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The planet may have lost its previous atmosphere and is now forming a new one, thanks to volcanic activity

NASA/ESA/R HURT

A wide-field view, showing the region of sky in which the exoplanet Gliese 1132 b can be found. Inside the yellow circle is a red dot – that's the star Gliese 1132 around which Gliese 1132 b orbits

For the first time, scientists using the Hubble Space Telescope have found evidence of volcanic activity reforming the atmosphere on a rocky planet around a distant star.

The planet, Gliese 1132 b, is located 40 light-years away in the constellation Vela and has a similar density, size and age to Earth.

It was first discovered in 2015 by the MEarth-South telescope array in Chile and appears to have begun life as a so-called sub-Neptune planet – a gaseous world with a thick atmosphere.

It's thought Gliese 1132 b initially had a radius several times that of Earth, but its primordial hydrogen and helium atmosphere was rapidly stripped away by the intense radiation from its hot, young star. The stripping process left behind a bare core approximately the same size as Earth.

Now, based on new observations carried out by Hubble, researchers have discovered that a second atmosphere, rich in hydrogen, hydrogen cyanide, methane and ammonia, may have formed on the planet due to volcanic activity.

They theorise that this arose due to hydrogen from the original atmosphere being absorbed into the planet's molten magma mantle and then slowly released to form a new atmosphere. Though this second atmosphere is also leaking away into space, it's continually being replenished from the reservoir of hydrogen in the mantle, they say.

"Further opportunities to observe Gliese 1132 b may come via the James Webb Space Telescope"

"This second atmosphere comes from the surface and interior of the planet, and so it's a window onto the geology of another world," said team member Dr Paul Rimmer of the University of Cambridge. "A lot more work needs to be done to properly look through it, but the discovery of this window is of great importance."

Further opportunities to investigate the geology of Gliese 1132 b may come via the James Webb Space Telescope (JWST) – the successor to Hubble, due to launch in October (see p32 for more on the JWST's preparations for lift-off).

The JWST will primarily look at the Universe in infrared, allowing it to see more distant objects than Hubble, which tends to observe in optical and ultraviolet wavelengths. This is due to the light from more distant objects being more redshifted – pushed from the UV and optical parts of the spectrum towards the near-infrared.

"This atmosphere, if it's thin – meaning if it has a surface pressure similar to Earth – probably means you can see right down to the ground at infrared wavelengths. That means that if astronomers use the JWST to observe this planet, there's a possibility that they'll see not the spectrum of the atmosphere, but rather the spectrum of the surface," said team leader Mark Swain of the Jet Propulsion Laboratory. "And if there are magma pools or volcanism going on, those areas will be hotter. That will generate more emissions and so they'll potentially be looking at the actual geological activity, which is exciting!"