BBC

WHAT THE WORLD'S BIGGEST CAMERA WILL CAPTURE

#231 AUGUST 2024

Sky at Night

THE UK'S BEST-SELLING ASTRONOMY MAGAZINE

FLYING OVER TITAN

The first mission to fly on another world gets the green light

HAS THE JWST BROKEN MODERN COSMOLOGY?

DISCOVER THE NEW ERA OF HUMAN SPACEFLIGHT

WATCH THE MOON COVER RINGED PLANET SATURN

WHY THE MILKY WAY IS LACKING ANCIENT STARS

ON TEST: UNISTELLAR'S ODYSSEY PRO SMART SCOPE

Our experts examine the hottest new research

CUTTING EDGE

How green are little green men? If aliens have embraced renewables, we could spot the signs

Could we find aliens by looking for their solar panels?

Designed to reflect ultraviolet and infrared, the panels have a unique fingerprint

Researchers searching for life beyond Earth spend a lot of time thinking about what telltale signs might be detectable astronomically. Forms of unambiguous evidence for the presence of life on another world are known as biosignatures. By extension, technosignatures are indicators of activity by intelligent, civilisation-building life.

SETI, the Search for Extraterrestrial Intelligence, focuses on picking up signals that could be alien communication, but other approaches include observing traces of industrial air pollution on an exoplanet; observing the emission of artificial light from cities on the planet's night side; or even detecting evidence that a highly capable civilisation has constructed a shell around its star, known as a Dyson sphere, to capture its emitted energy.

Ravi Kopparapu at the NASA Goddard Space Flight Center and colleagues have been looking into another option. Our own civilisation is turning increasingly to renewable forms of energy and it would be reasonable for an environmentally aware alien civilisation to have done the same. Could we detect evidence of large solar panel farms on an exoplanet? This idea was originally proposed by Manasvi Lingam, one of this study's authors, and Avi Loeb, but they didn't calculate how feasible it might be. Which is where Kopparapu and his team step in.

Signs in the silicon

Silicon-based solar panels absorb visible light really well – that is, after all, their function. They also strongly reflect ultraviolet and infrared wavelengths. This means that when you use spectroscopy to look at solar panels, wavelengths at around 400nm and 1,000nm show distinctly as the reflectance leaps up. In the same way that Earth-observation satellites can distinguish areas of sandstone from volcanic rock by their spectral features, exoplanet observers should, in principle, be able to use spectroscopy to detect artificial surfaces such as silicon panels.

And there's certainly a great deal of energy available to solar panels. Our current global energy demands could be met with panels covering just 2.4 per cent of Earth's land surface (compared to roughly 35 per cent that's used for agriculture). Kopparapu says that even supporting an increased world population of 10 billion people, all with a high standard of living, would only require 3 per cent land coverage.

> ***"Exoplanet observers should, in principle, be able to use spectroscopy to detect artificial surfaces such as silicon panels"***

Kopparapu and his team considered an Earth-like planet orbiting a Sun-like star, around 33 lightyears away. Would silicon solar panels on such a planet be detectable by their spectral signature using a space-based telescope with a large, eight-metre mirror? Kopparapu ran the numbers, and found that yes, it's possible... but only if hundreds of hours of observation time were used and if solar panels covered a whopping 23 per cent of the planet. To put it into context, that's equivalent to the entire surface of Africa being smothered with solar farms.

So the answer is realistically a 'no'. But we only know that now because a research team has taken the trouble to actually run the study and carefully calculate the numbers. And it helps to guide the future direction of which technosignatures are worth focusing on.

Prof Lewis Dartnell is an astrobiologist at the University of Westminster

Lewis Dartnell was reading... *Detectability of Solar Panels as a Technosignature* by Ravi Kopparapu et al.
Read it online at: arxiv.org/abs/2405.04560v1

JUSTIN PAGET/ISTOCK/GETTY, DZIKA_MROWKA/ISTOCK/GETTY