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Generation of a target list of observable exoplanets for The Exoplanet Characterisation Observatory (EChO)

R. Varley (1), I. P. Waldmann (1), M. Tessenyi (1), G. Tinetti (1), M. Ollivier (2), V. Coude´ du Foresto, (3,4), E. Pascale (5), B. Swinyard (1), H. Osborn (1), M. Martinod (1) and the EChO consortium
(1) University College London, Dept. Physics Astronomy, Gower Street, WC1E 6BT, London (r.varley@ucl.ac.uk)
(2) Institut d'Astrophysique Spatiale, Btiment 121, Universite´ de Paris-Sud, 91405 ORSAY Cedex, France
(3) Dept. Physics Astronomy, University of Leicester, Leicester, LE1 7RH, UK
(4) Center for Space and Habitability, University of Bern, Sidlerstrasse 5, CH-3012, Bern, Switzerland
(5) School of Physics Astronomy, Cardiff University, Cardiff, CF24 3AA, UK

Abstract

The science of extrasolar planets is one of the most rapidly changing areas of astrophysics and since 1995 the number of planets known has increased by almost two orders of magnitude. A combination of ground-based surveys and dedicated space missions has resulted in 800-plus planets being detected, and over 2000 that await confirmation. NASA's Kepler mission has opened up the possibility of discovering Earth-like planets in the habitable zone around some of the 100,000 stars it is surveying during its 3 to 4-year lifetime. The new ESA's Gaia mission is expected to discover thousands of new planets around stars within 200 parsecs of the Sun. The key challenge now is moving on from discovery, important though that remains, to characterisation: what are these planets actually like, and why are they as they are? The Exoplanet Characterisation Observatory (EChO) is a space mission dedicated to undertaking spectroscopy of transiting exoplanets over the widest range possible. In the frame of ESA's Cosmic Vision programme, EChO has been considered as medium-sized M3 mission candidate for launch in the 2022 - 2024 timeframe [1].

Survey missions like EChO require the generation of a target list of observable objects. The choices made in the selection is important to maximise the mission efficiency and breath of science. By running the current population of targets through the EChO end-to-end simulator, EChOSim [2], we can tell if a target can reach the required signal to noise, how many orbits it will take and how much EChO time it will use.

In this conference we describe the methods used to choose our target list, the assumptions made and some of the tools we created. We will present our estimates of the observability of the current population of targets with EChO.
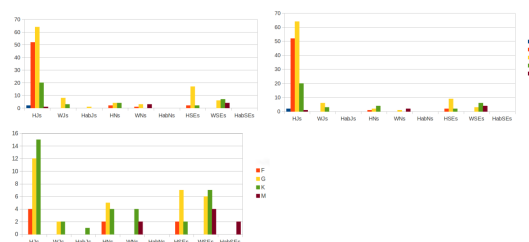
Figure 1: Results of initial simulations. Top Left: Number of transiting planets known today observable to SNR > 5 over full mission length in secondary eclipse (~200); Top right: same as left but SNR > 50 (115). We miss temperate super-Earths and Neptunes, expected to be provided by other missions and surveys. Bottom: same as top, but with a selection of optimal targets, as predicted for 2020 in the EChO Science Requirements Document [3]

References

[1] Tinetti, G. ,Beaulieu, J.P., Henning, T., et al. 2012, Exp. Astron., 34, 311

[2] Waldmann, I. P., Pascale, E., Swinyard, B., Tinetti, G., Amaral-Rogers, A., Spencer, L., Tessenyi, M., et al. (2013). Retrieved from http://arxiv.org/abs/1302.6425

[3] ECHO Science Study Team (2012), SRE-PA/2011.037