

ADS Support for Planetary Science Research

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Abstract

Interdisciplinary research, such as the study of exoplanets and the search for biosignatures, require both Astrophysics and Planetary Science expertise. The NASA Astrophysics Data System (ADS) has substantial expertise and collaborations in Astrophysics, but has less depth and adoption in the Planetary Sciences. Here we suggest a program to enhance the capabilities of ADS to better support Planetary research. Most of this effort involves the coordination of curation activities with existing Planetary Archives and databases. For this expansion to be fully successful in the long term it will require substantial Planetary Science domain expertise, which, in practical terms, means the establishment of formal collaborations between the ADS and the major planetary data archives such as the NASA's PDS and ESA's PSA, similar to the current relationship between the ADS and the astrophysics data archives.

1. Introduction

The field of Exoplanets is already 6% of the combined Astrophysics and Planetary literature (fig. 1) and is growing very rapidly, as well as moving into related areas like geophysics, biology and chemistry. Keeping up with these developments will take considerable coordinated effort by many groups and require expertise from different disciplines.

The increased reach of interdisciplinary research requires systems such as ADS to go beyond their silos in order to connect the relevant research objects. Currently, the ADS has no formal, ongoing collaboration with the Planetary Data System (PDS), or other planetary data sources, which would enable it to link data sets, measurements, or feature classifications with the journal articles where they appear. These capabilities have existed among the Astrophysics data centers and the ADS for more than two decades, and have allowed astronomers to seamlessly cross the boundaries between archives and the literature.

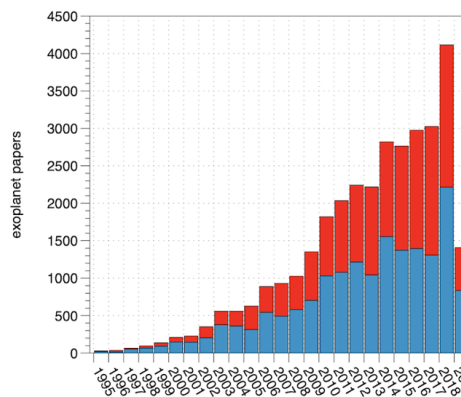


Figure 1: The number of articles mentioning the word “exoplanet” since the discovery of 51Peg b. Currently 6% of all refereed astronomy articles contain the word “exoplanet.”

1.1 Current ADS Efforts

As part of its current funding Agreement with NASA, and in response to our community’s feedback, in 2018 the ADS has expanded its efforts in providing better coverage of exoplanet research through the following enhanced curation efforts:

- Periodically Identify exoplanet-related refereed publications already in ADS, analyze citations and identify content not already covered by ADS
- Ingest highly cited journal metadata for which content is available from a collaborating publisher or through a data broker
- Support linking to Planetary Data products if and when exposed by the PDS

The rest of this paper describes additional efforts which, when coupled with corresponding initiatives from Planetary Data archives, would enable a level of functionality which ADS now provides to researchers

in Astrophysics. In particular, this would include linking the literature to relevant data products and measurements hosted by national and international planetary data archives. A whitepaper describing the motivation behind this effort in more detail was submitted to the US Committee on an Exoplanet Science Strategy [1]. A more expansive whitepaper describing the search for Exolife was submitted to the US Astro2020 Decadal Survey [2].

2. ADS-Planetary Collaboration

To better serve the Planetary Community, a greater engagement is required between ADS's leadership and the planetary research community at large, including scientists, publishers, and data archives. This will ensure that the proper dialog can occur and that the proper parties are well-informed about the goals of this effort and the needs of its community.

The next step involves the actual work of collecting, ingesting, and properly indexing relevant content into the ADS database. This requires performing in-depth analysis of planetary content in ADS through citation and topic analysis in order to identify publications currently being missed from reference lists, including gray literature, technical reports, PhD thesis, etc. This will help us identify additional partners and relevant data sources which should be incorporated in the ADS bibliographic database, including Open Access repositories publishing scholarly planetary material such as EarthArxiv [3] and ESSOAr [4].

Currently, the ADS is funded by the NASA Astrophysics Division and has no formal, ongoing collaboration with the Planetary Data System (PDS), or other planetary data sources, which would enable it to link data sets, measurements, or feature classifications with the journal articles where they appear. These capabilities have existed between the Astrophysics data centers and the ADS for more than two decades, and have allowed astronomers to seamlessly cross the boundaries between archives and the literature. The creation and maintenance of such links requires a collaboration between ADS and the relevant archives, with efforts being expended on both ends.

ADS would be responsible for extending its metadata enrichment and text mining capabilities to the archive's curation needs. This may involve the support the recognition of particular planetary

taxonomical entities in the indexed literature, the classification of bibliographic content using pre-established keywords, or the detection of citations to planetary content via registered DOIs. The data archives would be responsible for maintaining bibliographies and links between the published literature and their datasets, as described in [5].

NASA and ESA have invested a substantial effort in collecting and archiving high-value Planetary data and are committed to having it be FAIR: Findable, Accessible, Interoperable and Reproducible [6]. The existence of curated high-level data products linked to the literature in ADS will greatly increase their discoverability, re-use, and overall scientific impact at a fraction of the cost of the original missions and experiments [7], [8].

3. Conclusions

Cross-disciplinary endeavours, such as the study of extrasolar planets, require the breaching of institutional and disciplinary silos. Interdisciplinary inquiry is best supported by bringing researchers together at the information discovery level, in order to allow them to explore new ideas and to gain access to new data and knowledge. This is best enabled by providing platforms which allow them to explore and connect different research threads in the literature, identify communities of experts, and access and analyze the related published datasets.

The developments suggested here are modest, as they rely on existing and established research infrastructure, but are of substantial strategic import, in that they represent a formal interconnection of two disciplines and cultures at the information system level. We suggest that a closer collaboration between the Planetary Data Archives and ADS would bring significant benefits to the Planetary Community worldwide.

Acknowledgements

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