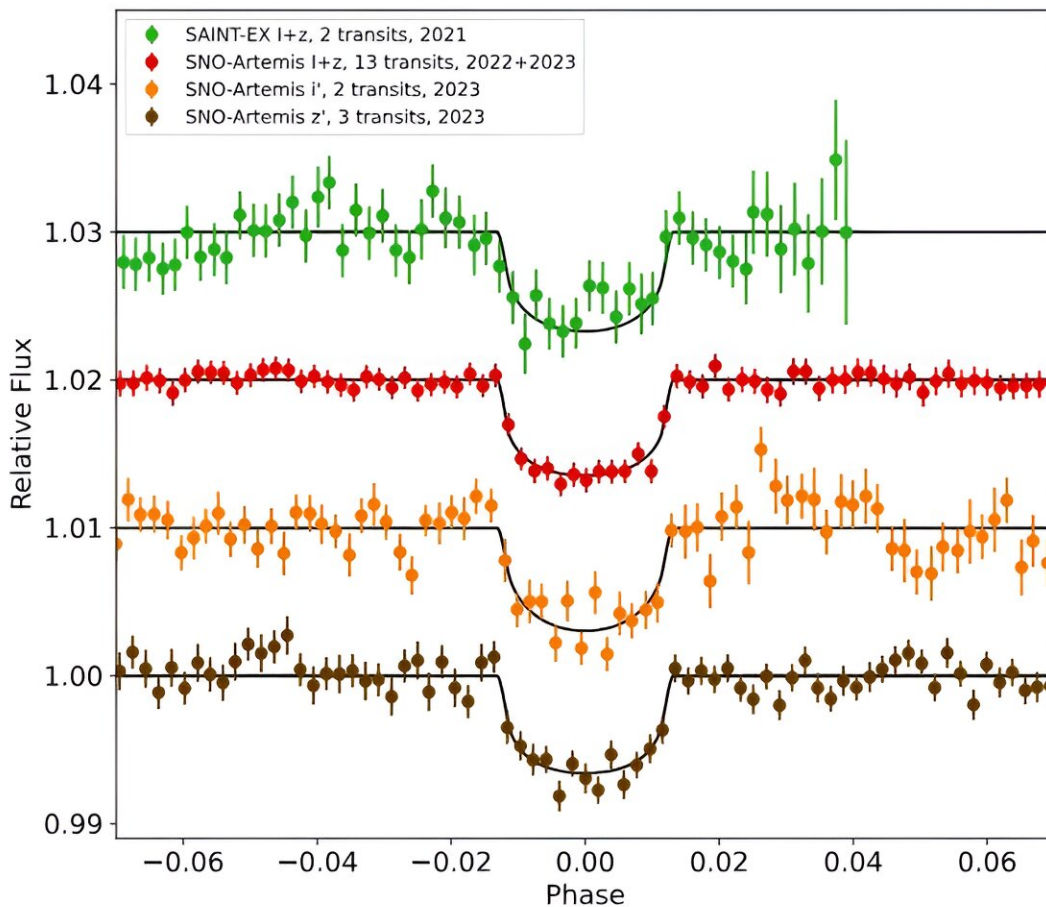


# Astronomers discover an Earth-sized exoplanet orbiting a nearby ultracool dwarf star

June 14 2024, by Tomasz Nowakowski



Discovery transit photometry of SPECULOOS-3 b. Credit: Gillon et al., 2024.

An international team of astronomers reports the discovery of a new Earth-sized exoplanet that orbits an ultracool dwarf star located just 54.6 light years away. The newfound alien world, designated SPECULOOS-3 b, is slightly smaller but much hotter than our planet. The finding was reported in a [paper](#) published May 15 in the journal *Nature Astronomy*.

The Search for Planets EClipsing ULtra-cOOl Stars (SPECULOOS) project aims to find potentially habitable exoplanets around some of the smallest and coldest stars of the solar neighborhood. It employs a network of six robotic 1-m-aperture telescopes: the four telescopes of the SPECULOOS-South Observatory (SSO) in Chile, Artemis, the first telescope of the SPECULOOS-North Observatory (SNO) in Tenerife, and the SAINT-EX telescope in San Pedro Martir Observatory in Mexico.

One of the stars observed as part of the SPECULOOS program is SPECULOOS-3 (also known as LSPM J2049+3336)—an ultracool dwarf of spectral type M6.5, about eight-times smaller and 10-times less massive than the sun. The star is estimated to be 6.6 billion years old and has an effective temperature of 2,800 K.

A group of astronomers led by Michaël Gillon of the University of Liège in Belgium has recently detected a transit-like signal in the light curves of SPECULOOS-3. Follow-up observations of this star found that this signal is caused by an Earth-sized extrasolar planet.

"We present the SPECULOOS project's detection of an Earth-sized planet in a 17-hour orbit around an ultracool dwarf of M6.5 spectral type located 16.8 parsecs away," the researchers wrote in the paper.

According to the paper, SPECULOOS-3 b has a radius of approximately 0.977 Earth radii and orbits its [host star](#) every 17.28 hours. The planet's equilibrium temperature was estimated to be about 553 K.

The mass and therefore the composition of SPECULOOS-3 b remains unknown. However, the astronomers assume that this planet has a rocky composition for such a small planet on such a short orbit to have maintained a substantial envelope of hydrogen. Moreover, they add that all currently-known Earth-sized [planets](#) in the NASA exoplanet archive have masses implying rocky compositions.

The researchers note that if SPECULOOS-3 b does indeed have a rocky composition, then its expected mass would be around 0.93 Earth masses. Follow-up spectroscopic observations could result in the detection of radial velocity signals of SPECULOOS-3 b, which could lead to the first measurement of its mass.

In concluding remarks, the authors of the paper underline that high irradiation of SPECULOOS-3 b, combined with the infrared luminosity and Jupiter-like size of its host make it one of the most promising rocky exoplanets to investigate with the James Webb Space Telescope (JWST) in order to conduct a detailed emission spectroscopy characterization.

**More information:** Michaël Gillon et al., Detection of an Earth-sized exoplanet orbiting the nearby ultracool dwarf star SPECULOOS-3, *Nature Astronomy* (2024). [DOI: 10.1038/s41550-024-02271-2](https://doi.org/10.1038/s41550-024-02271-2). On *arXiv*: [DOI: 10.48550/arxiv.2406.00794](https://doi.org/10.48550/arxiv.2406.00794)

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