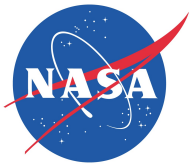

ExEP Science Update and NASA Exoplanet Archive Update

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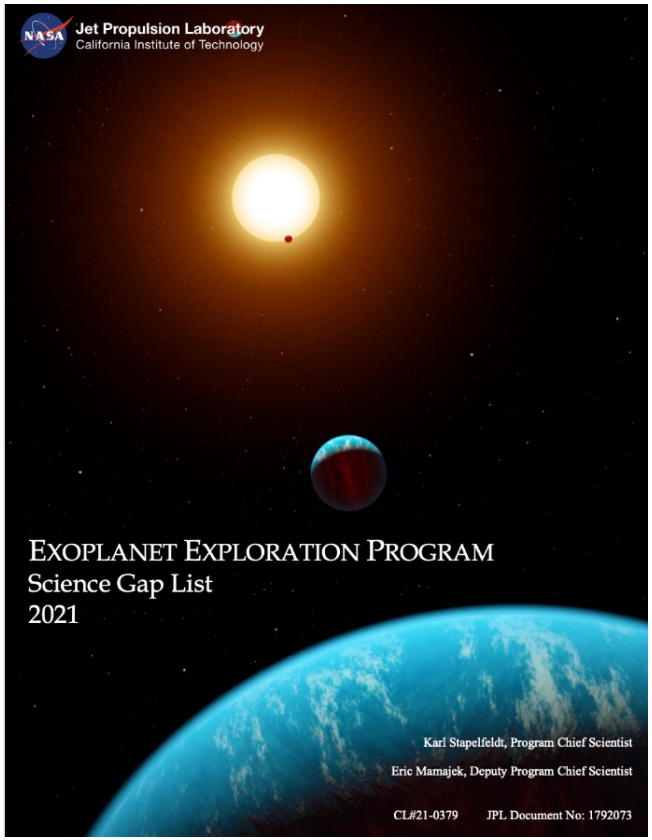
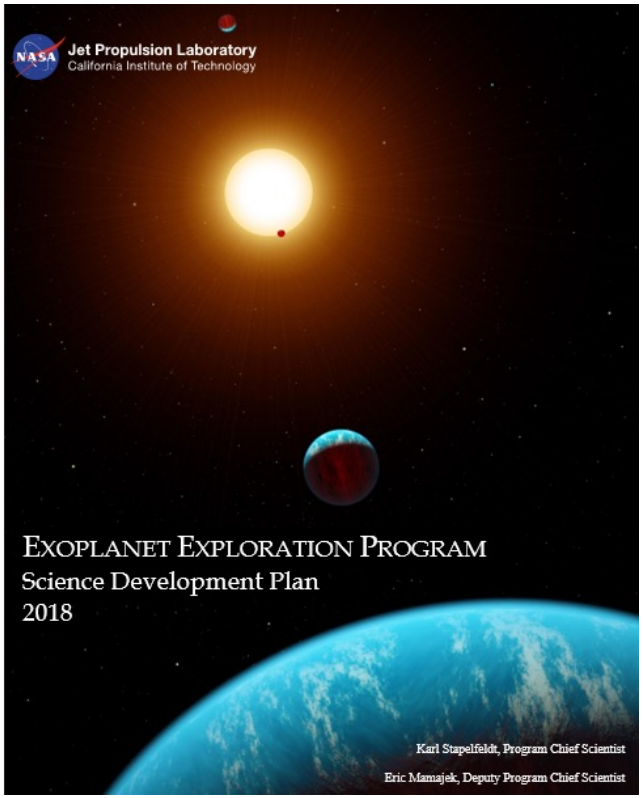
CL#21-2778

