

Media release, September 7, 2022

## Two new rocky worlds around an ultra-cool star

**An international research team, with the participation of the University of Bern and the National Centre of Competence in Research (NCCR) PlanetS, discovered two "super-Earth" exoplanets. One is located at just the right distance from its star to potentially hold liquid water on its surface.**

Most of the planets that have been discovered around other stars – also known as exoplanets – are bad candidates for life as we know it. They are either scorching hot or freezing cold, and the majority consist of nothing but gas. Relatively small terrestrial planets, like our Earth, are difficult to detect. Only a handful are known that receive just the right amount of radiation from their star to allow liquid water on their surface. The reported discovery of a promising candidate for such a world, made by a team of researchers with the participation of the University of Bern and the National Centre of Competence in Research (NCCR) PlanetS, is therefore a significant one. The team published their results in the journal *Astronomy & Astrophysics*.

### A follow-up that paid off

TOI-4306 is a small, cool star located about 100 light-years from Earth. Last year, researchers discovered a planet around it with the help of NASA's TESS space telescope. The discovery was made using the so-called transit method, in which the telescope monitors the brightness of the star, looking for slight dimmings that might be caused by planets passing in front of the star.

"However, a follow-up with ground-based telescopes is often necessary to confirm that the detected candidates are actually planets, and to then learn more about their properties", explains Dr. Laetitia Delrez, FNRS Postdoctoral Researcher in the [Astrobiology](#) and [STAR](#) research units at the University of Liège, and lead author of the study. "This follow-up is particularly important in the case of relatively cold stars, such as TOI-4306, which emit most of their light in the near-infrared and for which TESS has a rather limited sensitivity", Delrez says. And in this case, this follow-up observation proved to be worthwhile.

"Using the combined near-infrared sensitive ground based telescopes of the [SPECULOOS](#) consortium – including the Bern led SAINT-EX telescope in Mexico –, we were not only to confirm and characterize the candidate planet that TESS had detected, but also discovered a rather special second, previously unknown planet", co-author of the study, University of Bern Astrophysics Professor and NCCR PlanetS member Brice-Olivier Demory explains.

## **A potential Earth twin – or is it?**

The two planets are what astronomers refer to as “super-Earths”. They are likely of similar rocky composition and are about 30 to 40 percent larger than our Earth. The inner planet orbits its star in 2.7 days while the outer planet takes around 8.5 days to complete an orbit. “This second planet receives about the same amount of stellar radiation as our Earth receives from the Sun and could therefore potentially have liquid water on its surface”, study co-author Dr. Robert Wells from the University of Bern and the NCCR PlanetS says.

“But we should not get ahead of ourselves. Being in the right spot does not guarantee a palm beach”, Wells points out. “Our neighbor planet Venus, which is, so to speak, a CO<sub>2</sub> rich near 500°C pressure cooker, is also near this so-called *habitable zone* around the Sun.”

Much therefore depends on the presence and composition of a potential atmosphere: “To be able to answer whether this planet can indeed hold liquid surface water or not, we need to learn more about it. This requires detailed observations – for example with the James Webb Space Telescope”, Wells concludes.

### **Information about the publication:**

Delrez L. et al., *Two temperate super-Earths transiting a nearby late-type M dwarf*, *Astronomy & Astrophysics*, September 7, 2022, <https://www.aanda.org/10.1051/0004-6361/202244041>

### **Contact:**

Prof. Dr. Brice-Olivier Demory

Center for Space and Habitability (CSH) and NCCR PlanetS, University of Bern

Tel: +41 31 684 51 57

Email: [brice.demory@unibe.ch](mailto:brice.demory@unibe.ch)

### **SAINT-EX – Search and characterisation of exoplanets**

SAINT-EX is an international collaboration which had its kick-off meeting in the National Astronomical Observatory in San Pedro Martir (MEX) in September of 2016. The project’s principal investigator is Prof. Brice-Olivier Demory, from the Center for Space and Habitability of the University of Bern in Switzerland and National Center of Competence in Research PlanetS; the project’s coordinator and leader in Mexico is Dr. Yilen Gomez Maqueo Chew from the Instituto de Astronomía of the Universidad Nacional Autónoma de México (UNAM).

