

# The eclipses of Betelgeuse

## SIF 106° meeting 2020

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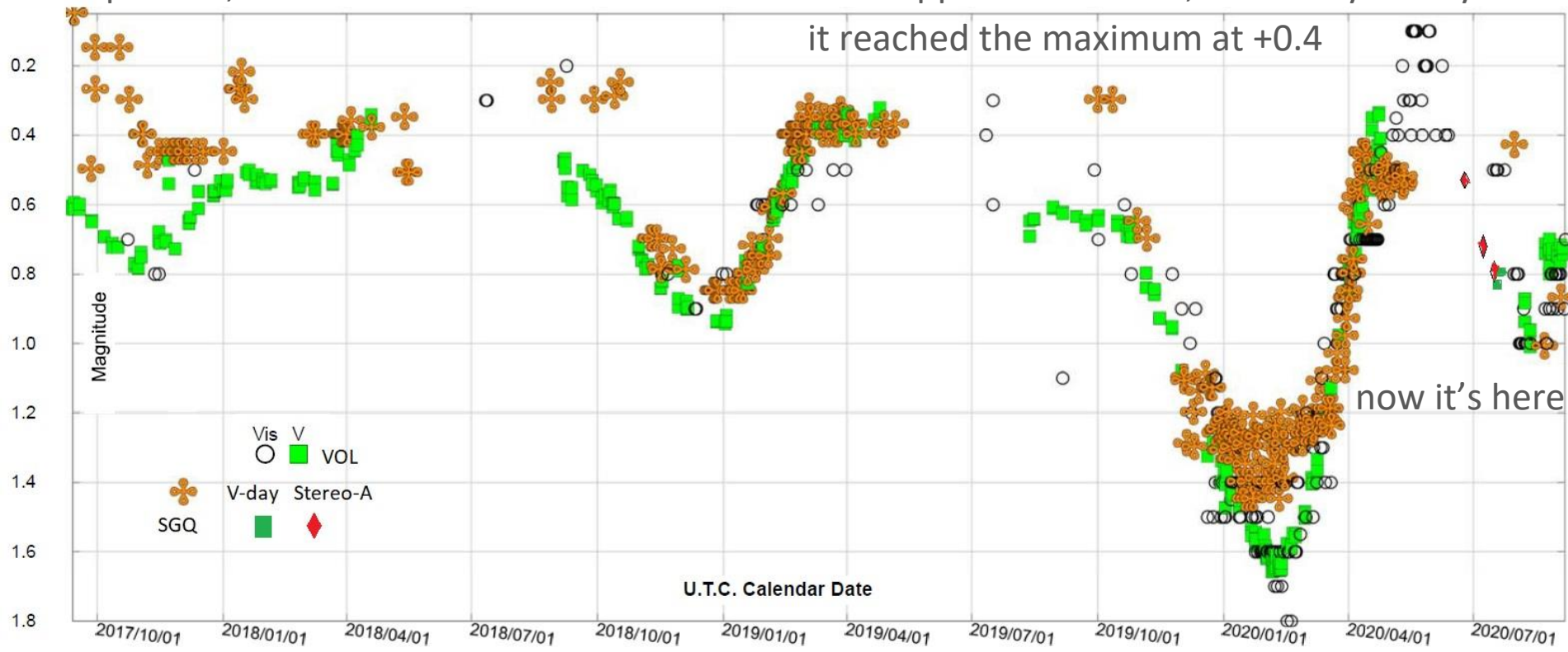
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# Betelgeuse “at historical minimum” (February 2020)

*Alpha Orionis* red, was classified of magnitude “(1-)” by Ptolemy in 150 AD, and  $\alpha$  by Bayer(1603), it has a mean visual magnitude +0.45, it is a [semi-regular variable type C](#) with 1.2 and 5.9 years main periods; between Dec 2019 and March 2020 it dropped below +1.0, from May to July 2020