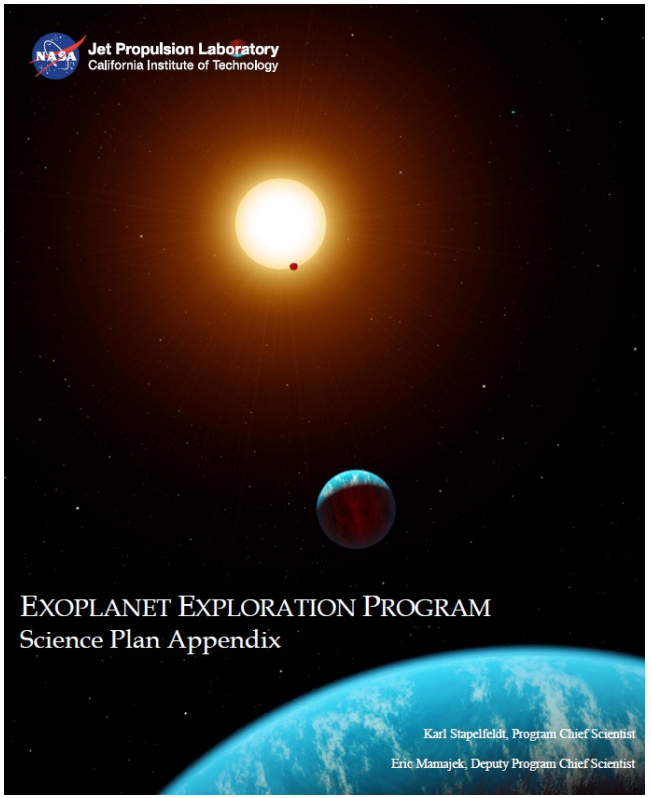
Three Exoplanet Program Science Plan documents



"All ExEP approaches, activities, and decisions shall be guided by science priorities"

-- NASA Exoplanet Exploration Program Charter





Authored by ExEP Program Chief Scientists
Karl Stapelfeldt & Eric Mamajek
Reviewed by NASA HQ and ExoPAG EC

Exoplanet Science Plan and Science Gap List

- The ExEP Science Plan has tactical scope for the implementation of science goals assigned to ExEP by NASA HQ and flowing from community policy documents. It now consists of
  - The **Science Gap List** (SGL) specifies areas where additional work would enhance the science return of current and upcoming missions, or provide info needed for the design of future missions. Updated annually.
  - The **Science Development Plan** defines roles and relationships between exoplanet scientists at HQ, Program Office, ExEP Projects, NExScI, and ExoPAG. It also lays out the process for SGL updates. Relatively static.
  - The **Science Plan Appendix** provides background information on state of the field, upcoming missions and facilities, and knowledge needed to inform ExEP objectives in five subdisciplines of exoplanet research (context for the SGL).
- Documents at https://exoplanets.nasa.gov/exep/science-overview/
- The Science Plan documents are intended for use in proposal solicitation, writing, and evaluation; they were referenced in the 2020 XRP and 2021 XRP calls.

What does a science gap look like ?

- A science gap is concise enough to be described in roughly 1 page of text and consists of these 5 elements :
  - A gap title
  - Summary description
  - “Capability Needed”, i.e. the data sets, or modeling, or analysis products that would significantly benefit NASA exoplanet missions
  - “Capability Today”, which in comparison to the Capability Needed defines the existing science gap
  - “Mitigations in Progress”, the efforts going on now that are likely to make progress in closing the gap
- We don’t provide a “Mitigations not yet started” element – that’s for individual proposers to conceive of
- To be an Exoplanet Program gap, it needs to be cross-cutting. We leave it to individual projects to track their internal science gaps.

2021 Process for Science Gap List Revisions

- Will follow similar process & schedule as last year
- Call for community inputs to SGL announced via exopagannounce list **June 10, 2021**, with open comment period through **September 30, 2021**
- Astro2020 results could create new gaps or require significant revision of existing gaps. If Astro2020 is significantly delayed beyond July, we may consider extending deadline for input.
- ExEP scientists work on updates during Oct-Dec, HQ review Dec/Jan, leading to a new SGL released in Jan 2022 (before NASA ROSES 2022 release in Feb 2022)
- Also plans in 2021-2022 to update the 60-page Science Plan appendix to reflect progress in the field, taking into account the Decadal Survey recommendations, and progress in NASA's decadal response implementation plan
- We are eager to see the community close these science gaps through innovative research !

ExEP Program Science Concerns (beyond Gap List)

- **"Mass Strategy"**: Ongoing discussions of issues affecting future exoplanet flagships. One clear issue is the likelihood that PRV will not be able to provide masses/orbits for a large fraction of HabEx/LUVOIR targets. Should flagships skip those targets? Take data and develop a strategy for interpreting spectra with no mass info? Or push for astrometry capability that could take up the slack? What technologies needed for astrometry? **→ ExEPO has held internal discussions that may lead to new technology gaps, welcomes EC input on ways to go forward**

- **Exozodi strategy:** Should NASA invest in further work to reduce exozodi uncertainties? If direct imaging mission selected, exozodi affects integration times. Awaiting Roman Space Telescope/CGI study of exozodi detection capability. **Absent an endorsement from Astro2020, NASA funded upgrade to LBTI will vanish as an option after FY21**. Capabilities of JWST, near-IR interferometers, ELTs to contribute needs further study.

