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The Young Suns Exoplanet Survey: imaging infant planets around young, solar analogs

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Within the Young Suns Exoplanet Survey (YSES) we are observing a homogeneous sample of 70 solar-mass members of the approximately 16 Myr-old Lower Centaurus-Crux subgroup of the Scorpius-Centaurus association to search for sub-stellar companions.

High-contrast imaging observations with VLT/SPHERE/IRDIS revealed (i) a shadowed transition disk around Wray 15-788 that shows significant signs of ongoing planet formation and (ii) one of the lowest-mass companions imaged to date: YSES-2 b has a mass of 6.5 Jupiter masses and is orbiting its solar-mass primary at a separation of 110 au. Most intriguing, though, was (iii) the discovery of the first directly imaged multi-planet system around a Sun-like star. The detection of two gas-giant companions of 14 ± 3 and 6 ± 1 Jupiter masses that are orbiting YSES-1 (TYC 8998-760-1) at separations of 160 au and 320 au, respectively, provides important implications for the outer architecture of planetary systems and the underlying formation mechanisms.

In addition to the SPHERE observations, we identified further companions to our ‘Young Suns’ outside the instrument’s field of view in the third early data release of the *Gaia* mission. Based on parallaxes and proper motions provided in this catalogue, we detected eight additional sub-stellar companions at separations larger than 500 au amongst our sample.

By combining *Gaia* astrometry with the high-contrast imaging capabilities of SPHERE, our survey will provide a complete census of wide-orbit sub-stellar companions for a statistically highly significant sample of young, solar analogues. From the current results we derived a preliminary probability of $14.3\pm 3.1\%$ for our solar-type stars to host wide-orbit, sub-stellar companions. As follow-up observations of 45 YSES targets are still pending, this ratio can be interpreted as a lower limit, which is tentatively indicating a higher companion yield than previous surveys.