

Review

The TESS Satellite will Search for Planets in the Vicinity of our Solar System

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Abstract: The US Space Agency has launched from Cape Canaveral, Florida, the TESS satellite, which will search for planets near our solar system and study them in detail. "TESS will significantly increase the number of planets studied," said George Ricker of the Massachusetts Institute of Technology, MIT, before launching. "It will double the number of planets we've seen and detected with the Kepler telescope," he added. The Kepler Space Observatory has discovered 2,650, about 70% of the total worlds outside the solar system that is known to mankind. TESS was launched with a Falcon 9 rocket, which returned to Earth after sending the satellite to the Earth's orbit. The telescope used by NASA to "hunt" the planets led to the discovery of two heavenly bodies that seem to be ideal places for life. The two planets have the ideal dimensions and are at the right distance from their star. William Borucki, the Kepler telescope scientist, has announced that these two planets are the best candidates identified so far in the race to discover planets that host life. The findings were published in the journal Science. Experts announce that these two planets are an important milestone in the race for identifying extraterrestrial life. In the past, when astronomers identified exoplanets (planets outside our solar system) they did not meet all the criteria necessary to accommodate life forms. Many planets are not in the habitable area - at a distance from their star so they are not too hot or too cold, but ideal for the existence of liquid water. Until now, all the planets identified inhabitable areas were too large. Most likely, these planets were huge gas balls, like Neptune, not suitable for life. Instead, the Earth-sized planets discovered so far have been at a distance unsuitable for their stars. The two planets now identified by the researchers, Kepler-62-e and Kepler-62-f, meets all the necessary conditions for hosting life. The two planets are twin - they orbit the same star and are next to each other, less than Earth and Mars. Planets are a bit wider than Terra, but they are not too big. Kepler-62-e is a warm Hawaiian planet and Kepler-62-f is cool like Alaska, Borucki explained. Researcher David Charbonneau of Harvard University, co-author of this study, says, "It's the first planet I really think of," he said, "but Kepler-62-f may be able to host life forms." The researcher added that "we have overcome an important barrier. So, why not have life forms?" The planets are 1,200 light-years away from Terra. The star that it orbits dates back 7 billion years ago, being 2.5 billion years older than our Sun.

Keywords: TESS, NASA, Kepler, Space Observatory, Exoplanets, Near our Solar System

Introduction

The Kepler Space Telescope was launched in 2009 and since then has made many important discoveries,

being also considered "NASA's first mission capable of finding Earth-sized planets."

Even after the Kepler mission ended after some malfunctions, the satellite could be re-used in a new

mission called K2, which has the same mission but includes a wider portion of the sky.

On December 14, 2017, NASA scholars have announced that our Solar System is not the only one that has so many planets after they have discovered yet another planet that is orbiting Star Kepler-90. The system has thus reached eight planets, just like the one in which the Earth is. This breakthrough was accomplished with a program developed by Google AI, which brought out another planet in the Kepler-90 system.

Researchers used the program on 670 solar systems that were known to have more than one planet, starting from the idea that they could have other, yet undiscovered.

Thus, they found the planet Kepler-90i, 2,545 light years from Terra. This is probably solid and, like Earth, is the third planet from its star, which has a higher temperature than our sun. Still, similarities with our planet stop there. The Kepler-90i completes an orbit in just 14.4 days, making it too hot to accommodate life forms. Surface temperatures may reach 430 degrees Celsius. It's the first solid planet discovered by Kepler, but it's not one you want to visit - it's so close to its star that surface temperatures are about 1,400 degrees Celsius. It is very small for the exoplanets discovered until then, having a diameter of 1.5 times greater than Terra and the mass is four times higher. A bizarre thing is that it can have a tail like a comet due to extremely high temperatures.

It is the first discovered planet that orbits a pair of two suns. Scientists have speculated that the phenomenon would be plausible and the discovery of the Kepler-16 system has confirmed. Since about half of the discovered stars are in pairs, discovery is important both in understanding the formation of solar systems and in seeking alien life.