Southern Radial Velocity

NASA has time available on southern hemisphere observatories for US astronomers.

SMARTS/Chiron

AAT/Veloce
(NASA time ended 2020A)

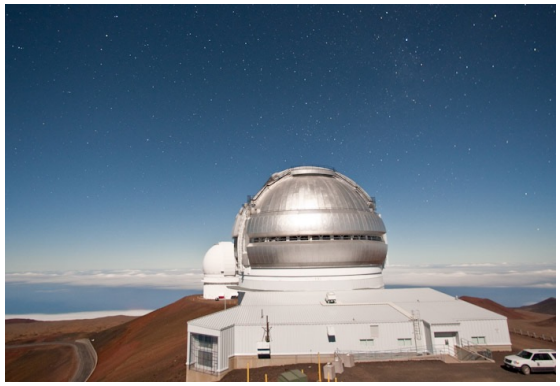
MINERVA-Australis

Facility	2019A	2019B	2020A	2020B	2021A	2021B	2022A	2022B	2023A
SMARTS/Chiron	392 hrs	407 hrs	80 hours	280 hrs	300 hrs	300 hrs	300 hrs	300 hrs	300 hrs
AAT/Veloce		5 nights	5 nights						
MINERVA-Australis				300 hrs	300 hrs	300 hrs	300 hrs	300 hrs	300 hrs

For proposal information: http://ast.noao.edu/observing/proposal-info

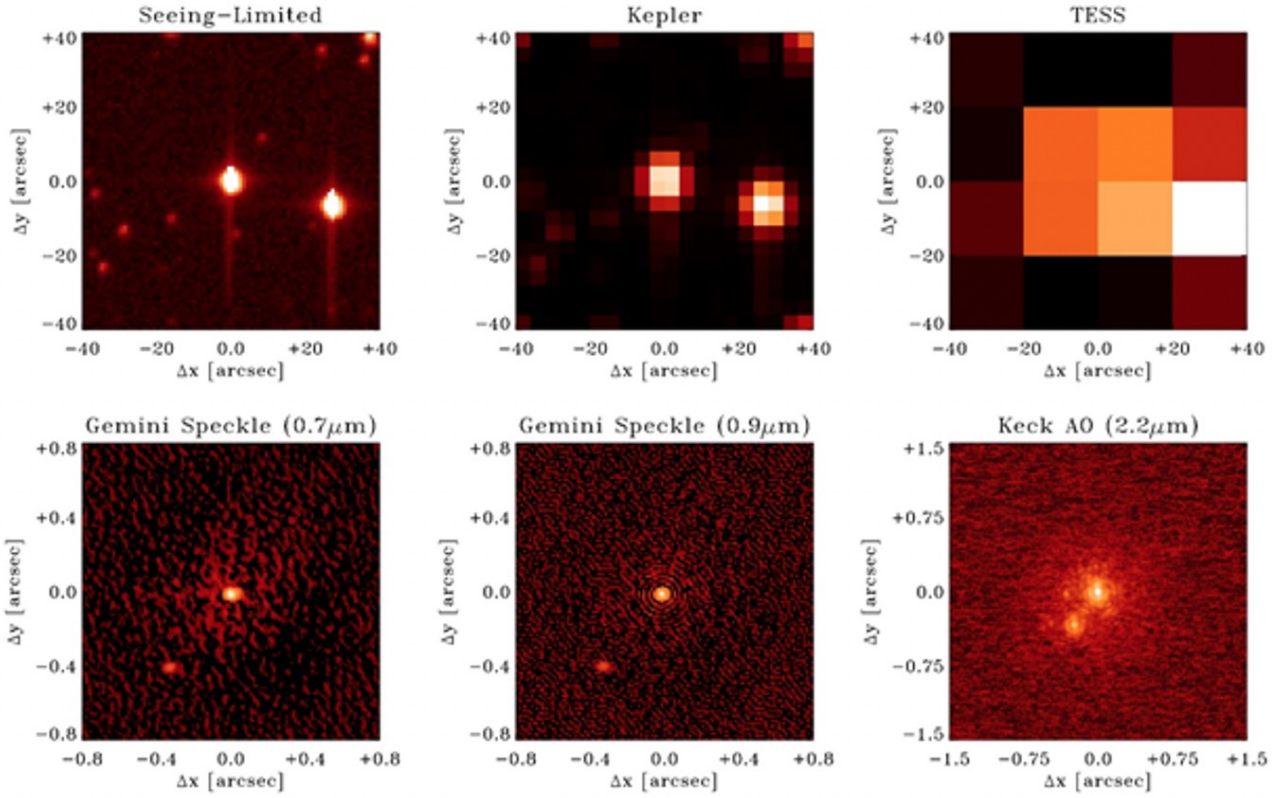
NASA High-Resolution Speckle Interferometric Imaging Program

