

THE MISUNDERSTOOD COMET: THE CURIOUS HISTORY OF COMET C/1618 V1

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Abstract: Among the three comets that appeared in rapid succession between August 1618 and January 1619, comet C/1618 V1 stands out as a particularly intriguing object. Its appearance was overshadowed by the very bright comet C/1618 W1, which emerged soon after C/1618 V1's discovery. As a result, relatively few observations of C/1618 V1 were published, with a few of them even attributed to C/1618 W1, which was a much brighter comet. The confusion was further compounded by the concurrent use of both the Julian and Gregorian calendars. Due to the scarce observational material, it took until 1985 for a rough orbit to be published. Here we critically assess the available observations and show that the comet was moving in a decidedly different orbit than indicated in 1985. Based mainly on observations by Jesuits carried out from India we show that the comet is a member of the Kreutz group of sungrazing comets.

Keywords: comets, orbits, C/1618 V1, Kreutz group

1 INTRODUCTION

Shortly after the beginning of the 30 Years' War in May 1618, three comets were seen in rapid succession in the Northern Hemisphere. While the first comet, which was seen in summer (C/1618 Q1), was not very conspicuous, the third one proved to be an impressive, bright object with a long tail. This comet (C/1618 W1) became visible in the morning sky at the end of November and was observed until January 1619. Interestingly, another, much more elusive comet became visible in early November, C/1618 V1. This comet was mostly seen only by its tail as the head of the comet remained hidden below the horizon. A few Southern Hemisphere observers, however, were able to observe the head of the comet. Of course, this comet was soon overshadowed by the comet that followed.

Because much of Europe experienced poor weather throughout November, many observers thought that C/1618 W1 was simply the same comet whose tail they had observed earlier in the month. As a result, it remained unclear whether two distinct comets had appeared during that period. This confusion led many contemporary tracts on the brighter comet to incorporate observations that in fact belonged to both objects. Later analysts also had to cope with the fact that the Julian and Gregorian Calendars were still used side by side and only by careful comparison with indicated celestial situations was a firm decision possible about the used calendar.

C/1618 V1 remained a mysterious object. From the available observations either no or no reliable positions could be derived for the calculation of a reliable orbit. In 1985, Werner Landgraf (1985: 351–353), used a limited number of indirect observations, basically of the tail only, to derive a rough orbit for the first time. Unfortunately, as will be shown later, this orbit is incorrect. Not only did his orbit indicate that the comet was moving North, while it was actually moving South, it also failed to explain the impressive length of the tail.

This analysis intends to re-examine the available observations to derive an orbit that is compatible with all of them. If the reader is interested in the impact of the comets of 1618 upon the cultural, social, and political life of that era we refer to the recently published *Cosmic Events - The Three Comets of 1618* by Clifford J. Cunningham (ed., 2026). Of the multitude of published contemporary treatises on these comets we concentrate here on sources which supply information which can help to improve the orbit of this comet.

2 THE OBSERVATIONS

The identification of observations which belong to this comet is complicated by several circumstances. First, many of the contemporary authors still used the Julian Calendar, even though the Gregorian Calendar had been in place since October 1582. This led to confusion for later analysts since two comets were fairly close to each other in the sky and there was a

danger that observations could be wrongly attributed. To avoid this confusion, we add the Gregorian date in brackets when the Julian Calendar was used. Second, large parts of Europe were plagued with bad weather. It is a common theme among the tracts on comet C/1618 W1, that the comet was first seen after a long spell of bad weather. Those who reported observations of C/1618 V1 in early November, said that their observations were interrupted by a period of bad weather. When the weather improved towards the end of November, C/1618 W1 was visible, and it was only logical that they drew a connection between the sightings of early November and the bright comet later that month.

Among the multitude of tracts published on C/1618 W1, only about a handful contain mentions of C/1618 V1. Most of these mentions are more like rumors or hear-say. Interestingly, there exist mentions of a comet's tail seen already at the end of October or early November. Paul Hintzsch (1582–1633), probably from Leipzig, Germany, was prompted to look for the comet as he was

... informed by several people that in October prior to sunrise a long ray was seen, which had the shape of a Turkish saber near the horizon, in the East. ([Hintzsch, 1619: B3r](#)).