Mini-Neptune

Satellite skills have provided scientists with enough examples of individual planets to realize that there are two types of small planets: A group of solid planets, about 1.75 times the size of the Earth and the second group that has been nicknamed of "mini-Neptune," consists of small gaseous planets twice as large as the Earth.

Kepler-22b

Scientists studying exoplanets are particularly interested in what is called the habitable area - the optimal distance of a star-planet from its own allowing it to have liquid water - the temperature must not be too low or too high. Kepler-22b was the first planet in this area that was discovered by satellite. More interesting is that the star he orbits is the same type as our sun.

The Incredible Quantity

The telescope has so far found 2,515 exoplanets and 30 of them are approximately the size of the Earth and at

a suitable distance from their stars to have liquid water on the surface. All the planets discovered by Kepler make up more than two-thirds of the total scientists discovered, that is, 3,564.

The Kepler Space Telescope was launched in March 2009. During the four years of the first mission, the ship scanned 150,000 stars, searching for the small falls in light caused by planets that pass in front of them. In 2014, Kepler switched to the second mission called K2, where he still hunts planets but also makes a variety of observations (Wang and Yagi, 2016; Obaiys *et al.*, 2016; Ahmed *et al.*, 2016; Jauhari *et al.*, 2016; Syahrullah and Sinaga, 2016; Shanmugam, 2016; Jaber and Bicker, 2016; Wang *et al.*, 2016; Moubarek and Gharsallah, 2016; Amani, 2016; Shruti, 2016; Pérez-de León *et al.*, 2016; Mohseni and Tsavdaridis, 2016; Abu-Lebdeh *et al.*, 2016; Serebrennikov *et al.*, 2016; Budak *et al.*, 2016; Augustine *et al.*, 2016; Jarahi and Seifilaleh, 2016; Nabilou, 2016; You *et al.*, 2016; AL Qadi *et al.*, 2016; Zurfı and Zhang, 2016; Rama *et al.*, 2016; Sallami *et al.*, 2016; Huang *et al.*, 2016; Ali *et al.*, 2016; Kamble and Kumar, 2016; Saikia and Karak, 2016; Zeferino *et al.*, 2016; Pravettoni *et al.*, 2016; Bedon and Amadio, 2016; Chen and Xu, 2016; Mavukkandy *et al.*, 2016; Yeargin *et al.*, 2016; Madani and Dababneh, 2016; Alhasanah *et al.*, 2016; Elliott *et al.*, 2016; Suarez *et al.*, 2016; Kuli *et al.*, 2016; Waters *et al.*, 2016; Montgomery *et al.*, 2016; Lamarre *et al.*, 2016; Petrescu, 2012b; Aversa *et al.*, 2017a; 2017b; 2017c; 2017d; 2017e; 2016a; 2016b; 2016c; 2016d; 2016e; 2016f; 2016g; 2016h; 2016i; 2016j; 2016k; 2016l; 2016m; 2016n; 2016o; Petrescu and Petrescu, 2013a; 2013b; 2013c; 2012; 2011; Petrescu, 2018; 2015a; 2015b; 2012; Petrescu *et al.*, 2016a; 2016b; 2016c; 2017a; 2017b; 2017c; 2017d; 2017e; 2017f; 2017g; 2017h; 2017i; 2017j; 2017k; 2017l; 2018a; 2018b; 2018c; 2018d; Petrescu and Calautit, 2016a; 2018b; Daud *et al.*, 2008; Taher *et al.*, 2008; Zulkifli *et al.*, 2008; Pourmahmoud, 2008; Pannirselvam *et al.*, 2008; Ng *et al.*, 2008; El-Tous, 2008; Akheshmeh *et al.*, 2008; Nachientai *et al.*, 2008; Moezi *et al.*, 2008; Boucetta, 2008; Darabi *et al.*, 2008; Semin and Bakar, 2008; Al-Abbas, 2009; Abdullah *et al.*, 2009a; 2009b; 2009c; Zulkifli *et al.*, 2009; Ab-Rahman *et al.*, 2009; Abdullah and Halim, 2009; Zotos and Costopoulos, 2009; Feraga *et al.*, 2009; Bakar *et al.*, 2009; Cardu *et al.*, 2009; Bolonkin, 2009a; 2009b; Nandhakumar *et al.*, 2009; Odeh *et al.*, 2009; Lubis *et al.*, 2009; Fathallah and Bakar, 2009; Marghany and Hashim, 2009; Kwon *et al.*, 2010; Aly and Abuelnasr, 2010; Farahani *et al.*, 2010; Ahmed *et al.*, 2010; Kunanoppadon, 2010; Helmy and El-Taweel, 2010; Qutbodın, 2010; Pattanasethanon, 2010; Fen *et al.*, 2011; Thongwan *et al.*, 2011; Theansuwan and Triratanasirichai, 2011; Al Smadi, 2011; Tourab *et al.*,

