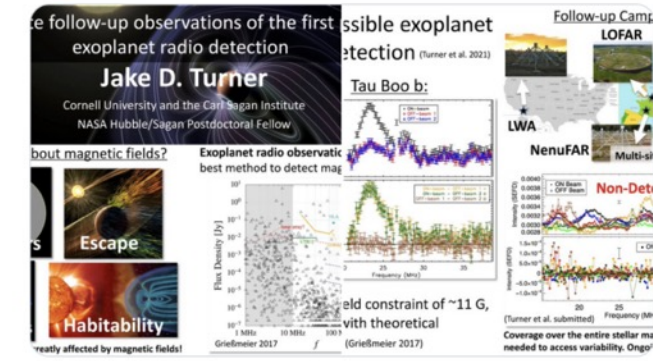
**Fouz Siddiqui** @FouzSiddiqui\_ · Jul 24  
I am attending #Sagan2023 remotely - Summer Workshop Characterizing Exoplanet Atmospheres: The Next Twenty Years. Thank you @caltechipac



**Dr. Jake Turner** @Astro\_journey · Jul 25  
What about magnetic fields? 🌌 🍷

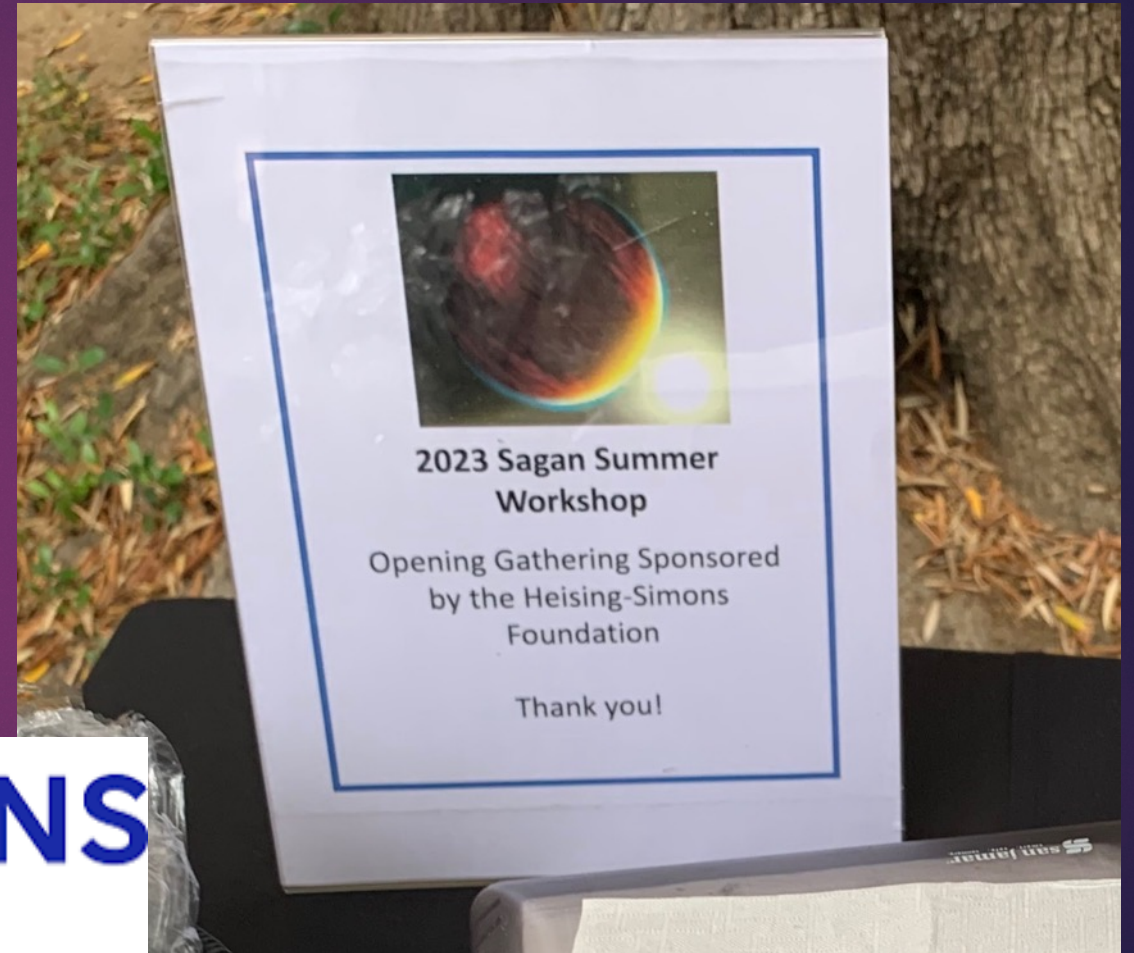
Today, I'm presenting my poster at the Sagan Workshop on our work using radio observations to constrain magnetic fields

