

NASA Exoplanet Exploration Program Science Update

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Updates to the ExEP Science Gap List

<https://exoplanets.nasa.gov/exep/science-overview/>

- Description of research areas where additional work would benefit current & future NASA exoplanet missions. *Tactical goals*, flowing from Decadal and NASA *strategic goals*.
- Connects mission needs to work in theory, laboratory measurements, simulations, and supporting observations.
- Its major utility is as a guide for XRP proposers, review panels, and NASA HQ selection officials. Not used proscriptively.
- Updated throughout with 2025 inputs from the ExoPAG EC, community, and NASA HQ
- Now a 62 page document with 17 defined gaps. In June there will be a call for inputs on the 2027 edition.

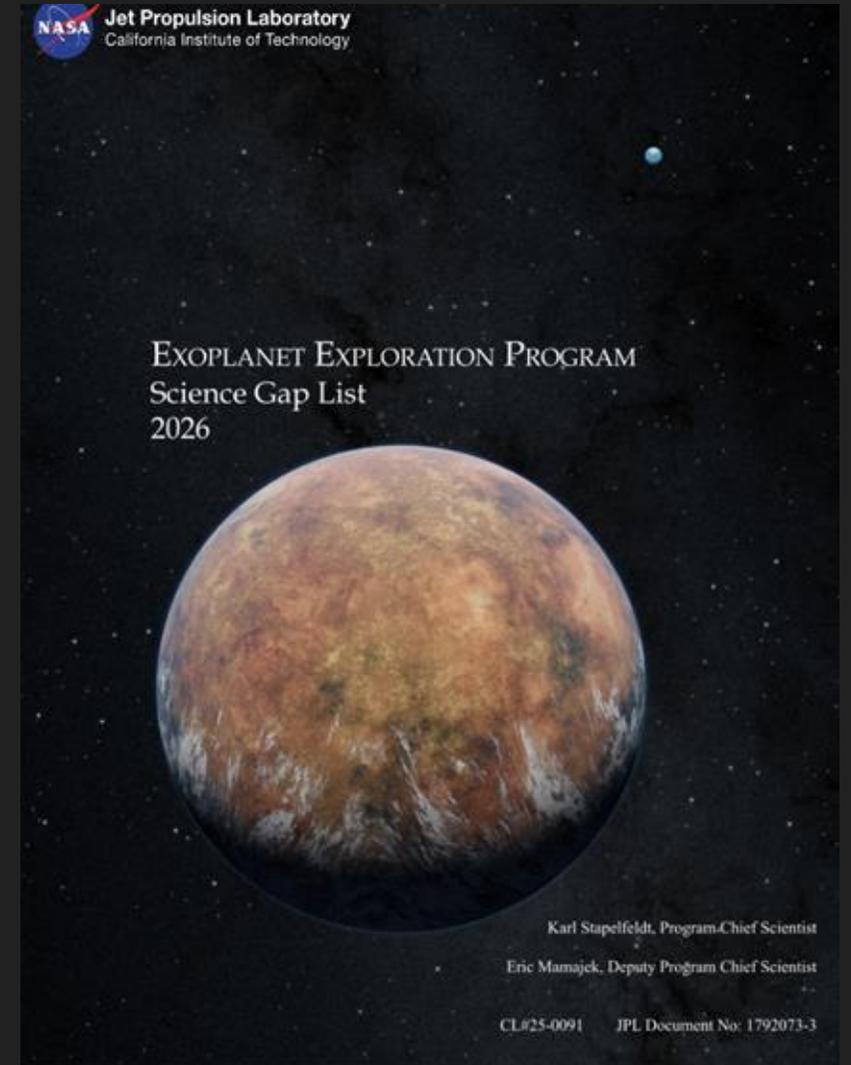


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Each gap is described by:

- **Title**
- **Summary**
- **Capability Needed**
- **Capability Today**
- **Mitigations in Progress**

Is it precursor, preparatory, or follow-up science ?

Mitigations NOT in progress are what the community should be proposing !

Changes made for the 2026 ExEP Science Gap List

- We had 45 distinct suggestions and made changes in response to 35 of them. Most of the changes made were small or medium in scope: clarifications, updated references, removing outdated material.
- Five of our TBD responses are policy-related and are pending resolution through internal discussions with HQ.
- Our response is still TBD to Malena Rice's point on improving the treatment of exoplanet dynamical evolution in Gaps 4 and 9. Additional discussions with the EC would be helpful here.
- No new gaps were added, but gap #14 had an adjustment in scope to encompass a new gap suggestion
- The final version of the 2026 Gap List will be posted online before ROSES 2026 is released, that date is still TBD. February 14 ?