2011; Raptis *et al.*, 2011; Momani *et al.*, 2011; Ismail *et al.*, 2011; Anizan *et al.*, 2011; Tsolakis and Raptis, 2011; Abdullah *et al.*, 2011; Kechiche *et al.*, 2011; Ho *et al.*, 2011; Rajbhandari *et al.*, 2011; Aleksic and Lovric, 2011; Kaewnai and Wongwises, 2011; Idarwazeh, 2011; Ebrahim *et al.*, 2012; Abdelkrim *et al.*, 2012; Mohan *et al.*, 2012; Abam *et al.*, 2012; Hassan *et al.*, 2012; Jalil and Sampe, 2013; Jaoude and El-Tawil, 2013; Ali and Shumaker, 2013; Zhao, 2013; El-Labban *et al.*, 2013; Djalel *et al.*, 2013; Nahas and Kozaitis, 2014).

Materials and Methods

The telescope used by NASA to "hunt" the planets led to the discovery of two heavenly bodies that seem to be ideal places for life. The two planets have the ideal dimensions and are at the right distance from their star (Fig. 1 and 2).

William Borucki, the Kepler telescope scientist, has announced that these two planets are the best candidates identified so far in the race to discover planets that host life.

The findings were published in the journal Science. Experts announce that these two planets are an important milestone in the race for identifying extraterrestrial life.

In the past, when astronomers identified exoplanets (planets outside our solar system) they did not meet all the criteria necessary to accommodate life forms. Many planets are not in the habitable area - at a distance from their star so they are not too hot or too cold, but ideal for the existence of liquid water. Until now, all the planets identified in habitable areas were too large. Most likely, these planets were huge gas balls, like Neptune, not suitable for life.

Instead, the Earth-sized planets discovered so far have been at a distance unsuitable for their stars.

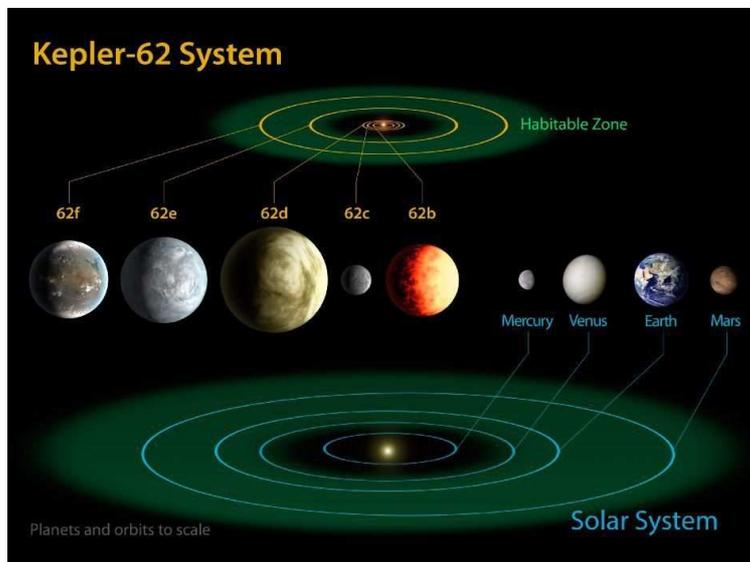


Fig. 1: Kepler 62 system



Fig. 2: Kepler 62 e and f and Earth

The two planets now identified by the researchers, Kepler-62-e and Kepler-62-f, meets all the necessary conditions for hosting life. The two planets are twin - they orbit the same star and are next to each other, less than Earth and Mars.