Come stop by or message me to chat about it #sagan2023





# And Now a Word From our Sponsors...



**Thank you!!!**



Home About Us Data Tools Support Login

5,470 Confirmed Planets  
07/11/2023

363 TESS Confirmed Planets  
07/11/2023

6,687 TESS Project Candidates  
07/08/2023

View more Planet and Candidate statistics

Explore the Archive

Name or Coordinates  Search

Optional Radius (arcsec)  Advanced Search

A Better Way To Work With Spectra  
July 18, 2023 - New Service  
We're happy to announce the beta release of the Atmospheric Spectroscopy Table. This new table offers an interactive and unified interface for browsing, visualizing, plotting, and downloading the archive's emission and transmission spectra. (Click for details)

Transit Surveys 130,041,578 Light Curves

TESS Launched in April 2018, TESS is surveying the sky for two years to find transiting exoplanets around the brightest stars near Earth.

Confirmed Planets

ExoFOP-TESS

Project Candidates

TESS Kepler K2 KELT

Tools & Services

Build a Query (TAP)

Build a Query (API)

Transit and Ephemeris Service

EXOFAST: Transit and RV Fitting

Periodogram

Predicted O for Exoplanet

FAQ

NASA EXOPLANET ARCHIVE  
NASA EXOPLANET SCIENCE INSTITUTE

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User Guide Atmospheric Spectroscopy

Download All Checked Spectra

Summary of Atmospheric Spectra

Planet Name	Type of Spectrum	Reference	# Data Points	Instrument	Facility	Center of Wavenumber (cm⁻¹)	Band Width (cm⁻¹)	Transit Depth (%)	Transit Depth (+err)	Transit Depth (-err)
WASP-39 b	Transmission	Dunn et al., 2022	1023	Next-Generation Infrared and Ultraviolet Spectrograph (NIGUS)	NASA & Sin James Webb Space Telescope (JWST)	3.09987	2.1308	0.0094	-0.0094	0.0094
WASP-39 b	Emission	Collier et al., 2023	408	Next-Generation Infrared and Ultraviolet Spectrograph (NIGUS)	NASA & Sin James Webb Space Telescope (JWST)	3.05381	2.1308	0.0094	-0.0094	0.0094
WASP-39 b	Emission	Collier et al., 2023	408	Next-Generation Infrared and Ultraviolet Spectrograph (NIGUS)	NASA & Sin James Webb Space Telescope (JWST)	3.05376	2.1308	0.0097	-0.0097	0.0097
WASP-39 b	Emission	Collier et al., 2023	408	Next-Generation Infrared and Ultraviolet Spectrograph (NIGUS)	NASA & Sin James Webb Space Telescope (JWST)	3.04317	2.1304	0.0097	-0.0097	0.0097
WASP-39 b	Emission	Collier et al., 2023	408	Next-Generation Infrared and Ultraviolet Spectrograph (NIGUS)	NASA & Sin James Webb Space Telescope (JWST)	3.05332	2.1482	0.0097	-0.0097	0.0097
WASP-39 b	Transmission	Milone et al., 2022	344	Next-Generation Spectrograph (NIGUS)	CSF NASA & Sin James Webb Space Telescope (JWST)	3.06224	2.1396	0.0097	-0.0097	0.0097
WASP-39 b	Transmission	Yelland et al., 2022	233	Next-Generation Infrared and Ultraviolet Spectrograph (NIGUS)	NASA & Sin James Webb Space Telescope (JWST)	3.05815	2.1233	0.0097	-0.0097	0.0097
WASP-39 b	Transmission	2022 Community-Generated Community	243	Next-Generation Spectrograph (NIGUS)	NASA & Sin James Webb Space Telescope (JWST)	3.09208	2.132	0.0096	-0.0096	0.0096
WASP-39 b	Transmission	Burrows et al., 2022	207	Next-Generation Spectrograph (NIGUS)	PIES NASA & Sin James Webb Space Telescope (JWST)	3.10944	2.1234	0.01	-0.01	0.01
WASP-39 b	Emission	Wang et al., 2022	242	Next-Generation Infrared and Ultraviolet Spectrograph (NIGUS)	NASA & Sin James Webb Space Telescope (JWST)	3.11794	2.138	0.0102	-0.0102	0.0102
WASP-39 b	Transmission	Hirata et al., 2022	120	Next-Generation Spectrograph (NIGUS)	NASA & Sin James Webb Space Telescope (JWST)	3.11049	2.1372	0.0102	-0.0102	0.0102
WASP-39 b	Transmission	Blanc et al., 2024	187	Wide Field Camera 3	Hubble Space Telescope satellite	3.44119	2.1799	0.0103	-0.0103	0.0103
WASP-39 b	Transmission	Wang et al., 2022	107	Next-Generation Infrared and Ultraviolet Spectrograph (NIGUS)	NASA & Sin James Webb Space Telescope (JWST)	3.10364	2.1338	0.0103	-0.0103	0.0103

