

An Updated Study of the ARIEL Mission Reference Sample

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Abstract

ARIEL (Atmospheric Remote-sensing Infrared Exoplanet Large-survey) has been selected as the next ESA medium-class science mission and is due for launch in 2028. During its 4-year mission, ARIEL aims to observe 1000 exoplanets ranging from Jupiter and Neptune-size down to super-Earth size in the visible and the infrared with its meter-class telescope.

The analysis of ARIEL spectra and photometric data will deliver a homogenous catalogue of planetary spectra which will allow the extraction of the chemical fingerprints of gases and condensates in the planets' atmospheres, including the elemental composition for the most favourable targets. It will also enable the study of thermal and scattering properties of the atmosphere as the planet orbit around the star.

1. Introduction

As of May 2018, over 3700 exoplanets have been discovered (nearly 3000 of which transit their stars) as well as 4500 Kepler candidate planets. Additionally, TESS is predicted to find more than 4500 planets around bright stars [2] and other surveys will find thousands more.

ARIEL has a designed mission life of 4 years including a 6-month commissioning and calibration phase. Additionally scheduling constraints, such as telescope housekeeping, slewing between targets and data downlink reduce the available science time. Assuming that telescope downtime corresponds to 15 %, ARIEL will have 3 years of usable science time during its nominal life.

Given the current instrument design, the capability of the ARIEL spacecraft to meet the science goals within this time has been assessed from the population of known planets and predicted TESS detections.

2. Methodology and an Example Mission Reference Sample

An initial ARIEL mission reference sample has been undertaken by choosing the planets which require the fewest observations, with no preference towards producing a diverse list of planets or selecting interesting targets. The distribution of these planets by radius and temperature is displayed in Figure 1. Planets selected for tier 3 are also included in tier 2 and in turn tier 1 planets incorporate all those studied in tier 2.

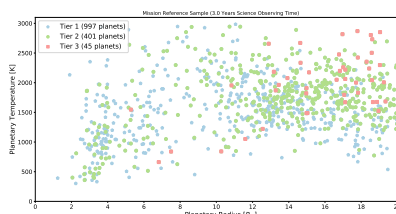


Figure 1: Example ARIEL Mission Reference Sample [1]

3. Summary and Conclusions

We find that ARIEL should be able to observe ~1000 planets at various resolutions over the primary mission life. This sample of the exoplanet population has a diverse range of sizes, temperatures and stellar hosts. The target list will continue to evolve as new planets are discovered.

Acknowledgements

This work has been funded through the ERC Consolidator grant ExoLights (GA 617119).

References

- [1] Edwards, B. et al., in prep, An Updated Study of the ARIEL Mission Reference Sample
- [2] Barclay, T., Pepper, J. and Quintana, E. V., 2018, A Revised Exoplanet Yield from the Transiting Exoplanet Survey Satellite (TESS), arXiv:1804.05050