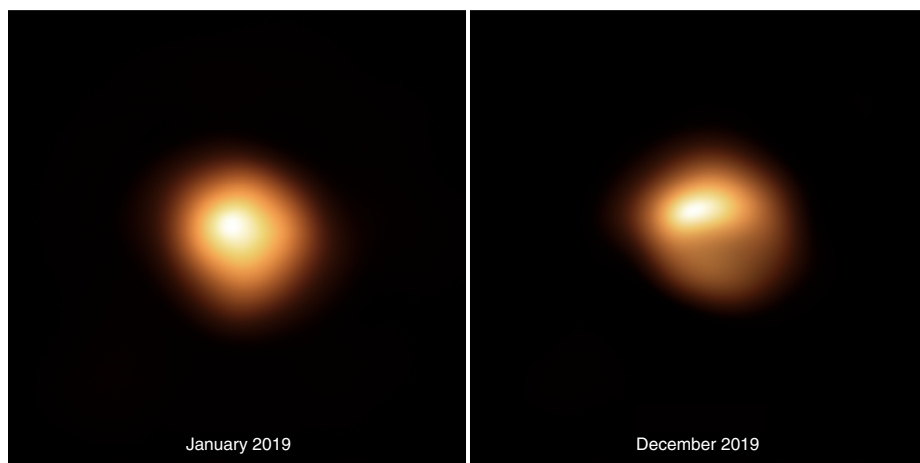BETELGEUSE
The hunter as the hunted
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Credit: ESO/M. Montargès et al.

Last December, the variable red supergiant star Betelgeuse in the Orion constellation went from the tenth brightest object in the sky to a faded, out-of-shape has-been (pictured before and after dimming) — indeed, some thought that a supernova was imminent. Since it then rebrightened in February, the record optical dimming was more likely to be due to increased obscuration from newly ejected dust, or changes in hot and cold spots on the surface of the star. Alternatively, it may just have been part of its normal cycle, albeit a more extreme one. To disambiguate these models, Thavisha Dharmawardena and coauthors used submillimetre wavelengths to probe the emission from the star.

The authors compared data taken on 23 January, 16 February and 3 March 2020 by the Submillimetre Common-User Bolometer Array 2 on the James Clerk Maxwell Telescope (JCMT) with archival data from 2012 and 2013 taken on JCMT and the Atacama Pathfinder Experiment submillimetre telescope. By using Bayesian inference to forward-model the fluxes, they found that the model with two epochs of constant (different) flux was significantly better than ones with a linearly changing flux or a constant flux. They concluded it was most likely that the submillimetre emission from the star decreased by 20%. This emission is dominated by the photosphere itself, rather than dust, which is optically thin at this wavelength. In fact, the authors' dust radiative-transfer modelling showed that any additional dust would only affect optical and infrared emission. With dust ruled out, the reduced luminosity was more likely to be due to a ~200 K surface temperature drop, the authors argue, from changes in the star spots that cover 50–70% of the visible surface. Star spots of this scale have not been observed on other stars. More detailed studies of Betelgeuse are needed.

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