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PLATO: PLAnetary Transits and Oscillations of Stars The exoplanetary system explorer

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PLATO is a space mission under definition study at ESA, as one of the medium-class candidates of the Cosmic Vision programme. Its objective is to characterize exoplanets and their host stars in the solar neighbourhood. While it builds on the heritage from CoRoT and KEPLER, the major breakthrough will come from its strong focus on bright targets. The PLATO targets will include a large number of very bright and nearby stars.

The prime science goals of PLATO are: (i) the detection and characterization of exoplanetary systems of all kinds, including both the planets and their host stars, reaching down to small, terrestrial planets in the habitable zone; (ii) the identification of suitable targets for future, more detailed characterization, including a spectroscopic search for bio-markers in nearby habitable exoplanets.

These ambitious goals will be reached by ultra-high precision, long (few years), uninterrupted photometric monitoring in the visible of very large samples of bright stars, which can only be done from space. The resulting high quality light curves will be used on the one hand to detect planetary transits, as well as to measure their characteristics, and on the other hand to provide a seismic analysis of the host stars of the detected planets, from which precise measurements of their radii, masses, and ages will be derived.

The PLATO space-based data will be complemented by ground-based follow-up observations, in particular very precise radial velocity monitoring, which will be used to confirm the planetary nature of the detected events and to measure the planet masses.

The full set of parameters of exoplanetary systems will thus be measured, including all characteristics of the host stars and the orbits, radii, masses, and ages of the planets, allowing us to derive planet mean densities, and estimate their temperature and radiation environment. Finally, the knowledge of the age of the exoplanetary systems will allow us to put them in an evolutionary perspective.