WIYN/NESSI



Gemini-North/'Alopeke

Gemini-South/Zorro



FWHM~16 mas
(HST~50 mas)

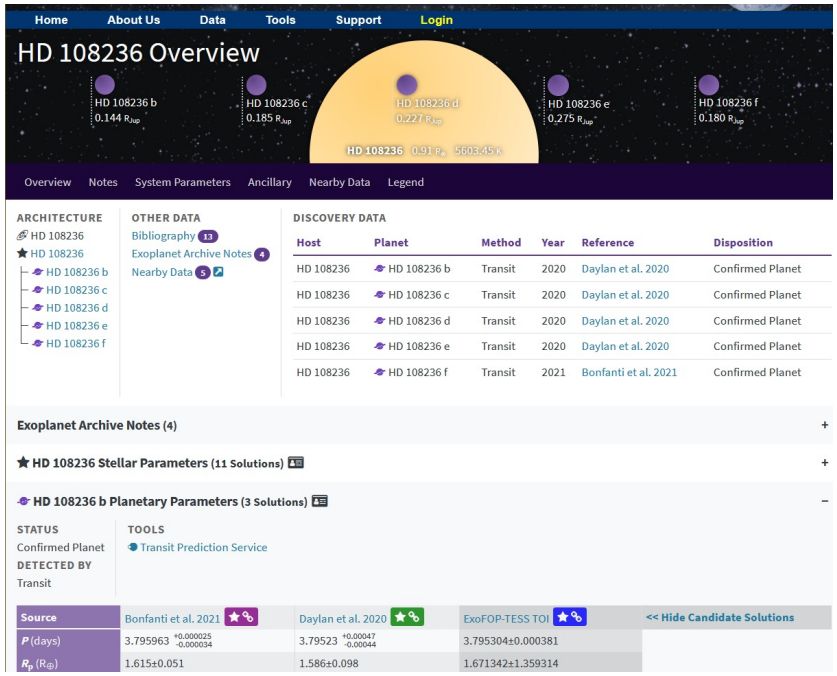
see later talk by Steve Howell

S. B. Howell, et. al., submitted.

Transition to David Ciardi's slides

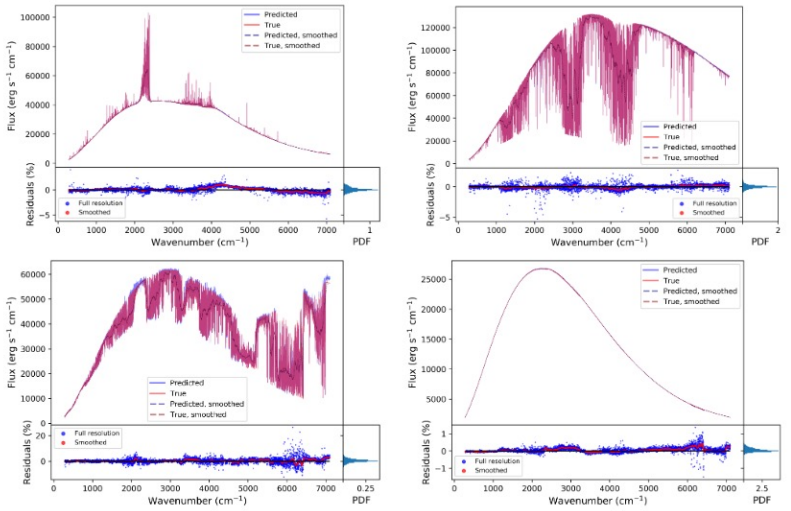
NASA Exoplanet Archive Updates

- **New Planetary Systems and Planetary Systems Composite Parameters tables replace the old Confirmed, Extended and Composite Parameters tables**
  - All Planetary Solutions in one table
  - More complete Planet+Star+System information
  - Serviced by new TAP API service
- **New Planetary Systems Overview pages**
  - Enable one-stop shopping per system for all archive content
  - Linked Planet and Stellar solutions
  - Directly accessible URLs *https://exoplanetarchive.ipac.caltech.edu/overview/hd108236*
  - Still under development
    - API
    - Easier links to content
    - Incorporation of ExoFOP Content