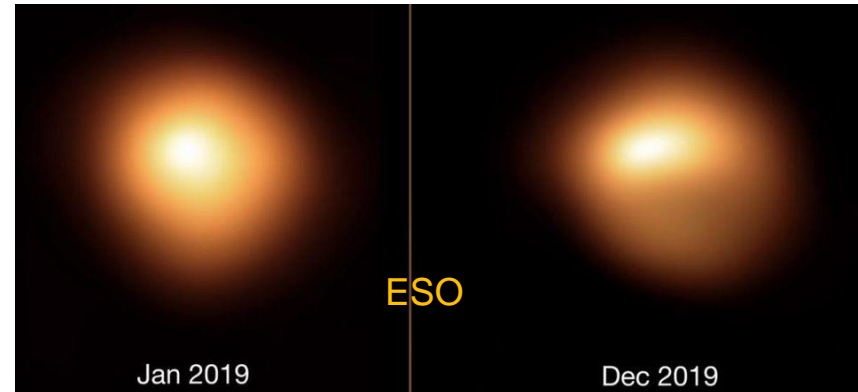
# Variability type SRC, naked eye and media coverage

Betelgeuse is a variable for the naked eye with airmass correction algorithm.

The new Betelgeuse's fading, at the beginning of its visibility season, is the occasion to introduce «lay» people to the NORMALITY of the stellar variability, but the news about an imminent explosion gained momentum last January. A Supernova onsets in a **free fall time (20-30 minutes for the nucleus)** not three months. SN1987A did not show any pre-explosion feature. Dupree, et al. issued a paper on 11 August ([arxiv](#), followed by several specialized media) on the dust cloud ejected by alf Ori. With the satellite Secchi/Stereo-A they measured also its magnitude in July ([ATel #13901](#)). Their measures are in agreement with ours (included from Australia & Brazil to 12 Jun and from 15 Jul).

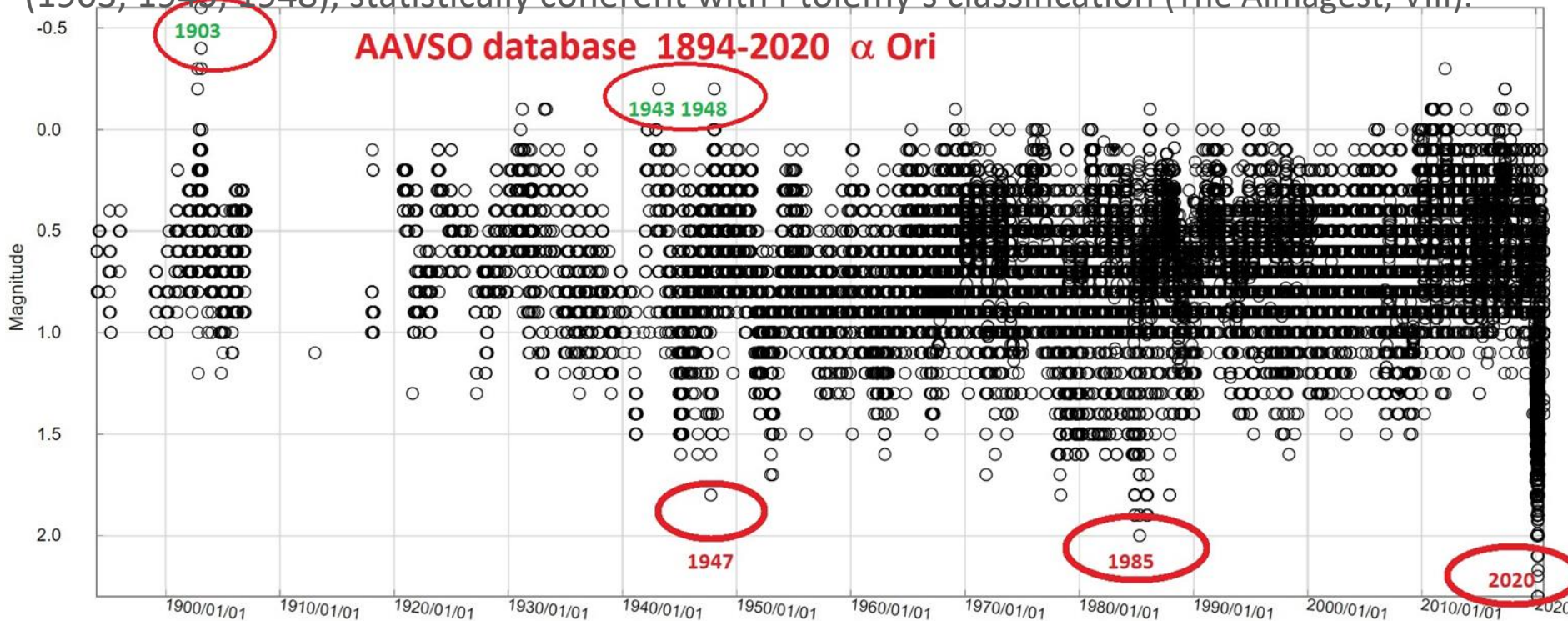
We ([ATel #13982](#)) claimed on August 30, a second dust cloud over the star still ongoing on September 6th, 2020.

