New Scientist

WEEKLY 26 April 2025

SPECIAL REPORT

THE POLAR CRISIS

The dramatic global impacts of shrinking sea ice

The race to drill the deepest-ever ice core

Why exploiting the Arctic won't lead to riches

RETHINKING PARKINSON'S

Why it might be two conditions, not one – and how this radical idea could lead to new treatments

No3540 £6.95 CAN$9.99

LIFE ON AN EXOPLANET?

What to make of the strongest hints yet of alien biological activity

Space

Strongest evidence yet of alien life

On a distant planet, the James Webb Space Telescope has picked up signs of molecules that, on Earth, are produced only by life – but researchers urge caution, finds **Alex Wilkins**

ASTRONOMERS claim to have seen the best evidence so far of life on another planet. But other researchers have urged caution until the findings can be verified and alternative, non-biological explanations can be ruled out.

"These are the first hints we are seeing of an alien world that is possibly inhabited," Nikku Madhusudhan at the University of Cambridge told a press conference on 15 April.

Astronomers first discovered the exoplanet K2-18b in 2015. About eight times as massive as Earth and orbiting a star 124 light years away from us, the planet sits in the habitable zone of its star, where liquid water can exist. Further observations in 2019 found evidence of water vapour, which led to suggestions that the planet may be covered in oceans sitting under a hydrogen-rich atmosphere, though not all astronomers agreed.

In 2023, Madhusudhan and his colleagues used the instruments on the James Webb Space Telescope (JWST) to look at K2-18b's atmosphere in near-infrared light, and again found evidence of water vapour, as well as carbon dioxide and methane. But they also found a tantalising hint of dimethyl sulphide (DMS), a molecule that, on Earth, is produced only by living organisms, mainly marine phytoplankton. The signs for DMS were extremely weak, however, and many astronomers argued that we would need much stronger evidence to be certain about the molecule's presence.

Now, Madhusudhan and his colleagues have used a different instrument from JWST, the mid-infrared camera, to observe K2-18b. They found a much stronger signal for DMS, as well as a possible related molecule called dimethyl disulphide (DMDS), which, on Earth, is also produced only by life (*The Astrophysical Journal Letters*, doi.org/phnd).

The team claims that the detection of DMS and DMDS is at the three-sigma level of statistical significance, which is equivalent to a 3-in-1000 chance that a pattern of data like this ends up being a fluke. In physics, the standard threshold for accepting something as a true discovery is five sigma, which equates to a 1-in-3.5 million chance that the data is a chance occurrence.

"We have a boy-who-cried-wolf situation for K2-18b, where previous detections vanished under scrutiny"

Nicholas Wogan at the NASA Ames Research Center in California says the evidence is more convincing than the 2023 results, but it still needs to be verified by other groups. Once the data is made public – which, as *New Scientist* went to press, was expected to be this month – other researchers can start to confirm the findings, but this could take weeks or months due to the difficulty of interpreting JWST data. "It's not just like you download the data and you see if there's DMS – it's this super complicated process," says Wogan.

Others are more sceptical. "These new JWST observations do not offer convincing evidence that DMS or DMDS are present in K2-18b's atmosphere," says Ryan MacDonald at the University of Michigan. "We have a boy-who-cried-wolf situation for K2-18b, where multiple previous three-sigma detections have completely vanished when subject to closer scrutiny. Any claim of life beyond Earth needs to be rigorously checked by other scientists, and unfortunately many previous exciting claims for K2-18b haven't withstood these independent checks."

Madhusudhan and his team estimate that between 16 and 24 hours of further observations with JWST could help them reach the five-sigma level, but the difficulty of observing the planet's atmosphere means they can't guarantee this.

ESA/HUBBLE, M. KORNMESSER

Does exoplanet K2-18b, shown here in an artist's impression, host life?

Lost in space

"The relative size of the atmosphere compared to the size of the planet is pretty close to the thickness of an apple skin on top of an apple. That's what we're trying to measure," says Thomas Beatty at the University of Wisconsin-Madison, who wasn't part of the study team.

Madhusudhan and his colleagues calculate that the possible concentrations of DMS and DMDS on K2-18b appear to be over 10 parts per million, thousands of times greater than the concentrations in Earth's atmosphere. This could indicate a far greater amount of biological activity than on Earth, if the signal proves to be correct, but establishing that the chemicals have a biological origin will take more work, he says.

"We have to be extremely careful," said Madhusudhan. "We cannot, at this stage, make the claim that, even if we detect DMS and DMDS, that it is due to life. Let me be very clear about that. But if you take published studies so far, then there is no mechanism that can explain what we are seeing without life."

The difficulty in proving that it couldn't have a non-biological explanation could put K2-18b in the category of a viable biosignature candidate for a long time, says Sara Seager at the Massachusetts Institute of Technology. "It may remain in that category for decades, since the question may never be fully resolved with the limited data exoplanets offer," she says. ▮