Upcoming Activity 1: 2026 Exoplanet Parameters Workshop

- Targeting April-June 2026, by invitation. Possible sequel in the Fall.
- How well do we need to measure exoplanet masses and orbital elements in order to interpret their reflected light spectra ?
- Focus is on requirements, not the solution options for making the measurements
- This question is programmatically important to ExEP, as it affects the requirements for precision radial velocity or astrometric measurements in support of HWO
- There is currently no consensus on the needed mass precision. On one end, 10% mass measurements would be needed in order to distinguish N₂ from O₂ atmospheres using a retrieved atmospheric scale height. At the other end, masses might be retrieved from the spectra without making dynamical measurements.
- Uncertainties in orbital elements affect instellation and thus planet Teff & HZ status
- Can a consensus be reached ? Is further analysis work needed to answer this question ?
- The participants will produce a summary report for HQ by the end of the year

Upcoming Activity 2: Exoplanets in the NASA Astrobiology Roadmap

- NASA HQ is organizing a new Strategic Plan for Astrobiology, to succeed the 2015 version. DARES = Decadal Astrobiology Research and Exploration Strategy
- The community submitted white paper inputs in March 2025, and DARES Task Force 1 distilled them into 9 Focus Areas for strategic planning
- After self-nominations via a Dear Colleague letter, DARES Task Force 2 is now being set up to organize writing of the new strategy document. Membership of 47, TBA soon
- ExEP HQ Program Scientist Hannah Jang-Condell is associate lead for DARES, and ExEP Chief Scientist Karl Stapelfeldt will be subcommittee lead for one of the Focus Areas, “Co-evolution of Biospheres, Worlds, and Planetary Systems”
- Our goal should be to raise the profile of exoplanet research to co-equal status in the new Astrobiology Roadmap, comparable with Mars Surface and Ocean Worlds
- See AAS splinter session Tuesday 6-8 PM in Room 126C for a full discussion of the DARES status and the path forward

Other ExEP Science Activities

- “Precise Radial Velocities” by Burt, Dumusque, and Halverson 2025
arXiv:2511.01954 to appear in *Annual Reviews of Astronomy & Astrophysics (2025)*
- An Exoplanet Missions webpage is in advanced development, release is expected in the 1st quarter of 2026. This is in response to an ExoPAG request. Intended as a research gateway for early career scientists
- “NASA Exoplanet Exploration Program (ExEP) Mission Star List for the Habitable Worlds Observatory” Mamajek & Stapelfeldt 2024
arXiv:2402.12414 is the most-cited paper on ADS connected to HWO. In 2nd and 3rd place are follow-up works building on the ExEP HWO list.
- We are supporting HQ’s plans for two community workshops in 2026, to **identify the mission concepts NASA should study for the Astro2030 Decadal. See Monday 2pm special session in room 225B for details.**

Exoplanet Sessions at AAS 247

Exoplanets @ AAS 247

January 3–8, 2026 – Phoenix AZ – Phoenix Convention Center (all times MST)

Saturday January 3, 2026				
Sat	8:30am–6:00pm	Exoplanet Exploration Program Analysis Group (ExoPAG 33) (Day 1 presentations) Agenda	301 D	NASA PAG Meeting
Sunday January 4, 2026				
Sun	8:30am–12:15pm	Exoplanet Exploration Program Analysis Group (ExoPAG 33) (Day 2 presentations + business meeting) Agenda	301 D	NASA PAG Meeting
Sun	2:00am–6:30pm	NASA's Joint Program Analysis Group (PAG) Session including presentation & discussion w/NASA Astrophysics Director	301 D	NASA PAG Meeting
Monday January 5, 2026				
Mon	9:00am–10:00am	105 – Technosignature Searches: Pipelines, Lasers, Radio from Stars to Interstellar Objects 108 – HWO Enabling Technologies: Stability, Metrology, and High-Contrast Imaging 112 – Protoplanetary Disks and Planet Formation: Chemistry, Accretion, and Observables 114 – Extreme Hot Jupiter Atmospheres: High-Resolution Spectroscopy and Modeling 115 – Exoplanet Atmospheres and Habitability: Models, Analogs, and Missions 116 – Ultracool Dwarf Atmospheres: Clouds, Variability, and JWST Spectroscopy 124 – Technosignatures Across the Spectrum: Surveys, Catalogs, Instrumentation	Exhibit Hall B/C/D	iPosters
Mon	10:00am–11:30am	132 – From Protoplanetary Disks to Planets	225 A	Oral
Mon	10:00am–11:30am	133 – Dynamics, Magnetism, and Habitability Across Planetary Systems	227 B	Oral
Mon	10:00am–11:30am	134 – Exoplanet Atmospheres with JWST and Ground-based Facilities	224 A	Oral
Mon	10:00am–11:30am	135 – Exoplanets with TESS	230	Oral

Flyer prepared by Eric Mamajek to help guide your path through the AAS week

Mailing list subscribers already received the PDF version; we have hardcopies available here today

Relevant to exoplanet science there are

- 26 poster sessions
- 32 regular oral sessions
- 7 splinter sessions
- and 4 plenary talks

On Wed. morning there are 6 exoplanet oral sessions running in parallel !

Ask it again: Is it time for a new AAS Division of Exoplanetary Sciences ?

The 2026 Spirit of Lyot Conference

THE SCIENCE AND TECHNOLOGY OF HIGH CONTRAST IMAGING

Feb. 02-06 2026 on the Caltech campus, Pasadena
CA

71 talks and 200 posters on these topics:

- Coronagraph instrument technology
- Exoplanet imaging and spectroscopy
- Theory & imaging studies of circumstellar disks & exozodi
- Large telescopes and adaptive optics for high contrast imaging
- Modeling of exoplanet atmospheres & biosignatures
- Image processing and spectral retrieval techniques
- High contrast imaging space missions and mission concepts, including a Roman Coronagraph session

REGISTER BY JANUARY 16 (in-person), JANUARY 30 (remote)
<https://conference.ipac.caltech.edu/SpiritofLyot6>



Conference Chairs:
Dimitri Mawet (Caltech)
Breann Sitarski (NASA))