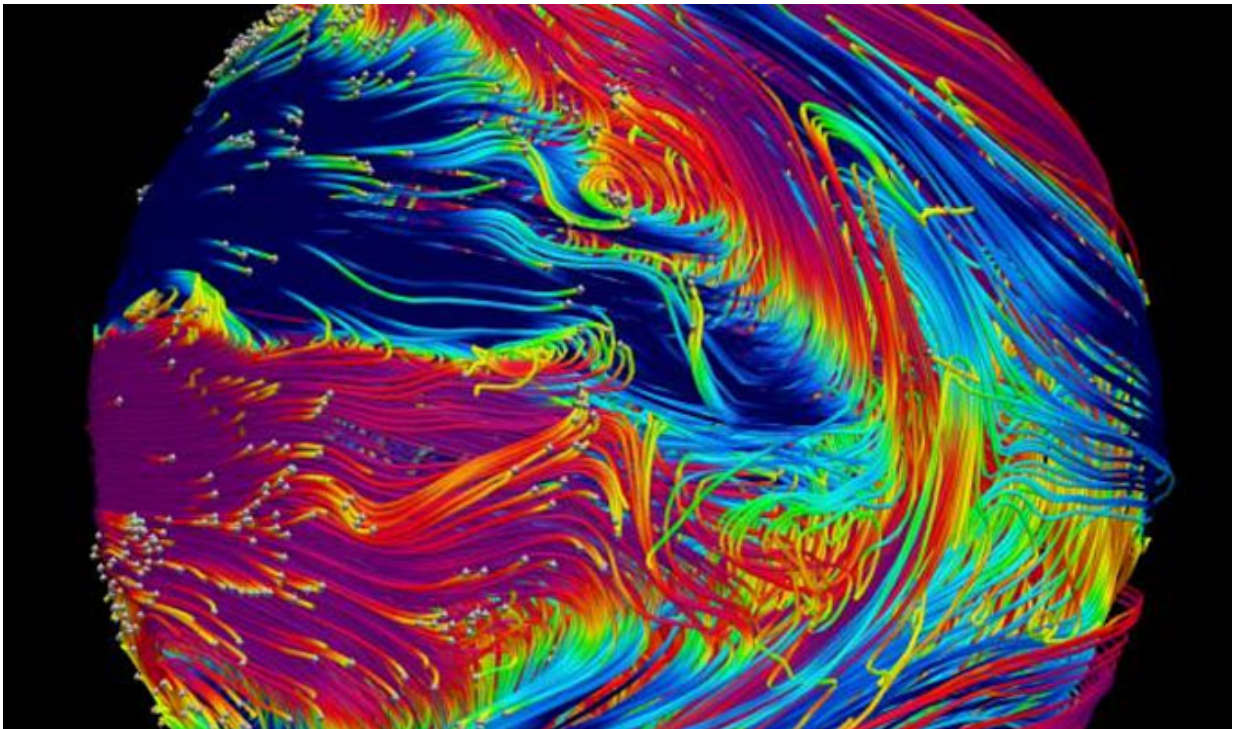


# Measuring the magnetic fields on the hottest planets in the galaxy

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Credit: Newcastle University

It is now possible to measure the magnetic field strengths of the hottest planets in the galaxy, new research has shown.

Studying a class of planets known as 'hot Jupiters', experts from Newcastle University, UK, have shown the planets' magnetic field is

responsible for the unusual behaviour of the atmospheric winds which move around it.

Instead of moving in an eastward direction as has always been assumed, new observations have shown the winds varied from eastward to westward on the hot planet HAT-P-7b.

Using this observation, Dr Tamara Rogers, from Newcastle University, was able to estimate the [magnetic field strength](#) of this far-off planet.

Publishing her findings this month in the leading academic journal *Nature Astronomy*, Dr Rogers says this new understanding of the magnetic fields of these far-distant planets will help astronomers understand their formation, size and migration paths and ultimately help us understand the formation and evolution of our own solar system.

"The extreme [temperature](#) of these unusual planets causes metals such as lithium, sodium and potassium to become ionized and this allows the magnetic field to be coupled to the atmospheric winds," explains Dr Rogers, who is based in the School of Mathematics and Statistics at Newcastle University.

"These magnetic forces are able to then disrupt the strong eastward winds, leading to variable and even oppositely directed winds. This then allowed us to estimate the [magnetic field](#) strength of the planet."

## **The "roasted" planets**

Modern astronomical research investigates not just stars and galaxies but also the planets around distant stars, termed "exoplanets", often thousands of light years from Earth.

The best studied of these exoplanets are called hot Jupiters - Jupiter-

sized planets that are very close to their home [stars](#). Because of their size and temperature, hot Jupiters are an extreme class of [planets](#) which test modern theories about gas dynamics.

In December 2016, observations were made by researchers at Warwick University that implied variable winds on HAT-P-7b.

HAT-P-7b is nearly 40 percent larger than our own Jupiter and orbits its star every couple of days. It is so close that its dayside temperature may be up to 2500 C with a night side temperature of 1400 C.

"Astronomers were able to trace the brightest point – the 'hot spot' – in the planet's atmosphere," explains Dr Rogers. "The extreme day-night temperature difference drives strong eastward winds in the atmosphere and shifts the hot spot away from the point directly beneath the star on the dayside.

"However, we saw this hot spot shift significantly over time – even ending up on the west side of the sub-stellar point. This shows that the winds are also varying significantly and even completely changing direction."

**More information:** T. M. Rogers. Constraints on the magnetic field strength of HAT-P-7 b and other hot giant exoplanets, *Nature Astronomy* (2017). [DOI: 10.1038/s41550-017-0131](https://doi.org/10.1038/s41550-017-0131)

Provided by Newcastle University

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