Possible upcoming return of the chi Cygnids in September 2020

P. Jenniskens

SETI Institute, 189 Bernardo Ave, Mountain View, CA 94043, USA.
pjenniskens@seti.org

In late August 2020, a cluster of meteor radiants was detected by CAMS stations in Australia, South Africa, Namibia and Chile consistent with the return of the chi Cygnid meteor shower (IAU #757). If so, that shower may be ongoing and be an interesting target for observations in the coming month of September. The shower was last seen in 2015, when it peaked in mid and late September.

1 Introduction

In the night of August 20–21, 2020, the CAMS low-light video surveillance networks in Australia, South Africa, Namibia and Chile recorded an outburst of slow meteors from a compact radiant located between the constellations Delphinus and Aquila (Jenniskens et al., 2020). The CAMS automated software identified this shower as the chi Cygnids (IAU 757), first detected by CAMS in 2015 during the period September 14–25 (Jenniskens, 2015; Roggemans et al., 2016; Koukal et al., 2016).

2 Methods

The Cameras for Allsky Meteor Surveillance (CAMS) project triangulates the trajectories of visible +5 to -5 magnitude meteors recorded in different networks of camera stations spread over the globe in order to calculate their radiant and speed. Each day, over a thousand radiant positions are measured which are displayed at the website[1].

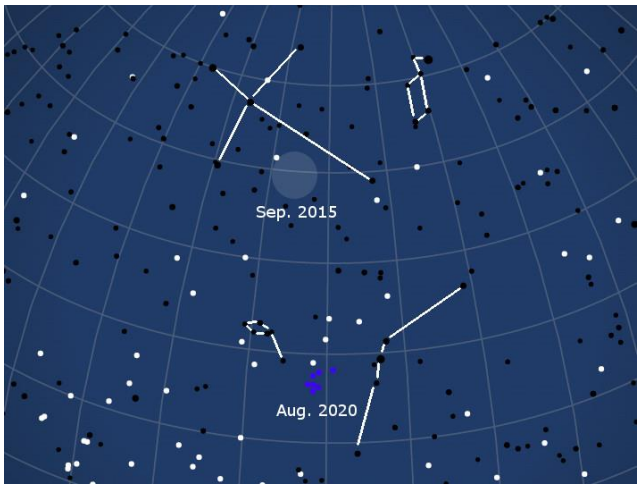

Figure 1 – Blue points mark the radiant of meteors identified as chi Cygnids in CAMS data of August 21, 2020, plotted in sun-centered ecliptic coordinates. White points are sporadic meteors. The radiant position of the shower in mid September 2015 is shown as a light circle.

Each radiant and speed are compared to a look-up table of past identified showers to obtain its shower association, which are shown by colors representing speed (red is fast, blue is slow).

3 A possible chi Cygnid shower in 2020

The outburst of possible chi Cygnids can be seen as a blue cluster in the map after selecting the date of Aug. 21, 2020 (*Figure 1*). The map covers the solar longitude interval 147.59–148.55 degrees (equinox J2000.0). The geocentric radiant was at R.A. = 304.7 ± 1.0 deg, Decl. = +8.5 ± 1.0 deg, and meteors had a slow speed v_g = 17.0 ± 0.4 km/s. The 8 measured orbits have median orbital elements a = 2.95 ± 0.17 AU, q = 0.830 ± 0.008 AU, e = 0.716 ± 0.017, i = 12.7 ± 0.6 deg, ω = 235.3 ± 1.3 deg, and Ω = 148.0 ± 0.3 deg. The longitude of perihelion of the median orbit is Π = 23.5 ± 1.3 deg.

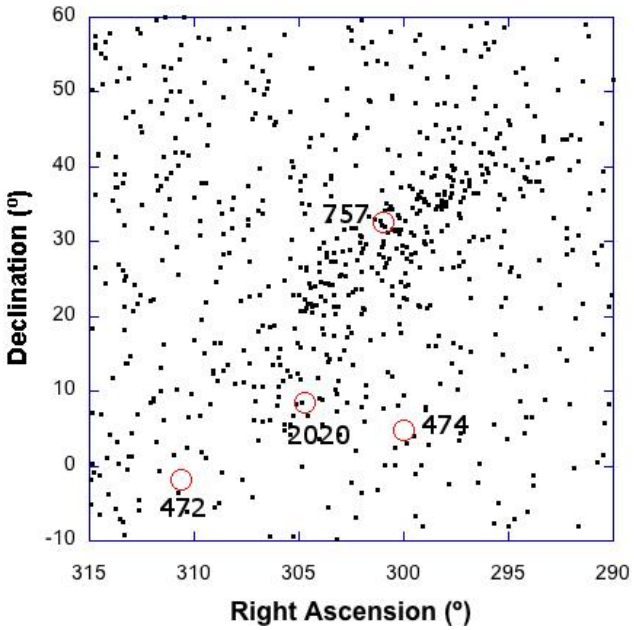

Figure 2 – 2015 chi Cygnids. The radiant position of all meteors observed from August 15 to October 2, 2015. The circle with label "757" marks the median orbit of the chi Cygnids. Showers 472 and 474 are discussed in the text.