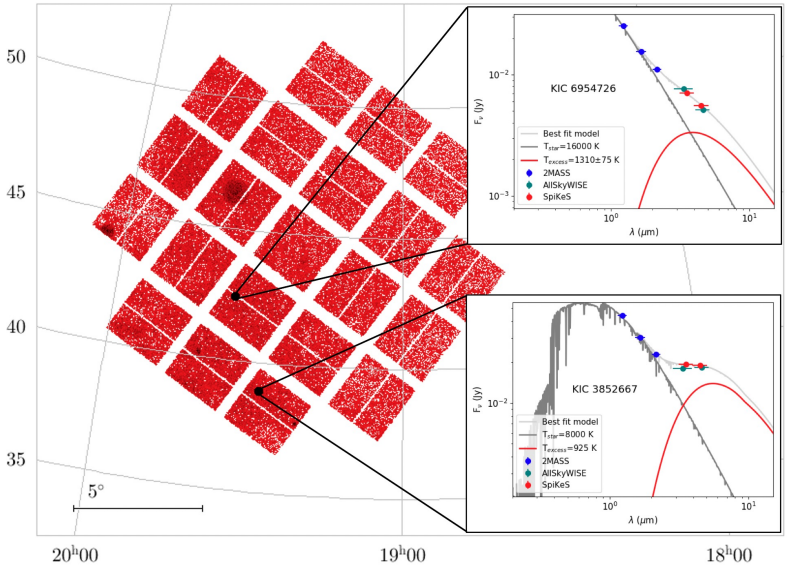


NASA Exoplanet Archive Updates: Contributed Data

- **MARGE-HOMER**
  - Contributed by Himes, Harrington, and collaborators (Himes et al. 2021)
  - Software and training-validation datasets for atmospheric retrieval code
  - https://exoplanetarchive.ipac.caltech.edu/docs/marge-homer.html

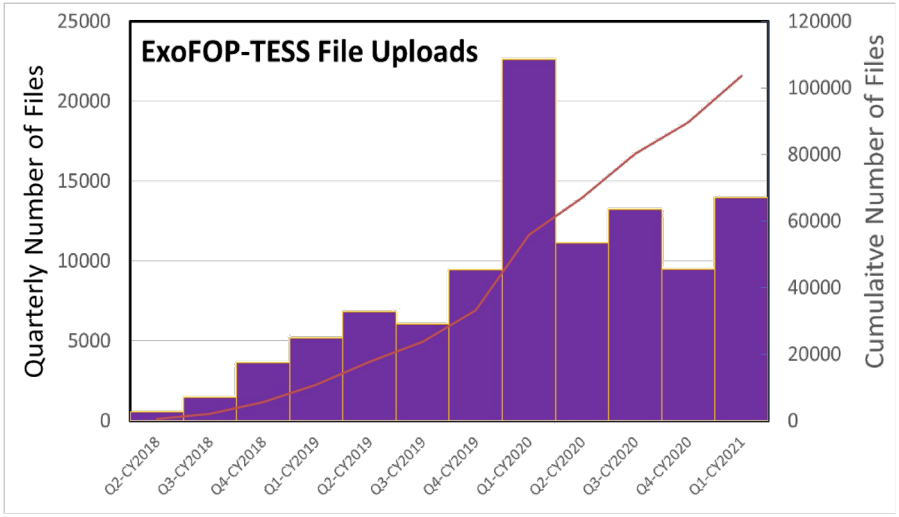


- **SpiKeS: Spitzer-Kepler Survey**
  - Contributed by Werner, Gorjian and collaborators (Werner et al 2021)
  - 3.5μm, 4.5μm photometric survey of Kepler field
  - http://exoplanetarchive.ipac.caltech.edu/docs/spikes.html



