

December 4, 2019

To: Charles Beichman
Executive Director, NASA Exoplanet Science Institute
at the California Institute of Technology and Jet Propulsion Laboratory

Regarding: NExSci Exoplanet Archive User Panel Recommendations

Dear Dr. Beichman,

I am pleased to provide you a summary of the recommendations of the NASA Exoplanet Archive User Panel, based on the meeting at IPAC in November 2019 led by Dr. David Ciardi which included members of NASA Exoplanet Archive team, the NExSci Director, and the Exoplanet Archive User Panel, with additional follow-up discussions by email.

The User Panel would first like to remark that the Exoplanet Archive is a crucial resource for the scientific community and for NASA missions relating to exoplanet science, along with a host of scientific projects and programs external to NASA. With the number of known exoplanets having grown to the thousands, and expected to grow by an order of magnitude in the coming years, nearly every scientific project relating to exoplanets worldwide depends on having a comprehensive, reliable, and accessible catalog of confirmed exoplanets. This information is used to compute intrinsic exoplanet occurrence rates, to select targets for exoplanet and host star characterization investigations, and a large variety of other efforts too numerous to itemize here. The Archive also hosts a variety of additional data and tools that are useful for exoplanet science investigations, and are especially valuable when included in the same online repository as the confirmed planet catalog.

The Exoplanet Archive User Panel is tasked with providing advice to NExSci regarding the content and functionality of the Exoplanet Archive to help guide continued operations and future initiatives, so as to benefit the full range of NASA missions, as well as the general scientific community. We have therefore examined the set of existing content of the archive and planned additions to the archive, including data, metadata, and analysis tools, and have assembled these prioritized recommendations for future archive development.

Overall, the User Panel is pleased with the current holdings of the archive, the way these holdings are served to the community, and the tools the Archive has assembled for accessing and analyzing the holdings. At the panel meeting on Archive operations, the Archive team briefed us on the upcoming development plans for the Archive, and we have discussed the relative importance of the tasks involved. We considered the underlying scientific value of the various tasks, the amount of effort required to complete them, and the time to completion as well. We have sorted those tasks by priority, and identified three tiers of prioritization (the tasks are not prioritized within a tier). The Panel findings are as follows:

Top Priority

- Continue ingestion of new exoplanet discoveries and serve the catalog to the community
- Develop improved online visualization environment to allow users to plot, sort, and filter the confirmed planet catalog through the website.
- Continue maintaining the ExoFOP site, and integrate the ExoFOP data tables with those of the Archive.

High Priority

- Incorporate high-level science products from NASA and other missions with significant exoplanet relevance, including TESS, CHEOPS, Gaia, and JWST, and prepare to do so for additional future missions, including ARIEL.
- Compile and serve published data related to transmission/emission spectroscopy of exoplanets, including planetary atmospheric abundance measurements.
- Continue developing APIs for external access to the Archive holdings, and also for accessing the ephemeris calculation tool.
- Create specialized tables of exoplanets detected through different methods, including detection-specific parameters (e.g. planet/star mass ratio for microlensing, or planet/star contrast ratio for direct imaging).
- Incorporate and serve mission data sets of high relevance to exoplanet science, including community-created catalogs of brown dwarfs, and relevant upcoming CubeSat missions.
- Work with the exoplanet community to assemble and serve intermediate data sets and catalogs of exoplanet observations and candidates to allow independent calculation of exoplanet occurrence rates.

Medium Priority

- Incorporate data and/or high-level science products from third-party exoplanet projects.
- Investigate how to incorporate catalogs of discovered protoplanetary and debris disks.
- Consider how host star population memberships and relationships can be incorporated into the Archive, so as to facilitate investigations into exoplanet trends with host star membership in clusters and associations.
- Continue developing APIs for external use of the Archive analysis tools (with the exception of the ephemeris tool, listed in the High Priority category).

These tasks and their prioritizations are discussed in the program review report on which we have consulted with Dr. Ciardi. The panel is excited to see the upcoming revamp of the underlying Archive dataset that will enable more flexible ways of organizing exoplanet data. This update will allow the basic exoplanet system data to connect to additional existing and future mission data and high-level science products. We are also looking forward to the implementation of an updated data visualization environment (in the Top priority category above) that is already underway.

As a final comment, we wish to reiterate how crucial the Exoplanet Archive is for further mission development. Flagship-scale missions like WFIRST, HabEx, or LUVOIR will rely on exoplanet properties and occurrence rates derived from this catalog. It is therefore essential for the success of those missions that the Archive be maintained as a resource for the agency and the scientific community.

Sincerely,

The Exoplanet Archive Users Group

Joshua Pepper, chair

William Welsh, past chair

Laurent Pueyo

Joshua Schlieder

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