[1] http://cams.seti.org/FDL/

Table 1 – Radiant and orbit of showers discussed here.

	$\lambda_\odot$ (°, J2000)	α_g (°)	δ_g (°)	v_g km/s	q AU	e	i (°)	ω (°)	Ω (°)	Π (°)	References
2020 shower	148	304.7	8.5	17	0.83	0.716	12.7	235.3	148	23.3	Jenniskens (2020)
757 CCY	171.6	301	32.6	15.1	0.949	0.655	18.6	209.9	171.6	21.5	Jenniskens (2015)
474 ABA	148.7	300	4.7	15.1	0.872	0.701	10.2	228.1	148.7	16.8	Rudawska & Jenniskens (2014)
472 ATA	147.3	310.6	-1.8	15.9	0.79	0.648	7.4	243.5	147.3	30.8	Rudawska & Jenniskens (2014)

Looking back at previous dates, the shower was first detected on August 18 (4 meteors) and one or two meteors were identified in the period August 19–22. The meteors are at higher ecliptic latitude and have a different longitude of perihelion than the late alpha Capricornids (labeled as shower 692). The map of August 18 shows both showers.

4 Discussion

At first sight, the association with the Chi Cygnids (CCY, IAU#757) is not obvious. The median orbit of this shower has a much higher inclination of $i = 18.6 \pm 1.6$ deg with a radiant in the constellation Cygnus (*Table 1*, *Figure 1*). *Figure 2* is a graph showing all CAMS detected radiants in that part of the sky between August 15 and October 2, 2015. The 2020 meteors had a radiant position below the main of the chi Cygnid shower, but in what appears a faint onset of the main cluster at lower latitudes.

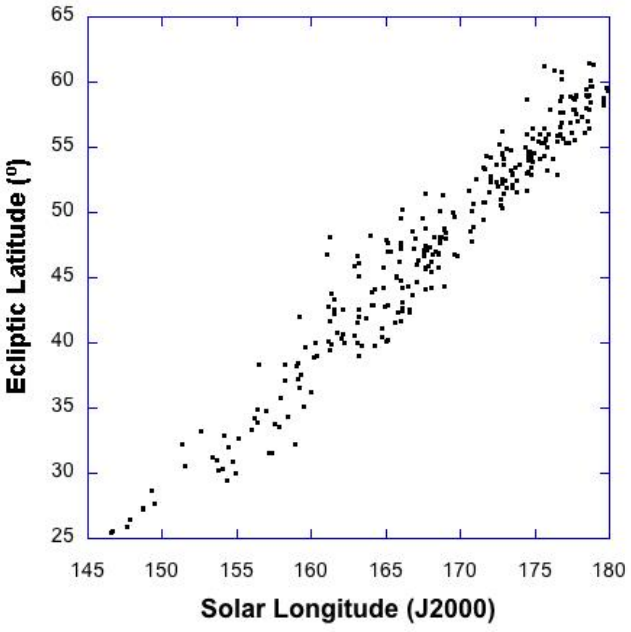

Figure 3 – 2015 Chi Cygnid meteors.

Indeed, the median orbit is not representative for the shower as a whole and the early detection of the shower in Aquila/Delphinus in 2020 does appear to be the return of the chi Cygnids. The chi Cygnids in 2015 had a moving radiant that changed a lot over the activity period throughout September. *Figure 3* shows the Sun-centered latitude of the radiant as a function of solar longitude. The shower was first detected at solar longitude 147º, when the ecliptic radiant latitude was 26º. The 2020 meteors had an ecliptic latitude of 27.1 ± 1.1º, in good agreement. The Sun-centered ecliptic longitude was 161.7 ± 0.9º for the 2020 shower and 161.8º for the 2015 chi Cygnids.

The 2020 shower has the same longitude of perihelion as that of the chi Cygnids ($\Pi = 21.5 \pm 1.9$ deg.). Nearby (now removed) showers 472 (August theta Aquilids) and 474 (August beta Aquariids) do not: 474 has a lower Π, 472 a higher value (*Table 1*). Especially shower 474 has a radiant that is not so far from that of the observed meteors. However, the radiant and speed are significantly off from those of the radiant cluster (*Figure 2*). They were detected in a D-criterion search in an early CAMS sample (Rudawska and Jenniskens, 2014; Kornos et al., 2014). Both showers are currently in the List of Removed Showers, after we found that the showers were not recognized as a density cluster when more data became available (Jenniskens et al., 2016).

It will be interesting to see what happens the coming month. If we are now seeing the beginning of shower 757, we might expect more of these meteors the coming weeks and the radiant will gradually shift north into Cygnus, peaking in mid and late September. Based on their orbital elements, the meteoroids appear to originate from an unknown Jupiter Family comet and the observations of the stream may assist in identifying the parent body.

Acknowledgments

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