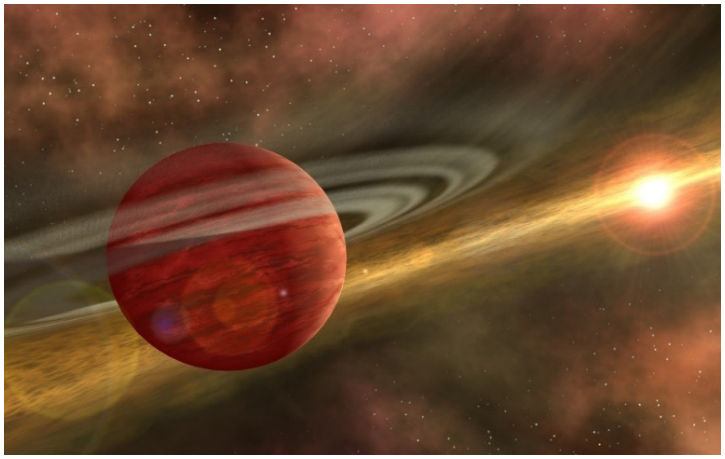
NASA ExoFOP Updates

- **Continued Support of TESS Community and TFOP**
  - TOIs updated by TESS project every day (3500+ TOIs)
  - Priorities and dispositions updated every day based upon TFOP WG results
  - Added ACWG transmission/emission spectroscopy calculations
  - 1500+ cTOIs, 100,000+ files, and 20,000+ observations uploaded by community
- **New Functionality: Saved Searches**
  - Run and save query from Search page
  - Query is saved (not results) to ensure updated results each time query is run
  - Saved query can be run via GUI or by URL API with JSON, CSV, or PIPE outputs
- **Large number of "API" functions for data access documented at** *https://exofop.ipac.caltech.edu/tess/Introduction_to_ExoFOP_php_functions.php*
- **Consolidation of ExoFOP Portals continues**
  - All Kepler data moved over to TESS
  - K2 data move in progress
  - Expected to close old portals this year



NExScI Updates: SSW and NASA Keck Time

- Sagan Summer Workshop (SSW) on Circumstellar Disks and Young Planets
  - *https://nexsci.caltech.edu/workshop/2021/*
  - Fully virtual: 19-23 July 2021
  - Registration still open
  - 12 July: Poster and Pop submissions due



- NASA Keck Observatory Time for 2022A
  - *https://nexsci.caltech.edu/missions/KSA/*
  - Call for Proposals release: 30 July 2021
  - Proposal due date: 16 Sep 2021
  - All areas of astrophysics and planetary science
  - Proposals will utilize Dual Anonymous
    - Community training webinar in August
  - Call includes Key Strategic Mission Support (KSMS) proposals
    - KSMS NOIs Due: 16 Aug 2021

ExoPAG Suggestions Slides for Business Meeting

ExoPAG Suggestions Status

- Suggestions - and what has been done - have not been presented and discussed since ExoPAG 22 (June 2020). Missed in January 2021 due to cancellation of business meeting.
- SAG 19 report: coronagraph metrics & data challenges (Jensen-Clem)

→ SAG 19 findings on rigorous contrast metrics should be factored into yield estimates for next round of NASA exoplanet mission concept studies

- Define RV strategy to reach precision of 1 cm/sec, per recommendation of NAS Exoplanet Science Strategy (2018) report

→ Extreme Precision Radial Velocity (EPRV) Foundation Science ROSES solicitation => 6 ROSES awards. EPRV Working Group final report submitted for review to ExoTAC (nearing completion). NASA APD awaiting Astro 2020 Decadal recommendations (see Gary's talk)

ExoPAG Suggestions Status

- Improve ExoPAG website

  → **Updated throughout, added Archive of past exopagannounce email messages, addition of Featured News box**

- Start ExoExplorers speaker and career development cohort

  → **Organized in late 2020 by Tiffany Kataria with help from ExoPAG EC and ExEP colleagues. 1st cohort selected and community presentations completed in early 2021 (see Tiffany's talk)**

- Opacity webserver for atmosphere modelers

  → **NASA funded this effort (unsolicited). NASA Ames will be hosting opacity webserver; beta version available in fall/winter [update from Natasha Batalha] (resolved independent of ExoPAG or ExEP)**

- Mission stars target list for the Exoplanet Archive

  → **Refined list from mission studies is still pending determination of scope by Decadal. SAG 22 to recommend data holdings needed.**

- Citizen science

  → **Schedule presentation at future ExoPAG**