WASP-39 b JWST Transiting Exoplanet Community ERS Team 2022 Spectrum Preview

# NASA Exoplanet Archive/ExoFOP

## NASA Exoplanet Archive

- ▶ The premiere exoplanet database of confirmed planets and candidates
- ▶ Almost 5,500 exoplanets with ~35,000 planetary system solutions
- ▶ All Kepler, K2, and TESS candidates
- ▶ All Kepler high level products
- ▶ Tools including a new Exoplanet Spectroscopy Visualization Environment
- ▶ [exoplanetarchive.ipac.caltech.edu](http://exoplanetarchive.ipac.caltech.edu)

## Exoplanet Follow-up Observing Program (ExoFOP)

- ▶ The premiere service to share exoplanet follow-up observations, data, and notes
- ▶ Built on the entire TESS Input Catalog (i.e., Gaia DR2)
- ▶ 70,000+ observations and > 1 million files, data, and notes uploaded by users
- ▶ [exofop.ipac.caltech.edu](http://exofop.ipac.caltech.edu)

Welcome to ExoFOP

The Exoplanet Follow-up Observing Program (ExoFOP) website is designed to optimize resources and facilitate collaboration in follow-up studies of exoplanet candidates. ExoFOP serves as a repository for project and community-gathered data by allowing upload and display of data and derived astrophysical parameters.

News: April 20, 2023

- TOLKOS Summary tables have been added to the top of the individual target pages listing the TOLKOS period and radius
- "Help with Table Filtering" and "Clear All Filters" buttons have been added to the Observation Summary tables

ExoFOP Professional Conduct Policy

All users are expected to follow the ExoFOP Data Use and Professional Conduct Policy.

Please include the following standard acknowledgment in any published material that makes use of ExoFOP: "This research has made use of the Exoplanet Follow-up Observing Program (ExoFOP, DOI: 10.26132/ExoFOP) website, which is operated by the California Institute of Technology, under contract with the National Aeronautics and Space Administration under the Exoplanet Archive Program."

REQUEST AN ACCOUNT RESET YOUR PASSWORD

**STARS**

Go To Target:

Find TIC ID

Search the TESS Candidate Target List

Download the TESS Candidate Target List

Follow your favorite targets

TIC v8.2 release notes

**PLANETS**

List of all TICs

K2 Candidates (Exoplanet Archive)

Search TICs

Save Searches

**DATA TAGS**

Data Tag (is a tag number or YYYYMMDD user\_description\_name)

List of all TAGS

View 100 most recent Data Tags for a user (enter username or leave blank to view your own if you are logged in)

Search TICs

**OBSERVATIONS**

Imaging

Spectroscopy

Time Series

Stellar Comparisons

**BULK UPLOADS**

Files

Observations

Observing Notes

CTIOs/Parameters

Stellar Companions

TIC Properties

ACWG Matrix

**TFOP WORKING GROUP**

Apply to Join TFOP Working Group

SQL TESS Transit Finder (TFP)

SQL TESS Observations Coordinator (TFC)

SQL Spectrograph

SQL Observation Coordinator

**CHANGE LOG**

View the Change Log (last week)

Search the Change Log (left) (enter TICs or TICs) (for detailed activity)

Subscribe to the Change Log Summary

**OTHER LINKS**

Statistics

TIC Input Data

ExoFOP News

TESS & ESA Documentation

Web Imaging of the Exoplanet Field

ExoFOP Download Functions

Tools (Python Notebooks)

Transit Detection

TESS Camera & Image Notes

ExoFOP Directory



# NASA-Keck Observing Time

- ▶ Access to ~47 nights/semester spread over the two 10m telescopes in Maunakea, HI
- ▶ Astronomers based at any U. S. institutions may apply as a PI; Co-Is may be international
- ▶ Proposals are evaluated for NASA strategic relevance and proposed science goals
- ▶ Twilight, Cadence, and Target of Opportunity proposals accepted
- ▶ Financial support for successful PIs, contingent upon NASA funding
- ▶ KSMS, GO, MS Proposals for 2024A due September 14, 2023
  - ▶ Key Strategic Mission Support (KSMS) Nols due August 16
  - ▶ Dual Anonymous Proposal Review process
- ▶ Cycle 3 joint NASA Keck/JWST program!