Planets are a bit wider than Terra, but they are not too big. Kepler-62-e is a warm Hawaiian planet and Kepler-62-f is cool like Alaska, Borucki explained.

Researcher David Charbonneau of Harvard University, co-author of this study, says, "It's the first planet I really think of," he said, "but Kepler-62-f may be able to host life forms." The researcher added that "we have overcome an important barrier. So, why not have life forms?"

The planets are 1,200 light-years away from Terra. The star that it orbits dates back 7 billion years ago, being 2.5 billion years older than our Sun.

"If life forms on these planets exist they are likely to be very advanced," commented Borucki.

Results

"TESS will significantly increase the number of planets studied," said George Ricker of the Massachusetts Institute of Technology (MIT) before launch.

"It will double the number of planets we've seen and detected with the Kepler telescope," he added. The Kepler Space Observatory has discovered 2,650 exoplanets, about 70% of the total worlds outside the solar system that are known to mankind.

TESS was launched with a Falcon 9 rocket, which returned to Earth after sending the satellite to the Earth's orbit.

NASA's new satellite will search for planets using the same technology as its predecessor, Kepler, investigating even the smallest visible spots on the star's surface. These are usually made by planets that run in front of the stars they surround.

Kepler monitored 150,000 stars simultaneously, most of them being at hundreds of light years away. The days of the famous space telescope are, however, counted, exhausting almost all of its fuel resources.

TESS is Looking for Habitable Planets

TESS will also use a series of observers on Earth to determine which of the planets they find can support life. Such a partner will also be the James Webb Space Telescope, which will cost nearly \$ 9 billion and will be launched in 2020.

James Webb can find out if the planets found by TESS have an atmosphere. Moreover, this telescope can also look for signs of life, NASA experts said.

"TESS is the first step in our mission to find living planets," said researcher Stephen Rinehart, who is directly involved in this project.

Discussion

NASA researchers have announced that the Kepler telescope has made an amazing discovery: A planet similar to Earth, which would be an ideal host for humans. It is the closest planet of this type discovered so far, being outside our solar system.

"It is an astonishing breakthrough that will remain in the history of mankind," commented Geoff Marcy of the University of California, one of the pioneers of the field of "Planetary Planners."

The newly discovered planet is found in the "Goldilocks area," as astronomers call it the ideal region for life forms similar to those on Earth. In the Goldilocks area, the planet is not too close to its star (as water to boil), but not too far (to freeze water). The surface temperature of the discovered planet is 22 degrees Celsius, scientists say.

Researchers called the planet Kepler-22b and claim to resemble the Earth in many ways: It orbits a star similar to the Sun at about the same distance. One year on the Kepler-22b lasts for 290 days and the researchers say it is very likely that rocks and water will be found on the surface of the planet.

Kepler-22b differs from Terra in one significant aspect: It is 2.4 times higher than our planet. That's why researchers say it's unlikely to have life forms on its surface. Researchers say the planet may be covered by a huge ocean. Natalie Batalha, a Kepler researcher, said that "it's not at all impossible for the ocean to host life."

Kepler-22b is 600 light-years away from Earth, being the closest Earth-like planet discovered so far. With the current technology, a space shuttle would take 22 million years to make a trip from Terra to Kepler 22-b.

Therefore, obviously, besides the new telescope satellites that are looking for and finding more and more new planets that can host life as we know it today on Terra, we also need new spacecraft capable of moving much faster than those existing today.

Conclusions

The US Space Agency has launched from Cape Canaveral, Florida, the TESS satellite, which will search for planets near our solar system and study them in detail. "TESS will significantly increase the number of planets studied," said George Ricker of the Massachusetts Institute of Technology, MIT, before launching. "It will double the number of planets we've seen and detected with the Kepler telescope," he added.

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Ethics

Author declares that are not ethical issues that may arise after the publication of this manuscript. This article is original and contains unpublished material.

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Figure Sources

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