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By Carlo Rovelli

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Space

Orbiting junk probably foiled study of oldest known galaxy

Jonathan O'Callaghan

A FLASH of light in the night sky, thought to have been a burst from a galaxy in the early universe, may have been nothing more than a glint from a piece of space junk.

In December 2020, Linhua Jiang at Peking University in Beijing, China, and his colleagues announced they had seen a brightening event in GN-z11, thought to be the most distant and oldest known galaxy in the universe, which we see as it was 13.4 billion years ago. The event was believed to be a gamma-ray burst, possibly resulting from the supernova explosion of a giant star, the oldest known such occurrence.

However, Michał Michałowski at Adam Mickiewicz University in Poland and his colleagues found that the detection, made from Hawaii in 2017, lined up with a piece of space junk from a Russian Proton rocket that was launched in February 2015 (arxiv.org/abs/2102.13164).

Weighing about a tonne, the piece of junk originates from a flight to put a communications satellite from the UK firm Inmarsat, called Inmarsat-5 F2, into orbit. It was the rocket's upper stage, known as the Breeze-M, that was left following an elliptical track around Earth at an altitude varying between 350 and 15,000 kilometres above the planet.

Jiang says his team knew of the existence of this object and ruled it out as being responsible for what they saw: he says it wasn't in the exact field of view of their observations. "We also found the brightness was much fainter than what was needed to produce this flash," he says.

Yet others agree with Michałowski and his team's findings. "I think it's the



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definitive answer," says Guy Nir at the Weizmann Institute of Science in Israel, whose independent research also concluded that the burst could have been caused by a satellite. "The orbit of this piece of space trash coincides with the images they took. This is an unlikely event, but it's still more likely than a gamma-ray burst."

Given the flash has passed and is unlikely to repeat, we will probably never know for sure what happened. But the whole episode, with hundreds of hours spent analysing this

"This highlights the problem astronomers face from satellites and space debris"

event, highlights the growing problem astronomers face with satellites and space debris affecting their observations.

In the past year, the number of active satellites in Earth orbit has grown by roughly a third, thanks largely to the launch of more than 1000 satellites in the US firm SpaceX's Starlink mega constellation, designed to beam the internet to Earth from space.

Artist's impression of space debris circling our planet

These satellites are in relatively low orbits, which means that later at night they are in Earth's shadow and so are dark. But other objects left in higher orbits like Breeze-M – which will orbit for decades or even centuries – pose larger problems throughout the night. "There's an accumulation of 50 years of stuff up there," says Jonathan McDowell at the Harvard-Smithsonian Center for Astrophysics.

Michele Bannister at the University of Canterbury in New Zealand says the work of astronomers is increasingly hampered by human-caused interference. "We are already seeing the community spending substantial amounts of entirely unfunded time having to chase their tails to understand and mitigate these issues," she says.

"The best estimate we have is 20,000 [human-made flashes] per day over the entire sky," says Nir, but notes the true number "is probably 10 times bigger". ■

Exoplanets

Planet hotter than most stars spotted 25 light years away

Jonathan O'Callaghan

ASTRONOMERS may have detected a planet around a nearby star – potentially the second hottest exoplanet ever found.

Spencer Hurt at the University of Colorado, Boulder, and his colleagues used 10 years of observations of Vega, a bright star just 25 light years from our solar system, to look for the telltale gravitational tug of planets.

They were able to spot a potential world that orbits the star every 2.43 Earth days, at a distance 10 times closer than Mercury orbits the sun. It has a mass up to 20 times that of Earth, making it a so-called "hot Jupiter", but its close proximity coupled with the star's brightness – almost 60 times the luminosity of our sun – would make it especially warm.

"It's not unusual to see hot Jupiters," says Samuel Quinn at the Harvard-Smithsonian Center for Astrophysics, a co-author of the paper. "But it's unusual to see hot Jupiters as hot as this."

The planet would have an average temperature of about 3000°C, although because it is orbiting at such a close distance, it would almost certainly be tidally locked to the star with one face in constant sunlight and thus much hotter than the other (arxiv.org/abs/2101.08801).

There is one planet thought to be even hotter than this. KELT-9b, a hot Jupiter 650 light years away from Earth, is estimated to have a surface temperature of 4300°C. Both KELT-9b and the new planet are hotter than most red dwarf stars – which are the most abundant class of star in our galaxy – according to the team.

If the observations are confirmed, this would also be the first planet ever discovered in the Vega system. Other planets might exist orbiting at a greater distance from the star too. ■