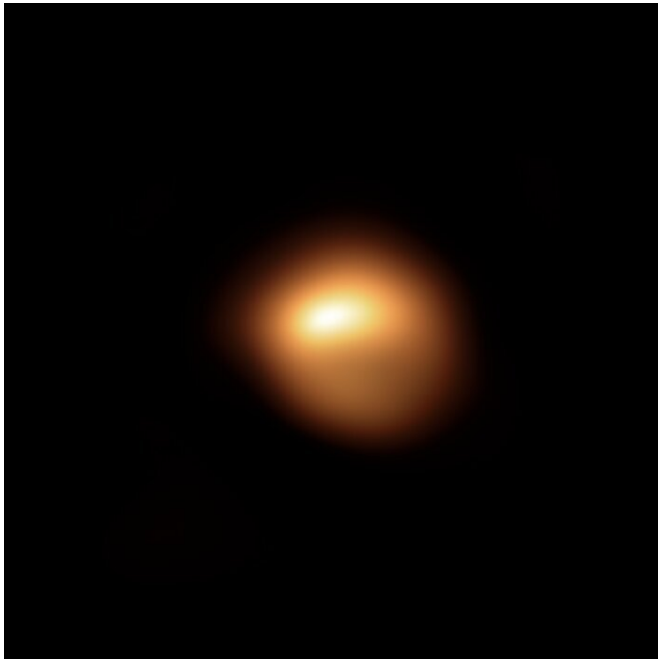


# ESO telescope sees surface of dim Betelgeuse

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The red supergiant star Betelgeuse, in the constellation of Orion, has been undergoing unprecedented dimming. This stunning image of the star's surface, taken with the SPHERE instrument on ESO's Very Large Telescope late last year, is among the first observations to come out of an observing campaign aimed at understanding why the star is becoming fainter. When compared with the image taken in January 2019, it shows how much the star has faded and how its apparent shape has changed. Credit: ESO/M. Montargès et al.

Using ESO's Very Large Telescope (VLT), astronomers have captured the unprecedented dimming of Betelgeuse, a red supergiant star in the constellation of Orion. The stunning new images of the star's surface show not only the fading red supergiant but also how its apparent shape is changing.

Betelgeuse has been a beacon in the night sky for stellar observers but it began to dim late last year. At the time of writing Betelgeuse is at about 36% of

its normal brightness, a change noticeable even to the naked eye. Astronomy enthusiasts and scientists alike were excitedly hoping to find out more about this unprecedented dimming.

A team led by Miguel Montargès, an astronomer at KU Leuven in Belgium, has been observing the star with ESO's Very Large Telescope since December, aiming to understand why it's becoming fainter. Among the first observations to come out of their campaign is a stunning new image of Betelgeuse's surface, taken late last year with the SPHERE instrument.

The team also happened to observe the star with SPHERE in January 2019, before it began to dim, giving us a before-and-after picture of Betelgeuse. Taken in [visible light](#), the images highlight the changes occurring to the star both in brightness and in apparent shape.

Many astronomy enthusiasts wondered if Betelgeuse's dimming meant it was about to explode. Like all red supergiants, Betelgeuse will one day go supernova, but astronomers don't think this is happening now. They have other hypotheses to explain what exactly is causing the shift in shape and brightness seen in the SPHERE images. "The two scenarios we are working on are a cooling of the surface due to exceptional stellar activity or dust ejection towards us," says Montargès. "Of course, our knowledge of red supergiants remains incomplete, and this is still a work in progress, so a surprise can still happen."

Montargès and his team needed the VLT at Cerro Paranal in Chile to study the star, which is over 700 light-years away, and gather clues on its dimming. "ESO's Paranal Observatory is one of few facilities capable of imaging the surface of Betelgeuse," he says. Instruments on ESO's VLT allow observations from the visible to the mid-infrared, meaning astronomers can see both the surface of Betelgeuse and the material around it. "This is the

only way we can understand what is happening to the star."

Another new image, obtained with the VISIR instrument on the VLT, shows the infrared light being emitted by the dust surrounding Betelgeuse in December 2019. These observations were made by a team led by Pierre Kervella from the Observatory of Paris in France who explained that the wavelength of the image is similar to that detected by heat cameras. The clouds of dust, which resemble flames in the VISIR image, are formed when the star sheds its material back into space.

"The phrase 'we are all made of stardust' is one we hear a lot in popular astronomy, but where exactly does this dust come from?" says Emily Cannon, a PhD student at KU Leuven working with SPHERE images of red supergiants. "Over their lifetimes, red supergiants like Betelgeuse create and eject vast amounts of material even before they explode as supernovae. Modern technology has enabled us to study these objects, hundreds of light-years away, in unprecedented detail giving us the opportunity to unravel the mystery of what triggers their mass loss."

Provided by ESO

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