It must be noted that October could also mean early November if the Julian Calendar was used. Benjamin Ursinus (1587–1633), Berlin, Germany, wrote that

... from 30 October [9 November], it has been reported from Cologne that a comet with a very long tail was seen in the north-east but not for a long time. ([Ursinus, 1619: B1r](#)).

In general, it can be said that the comet was noted around 9–15 November for the first time. The Franciscan father Gregorio de San Esteban was in the Maluku Islands in 1618 and said:

On the ninth day of the month of November of this year 1618, on Friday, at four in the morning, a comet appeared in the east above these Molucca Islands ... It was shaped like a very great palm-branch, whose end tapered off toward the northeast. Its color was whitish, without any mixture of another color. Its origin was a small star that could scarcely be distinguished. Its length, in our Estimation, was about eight or ten picas/pikes. It lasted for the space of a month and a half, three days more or less. During the time it lasted, its course gradually drew southward. ([De San Esteban, 1618: 53v–54r](#)).

The Spanish ambassador to Persia, García de Silva Figueroa, while in Ispahan (now Isfahan, Iran), said that servants apparently saw the comet on the morning of 10 November. He then decided to get up before the sunrise on 11 and 12 November, to view the comet by himself.

It did not have the same brilliance that one sees in other comets, but its color was dark and ashen, resembling somewhat that which one sees in the smoke of good cannon powder, or in very light ash. It represented in its shape a Turkish scimitar, strongly curved toward the point, and wider, but much narrower toward the hilt. At that end one could see the matter from which the comet drew its nourishment, and on the side where it leaned, one saw the first night small flames of fire emerging from time to time. From one of the ends, which was toward the East, it kept widening more and more, until it remained very wide and curved toward the point, appearing thus like the shoot of a palm tree, which throws its leaves backward. It occupied the greater part of the signs of Virgo, Libra, and Scorpio ... ([De Silva Figueroa, 1667: 272–273](#)).

Another of the earliest observations comes from the Tūzuk-I-Jahāngīrī, which is the memoir of Emperor Jahāngīr I:

On Saturday, the 18th (Ābān), the camp was at Rāmgarh. For some nights before this there appeared, at three gharīs before sunrise, in the atmosphere, a (luminous) vapour in the shape of a pillar. At each succeeding night it rose a gharī earlier. When it assumed its full form, it took the shape of a spear (ḥarba), thin at the two ends, and thick in the middle. It was curved like a sickle, and had its back to the south, and its face to the north. ([Rogers and Beveridge, 2003: 48](#)).

The date corresponds to Friday, 9 November. Already from these three early reports several interesting characteristics of the comet can be derived: It had a very conspicuous tail, shaped like a palm leaf or branch, wider in the middle and narrower at both ends. It was curved and the head was not very conspicuous.

In the days that followed, the comet was observed across wider areas of Europe and Asia, with observers at more Southerly latitudes having clearer and more favorable views.

The Philippine Islands: 1493-1898 is a 55-volume series detailing the history of the Philippines through the use of books and manuscripts. Volume 18 contains an account by an anonymous author, written on 12 July 1619,

from Manila and said that on the morning of 11 [21] November:

... a comet was seen ... It had a tail, was silver-colored, with a slightly ashen tinge, and had an extraordinary form. At first it was like a trumpet, and then like a catan, with the edge toward the southwest; and at the end it appeared palm-shaped. (Blair and Robertson, 1904: 224, 227).

The writer added that "... its length was equal to the whole of the sign of Libra, with which it rose." (Blair and Robertson, 1904: 227). He continued, that

... eight days afterward the declination of the southwestern end was twenty-four degrees and thirty minutes south. At this time the head was thirty-one degrees south, and the lower point, or end of the tail, eight degrees from the star called Spica Virginis. (Blair and Robertson, 1904: *ibid.*).

The account says that no ... "star exhalation ..." was seen (Blair and Robertson, 1904: *ibid.*), while others said it was a very small one. As will be shown later the dates are probably for the Julian calendar, which would mean that the dates are 21 and 29 November, respectively.

The first reports from Europe followed not much later. Observers from more Northern latitudes saw only the tail in the morning sky. A typical example of such a report is the one by Joachim Frolichius (1580–1626), from Güstrow, Germany. He said:

At the beginning of November, I have first seen the rays or the tail of this star and concluded from it that it must be a comet, which I finally saw on the 16th [26th], but could not observe it properly due to damp air until I finally was able to observe it on 26 November [6 December] ... (Frolichius, 1618: D2v).

