Kepler spacecraft in emergency mode

NASA engineers work to recover the telescope on the eve of a new type of planet search.

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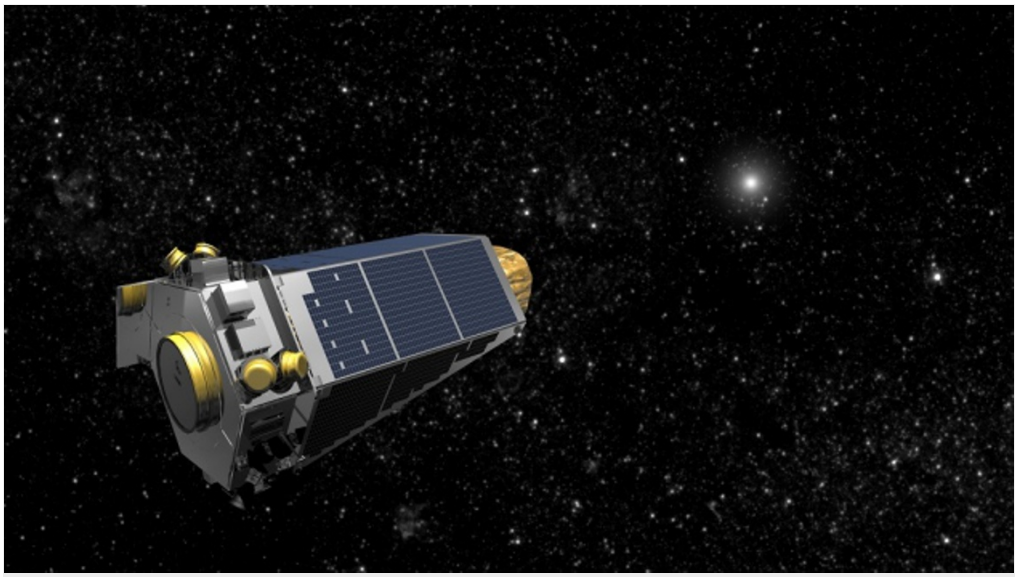

NASA

Problems with Kepler's orienting mechanism ended its first mission in May 2013.

Update (11 April): The Kepler spacecraft has been recovered from its emergency state, NASA announced today. Engineers expect to spend the rest of the week assessing the health of the spacecraft before commanding it to begin the microlensing planet search.

NASA's Kepler space telescope has unexpectedly gone into an emergency operations mode, halting the start of a much-anticipated phase of its planet hunt. Engineers are working to try to get the probe working normally.

Kepler apparently entered the mode on 6 April, according to an 8 April update from Charlie Sobeck, the mission manager at NASA's Ames Research Center in Moffett Field, California. In emergency mode, Kepler burns more of its dwindling supply of fuel, which is needed to ignite its thrusters and orient the spacecraft to communicate with Earth. The spacecraft had not yet executed the turning manoeuvre that would have started the new planet hunt.

Until now, Kepler has discovered planets by watching for the slight dimming of starlight caused by an orbiting planet passing in front of a star. The probe has been wildly successful at this task, finding more than 1,040 confirmed planets and more than 4,700 planet candidates since its 2009 launch.

The new campaign was to have run from 7 April to 1 July. It would have looked for the temporary brightening of stars caused by a different effect, known as gravitational microlensing. In microlensing, the gravity of an intervening object — such as a planet — focuses and intensifies the light from a background star, causing it to brighten. Unlike Kepler's other discoveries, which tend to be smaller planets relatively close to their host stars, microlensing targets big planets at large distances from their stars, or even lonely planets wandering on their own through the depths of space.

Sun's stroke keeps Kepler online

Ground-based telescopes have discovered 46 planets through microlensing, and astronomers were hoping that Kepler would uncover 10 or more during its campaign. (The space telescope would have upped its chances by turning to look at the star-spangled heart of the Milky Way.) Such discoveries could help to narrow the statistics on how common free-floating planets might be throughout the Galaxy.

Ground game

Astronomers have coordinated an elaborate plan in which some two dozen ground-based telescopes, spread across six continents, would gaze at the same part of the sky at the same time as Kepler. They include the Optical Gravitational Lensing Experiment (OGLE) survey, which hunts for microlensing events from the Las Campanas Observatory in Chile. OGLE was to have shifted its observing strategy slightly in order to overlap with the same fields that Kepler was looking at. In late June, NASA's Spitzer Space Telescope was to have joined the hunt as well.

It would have been the first microlensing survey conducted simultaneously from the ground and from space. Those different vantage points would have allowed astronomers to study potential microlensing planets more easily than using just one or two ground-based telescopes.

The truth about exoplanets

"There's a strong feeling like it's Christmas morning; we were all set to unwrap a shiny new toy, and then we had to put everything on hold due to a power outage or something," says Andrew Cole, an astronomer at the University of Tasmania in Hobart, Australia. His team had planned to use a 1.3-metre telescope in Tasmania to follow up on microlensing alerts from Kepler.

For now, the start of Kepler's microlensing campaign is on hold until engineers can get the telescope working again. It is currently about 120 million kilometres from Earth, meaning each message takes 13 minutes to get to Kepler and back.

Days lost from the microlensing campaign cannot be made up later. On 2 July, the day after the observations were due to end, Kepler will no longer be in the proper orbital position, relative to the Sun, to be able to hunt for microlensing planets.

Paul Hertz, NASA's director of astrophysics, has touted the Kepler microlensing survey as a step towards the agency's next big space telescope, the Wide-Field Infrared Survey Telescope, which is meant to do microlensing searches after it launches in the 2020s.

The latest glitch is not Kepler's first problem. Issues with its reaction wheels, which allow the spacecraft to orient itself, caused the main mission to end in May 2013 after four years of observing. It has been operating since then in a more limited 'K2' mode, which uses pressure from sunlight to compensate for the loss of the reaction wheels. Even that, however, has yielded a bonanza of exoplanets.

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Updates

Updated: Updated to reflect the latest information on Kepler's status.

References

1. Henderson, C. B. *et al*. Preprint at http://arxiv.org/abs/1512.09142 (2016).

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