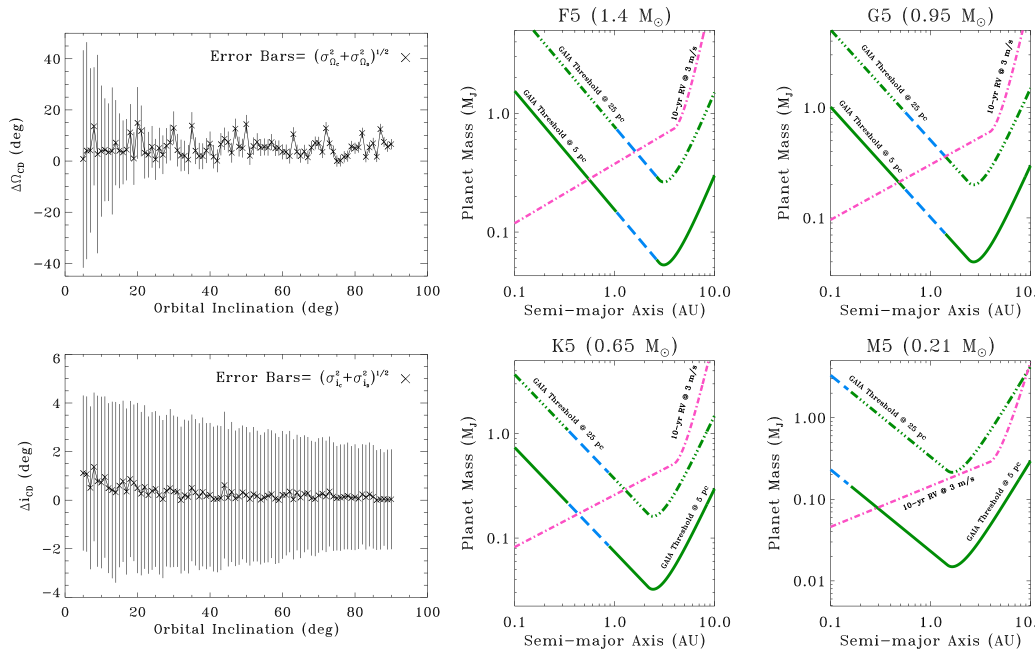

Left: Coplanarity analysis for the υ And system. Right: Gaia planet discovery space as a function of orbital radius, stellar spectral type and distance from the observer (green solid line: 5 pc; green dashed-dotted line: 25 pc). The blue dashed line represents the habitable zone of the star. The pink dashed line indicates the planet discovery space for 3 m/s precision radial velocity measurements.

The size of the stellar sample out to 150−200 pc to be investigated for planets (comprising hundreds of thousands of objects) constitutes the most significant contribution Gaia will provide to the science of extra-solar planets. Indeed, the results derived from Gaia's μas-precision astrometric measurements will help decisively improve our understanding of orbital parameters and actual mass distributions, and they will provide important data to determine the correct theoretical models of formation, migration, and dynamical evolution.

Based on star counts in the vicinity of the Sun extrapolated from modern models of stellar population synthesis, limited to bright ($V < 13$ mag) solar-type (earlier than K5) objects, we estimate $N_\star \sim 3 \times 10^5$ stars to 200 pc. The table below shows how, given reasonable assumptions on the planetary frequency as a function of orbital radius, on the detection threshold, and on the accuracy of orbit determination, Gaia will be capable of discovering thousands of planets around relatively nearby main-sequence stars, and it will accurately measure the orbital characteristics and actual masses for a significant fraction of the detected systems.

Δd (pc)	$N_\star$	Δa (AU)	$N_{\rm d}$ (1)	$N_{\rm m}$ (2)
0-100	∼61 000	1.3 - 5.3	≥ 1600	≥ 640
100-150	∼114 000	1.8 - 3.9	≥ 1600	≥ 750
150-200	∼295 000	2.5 - 3.3	≥ 1500	≥ 750

(1) Number of giant planets ($N_{\rm d}$) that could be detected by Gaia around solar-type stars, as a function of increasing distance from the Sun. (2) Number of detected planets ($N_{\rm m}$) for which orbital elements and masses can be accurately measured (to better than 20%). A uniform frequency distribution of 1.3% planets per 1-AU bin is assumed

The frequency of multiple-planet systems, and their preferred orbital spacing and geometry are not currently known. The same star counts predict $\sim$ 13 000 stars to 60 pc. Gaia, in its high–precision astrometric survey of the solar neighbourhood, will observe each of them, searching for planetary systems composed of massive planets in a wide range of possible orbits, making precise measurements of their orbital elements, and establishing quasi-coplanarity (or non-coplanarity) for detected systems with favorable configurations.

Gaia observations of nearby stars (d $\leq$ 25 pc) will also contribute to populating the database of stars to be observed by the ESA/NASA Darwin/TPF when it is launched in the middle of the next decade. Gaia astrometry will confirm the existence of Jupiter signposts from radial velocity measurements, and will extend spectroscopic surveys to the large database of nearby M dwarfs, complementing ground-based observations. The Gaia measurements will provide estimates of the actual planet masses, thus contributing to models establishing whether or not dynamical interactions would permit an Earth-like planet to form and survive in the habitable zone of any given star. Finally, Gaia will measure the inclination of the orbital plane, complementing ground-based studies of exo-zodiacal cloud emission for the extra-solar system.