Also, part of the project are Prof. Willy Benz from the NCCR PlanetS, Prof. François Bouchy from the University of Geneva in Switzerland, Dr. Michaël Gillon from the University of Liège in Belgium, Prof. Kevin Heng from the University of Bern in Switzerland, Prof. Didier Queloz from the University of Geneva, Switzerland, and Cambridge in the UK, and Dr. Laurence Sabin, also from Instituto de Astronomía de Astronomía in UNAM. SAINT-EX has been funded by the Swiss National Science Foundation and the Universities of Bern, Geneva, Liège and Cambridge as well as UNAM. SAINT-EX also received support from the National Council for Science and Technology (CONACYT) through the National Laboratories call for proposals for the National Astronomical Observatory of San Pedro Martir.

<https://www.saintex.unibe.ch/>

### **Center for Space and Habitability (CSH)**

The mission of the Center for Space and Habitability (CSH) is to foster dialogue and interactions between the various scientific disciplines interested in the formation, detection and characterization of other worlds within and beyond the Solar System, the search for life elsewhere in the Universe, and its implications for disciplines outside of the sciences. The members, affiliates and collaborators include astronomers, astrophysicists and astrochemists, atmospheric, climate and planetary scientists, geologists and geophysicists, biochemists and philosophers. The CSH is home to the CSH and Bernoulli Fellowships, which host young, dynamic and talented researchers from all over the world to conduct independent research. It actively runs a series of programs to stimulate interdisciplinary research within the University of Bern including collaborations and/or open dialogue with Medicine, Philosophy and Theology. The CSH has an active tie to the Centre for Exoplanets & Habitability of the University of Warwick. It is active in implementing gender equality measures and public outreach.

More information: <https://www.csh.unibe.ch/>

### **Bernese space exploration: With the world's elite since the first moon landing**

When the second man, "Buzz" Aldrin, stepped out of the lunar module on July 21, 1969, the first task he did was to set up the Bernese Solar Wind Composition experiment (SWC) also known as the "solar wind sail" by planting it in the ground of the moon, even before the American flag. This experiment, which was planned, built and the results analysed by Prof. Dr. Johannes Geiss and his team from the Physics Institute of the University of Bern, was the first great highlight in the history of Bernese space exploration.

Ever since Bernese space exploration has been among the world's elite. The University of Bern has been participating in space missions of the major space organizations, such as ESA, NASA and JAXA. It is currently co-leading the European Space Agency's (ESA) CHEOPS mission with the University of Geneva. In addition, Bernese researchers are among the world leaders when it comes to models and simulations of the formation and development of planets.

The successful work of the [Department of Space Research and Planetary Sciences \(WP\)](#) from the Physics Institute of the University of Bern was consolidated by the foundation of a university competence center, the [Center for Space and Habitability \(CSH\)](#). The Swiss National Science Foundation also awarded the University of Bern the [National Center of Competence in Research \(NCCR\) PlanetS](#), which it manages together with the University of Geneva.

### **About SPECULOOS**

SPECULOOS is a project led by the [University of Liège](#) (project leader: Michaël Gillon) and carried out in partnership with the [University of Cambridge](#), the [University of Birmingham](#), the [Massachusetts Institute of Technology](#), the [University of Bern](#), the [Canary Islands Institute of Astrophysics](#), and the [European Southern Observatory](#) (ESO). It is based on a network of robotic telescopes whose main cores are the observatories [SPECULOOS-South](#) at ESO's Paranal Observatory in Chile (4 telescopes) and [SPECULOOS-North](#) in Tenerife (currently 1 telescope), complemented by the [SAINT-EX](#) (1 telescope in Mexico) and [TRAPPIST](#) (2 telescopes, 1 in Chile and 1 in Morocco) telescopes.