Now the attention is focused on the dust ejections of the star along our line of sight.



# The AAVSO light curve of Betelgeuse

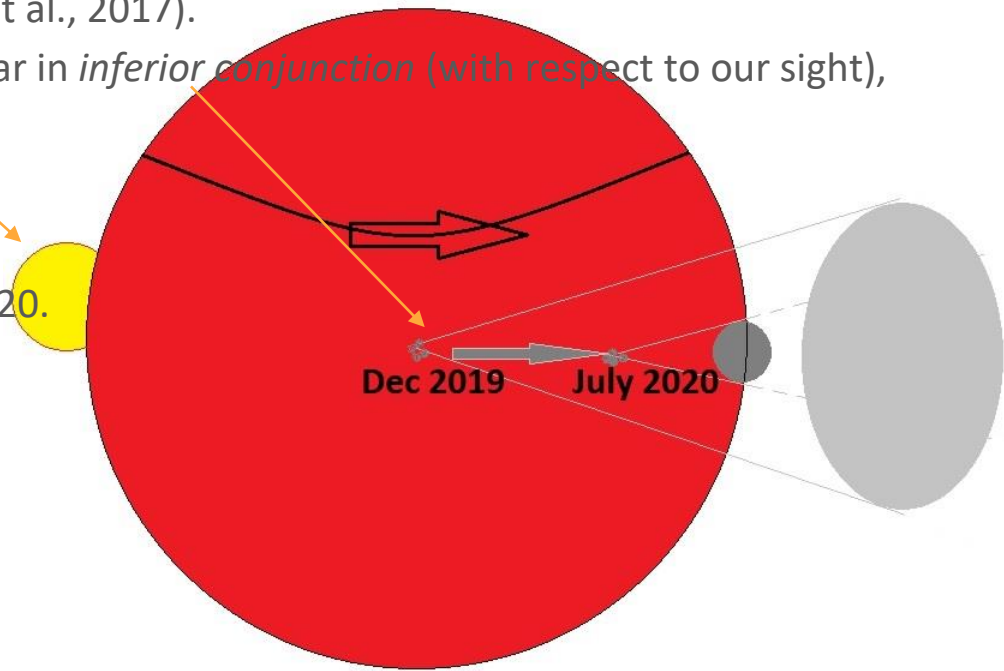
We follow visually Betelgeuse since many years (SGQ 2011, VOL 1978, AAX 2010, SRX 2019) and these dimming are not unique (AAVSO database). Beyond the modulant period of 5.9 years, there are data below visual magnitude +1.8 (1947, 1978, 1985...) and peaks brighter than -0.2 (1903, 1943, 1948), statistically coherent with Ptolemy's classification (The Almagest, VIII).



# Dust ejected in inferior conjunction (eclipse) or superior (brightening)

The eclipses are made by dust clouds (Dupree et al. 2020). Since December 2019 the clouds have been two, and the second is passing now (July-September 2020) onto the star's line of sight. This new cloud should fade for dispersion and tangential motion, and the present maximum luminosity (+0.4 mag) of Betelgeuse should be recovered by end of September 2020 (without new clouds). The tangential motion is larger than the rotation velocity 15 km/s (the circular orbital velocity is 60 km/s at 5 AU photospheric radius, with a 20 solar masses star, Craig Wheeler et al., 2017).

The two dust clouds have been ejected from the star in *inferior conjunction* (with respect to our sight), when the expulsion is in *superior conjunction*, the total luminosity increases by back scattering. Both effects, when in phase with pulsation minima, or maxima, enhance them, as in 1903, 1985 and 2020.



**References** [A. K. Dupree, et al.](#) arxiv2008.04945 (2020)

[J. Craig Wheeler, et al.](#) MNRAS **465**, 2654-61 (2017)

[C. Sigismondi, et al.](#) Gerbertus **13** 69-72 (2020)

C. Sigismondi, et al. [ATel #13982](#) (2020)

[www.aavso.org](#) database (2020).