<https://nexsci.caltech.edu/missions/KSA>



# NASA Hubble Fellowship Program (NHFP)

- ▶ For independent research related to the goals of NASA Astrophysics
  - ▶ Observational, theoretical, experimental, or instrumental
  - ▶ Within 4 years of your PhD
  - ▶ Applicants can be from *anywhere* around the world, but must serve their fellowship at a US institution
  - ▶ Fellows named Sagan, Hubble, or Einstein depending on their field of study
- ▶ Call for applications online in early September
- ▶ 2024 applications are **due November 2, 2023**



<https://nexsci.caltech.edu/sagan/fellowship.shtml>



# Reminders

- ▶ **Letter** request website is now available
  - ▶ Letters will be sent to those who have requested them no earlier than late August, so please be patient!
  - ▶ <https://catcopy.ipac.caltech.edu/ssw/certificate.php>
- ▶ Submit your **headshot** to be part of the on-line Class Photo
  - ▶ August 18 deadline
  - ▶ [https://catcopy.ipac.caltech.edu/ssw/enter\\_photo.php](https://catcopy.ipac.caltech.edu/ssw/enter_photo.php)
- ▶ **Slack** will remain open, but messages older than 90 days will not be accessible
  - ▶ If you are still working on the hands-on sessions, please search in the relevant channels for answers to your questions. There are many answers in there!





# Tomorrow!

**NExSci**  
**NASA Exoplanet Science Institute**

EXOPLANET EXPLORATION  
Planets Beyond Our Solar System



SERVING THE EXOPLANET SCIENCE COMMUNITY

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## EXCALIBUR Workshop

### EXoplanet CALibration and Bayesian Unified Retrieval

Saturday morning, July 29, 2023 in Baxter Lecture Hall at Caltech and online using the same Zoom webinar link as the Sagan Workshop.

Following the 2023 Sagan Summer Workshop, there will be an optional add-on half-day workshop to learn about EXCALIBUR (EXoplanet CALibration and Bayesian Unified Retrieval). EXCALIBUR is a new tool for comparative planetology. Developed at the Jet Propulsion Laboratory, EXCALIBUR implements uniform processing of exoplanet input catalogs with a high-agility architecture to respond to updates in system parameters, observational data, instrument models, and retrieval methods. EXCALIBUR preserves the full chain of inference by saving all intermediate data products. An initial EXCALIBUR catalog and associated data products will be available this summer through a NExSci portal and EXCALIBUR will eventually form the basis of the [CASE Explorer Mission of Opportunity](#) data reduction pipeline. The CASE project is the US contribution to the European Space Agency's [Ariel mission](#), which will survey the atmospheres of approximately 1000 exoplanets. Hubble data processed by EXCALIBUR has been used to study the structure, composition, and chemistry of various exoplanet atmospheres (see [Swain et al. 2021](#), [Roudier et al. 2021](#), [Estrela et al. 2021, 2022](#), [Huber-Feely 2022](#)).

If your schedule allows, spend an extra half-day (either in-person or virtually) after the Sagan Summer Workshop to learn from the EXCALIBUR scientists and developers about how EXCALIBUR works, the data products it produces, and how to interact with the data products. Please indicate your interest in this half-day workshop when you register for the 2023 Sagan Workshop. The EXCALIBUR workshop will be held on the Caltech campus.

## Agenda

Time	Title	Speaker
9:00 am	Welcome to the EXCALIBUR Tutorial	David Ciardi (Caltech/IPAC-NExSci)
9:10 am	Philosophy and Overview of Excalibur	Mark Swain (JPL)
9:30 am	Excalibur Public Interface	David Ciardi (Caltech/IPAC-NExSci)





2009 SSW: Exoplanet Atmospheres  
(101 registered)



# SAGAN SUMMER WORKSHOP 2009



Kevin Stevenson  
Ian Crossfield

Jonathan Fortney

Leigh Fletcher

2009

Yamila Miguel  
Emily Rauscher  
Nikole Lewis

Dawn Gelino

(101 registered)

2023

(1400+ registered)