The latter two observations refer already to Comet C/1618 W1.

Another of the few reports from Northern Europe with more descriptive information comes from Johann Hoppener, about whom not much is known except that he was a student of mathematics in Rostock, Germany.

I saw it first not before 3 [13] November. As here word was spread, that a new star with a long tail was seen, I went in the morning at half past 6 to see the new star and I found it towards the south-south-east not far from the horizon 5 degrees from Mercury. But since the next day a foggy and rainy weather came that almost persisted for 14 days, I saw it again

not earlier than on November 18 [28], when it had risen already quite far in height, from the south through the zodiac towards north. (Hoppener, 1618: B3r).

The comet he saw on 28 November was C/1618 W1. This report also explains why, at least from Germany, in most cases only one comet was recognized: after the few sightings of the tail in early November, bad weather arrived and when it cleared again, the bright comet C/1618 W1 was in the same region of the sky, leading to the assumption it was the same comet.

Another quite extensive report comes from astronomer and mathematician Michael Mästlin (1550–1631). Mästlin prepared a treatise on the comet of 1618, that was never published; the manuscript is now preserved at Württembergische Landesbibliothek Stuttgart, Germany, and has recently been transcribed and analyzed by Granada and Boner (2022). While the treatise focused on the bright comet C/1618 W1, Mästlin also mentions the other two comets of 1618. For C/1618 V1 he says

Also, in the month of November, every morning at 4 or 3 o'clock, a shimmering brightness was seen from the south, stretching high above, but bent slightly like a horn. Whether this shine, like many want, is to be called a comet, I leave it to those who saw it, since it was never seen completely from our lands as its beginning, *caput* or comet-star never came above our horizon. (Mästlin, 1619: 4–5).

He then goes on to say that, if it was a comet, its tail must have been curved, since it deviated from the anti-solar direction. On 19 and 20 November and several days thereafter, the tail crossed the stars of Corvus up to the ecliptic in Virgo and after 26 November through the stars of Crater. He also notes that the tail brightness was not uniform. Still using the Julian calendar, he adds:

When it started to shine, I could not tell. From trustworthy people I hear that they have seen it already on 7 [17] November. Likewise, when it vanished is uncertain. I saw it from 10 [20] November every morning as the sky was clear until 25 November [5 December] and saw it becoming weaker. (Mästlin, 1619: 6).

More Southerly observers had better viewing and weather conditions and provided reports which contain much more helpful information. The Jesuit astronomer and mathematician Giuseppe Biancani (1566–1624) observed a ray or beam in the morning sky from the Roman College in Italy. He saw it first on 18 November

after he had heard about it:

Therefore, in the year 1618, on the 18th day of November—as the astronomical disputation of our Society's Roman College relates—an enormous beam shone upon the world before dawn, occupying 40 degrees in the sky. It persisted for 11 days, during which it advanced by its own proper motion nearly 24 degrees, from Crater to the heart of Hydra.

From this it further seems to follow that beams of this sort are very closely related to comets and clearly belong to astronomical study, since they move at lofty heights and persist for a long time, and are driven not only by daily motion but also by their own proper motion and finally have a form not unlike comets. For when I saw it on the morning of November 29th, extended toward the south and close to the horizon, it seemed to me like the great tail of another comet; for just shortly before I had seen a new comet, of which I shall speak presently. Thus, beams of this kind wholly imitate the nature of comets. (Biancani, 1620: 188).

This report is very important as it clearly demonstrates that the observer never saw the head of the comet. He was not even convinced that it was a comet at all! The new comet which he mentions in the last sentences is C/1618 W1.

Antonio Luciano, a mathematician from Valencia, Spain, published a treatise on the two comets of 1618. He wrote:

After it was known from the relation of credible persons that on Monday the 12th day of the month of November of this present year 1618, two or three hours before sunrise, there had been seen toward the East, a radiance, or resplendent cloud, like a piece of the arc that in this place they call Saint Martin's, or in the manner of a palm. Thursday the 15th of said month I observed its beginning to be near the stars of the Tail of Hydra, in the first degree of Scorpio, 12 degrees 20 minutes of southern latitude, and its end and terminus (which many have judged to be the beginning, because it rose first) near the stars of the wing of Corvus, with 13 degrees of southern latitude. It was also observed on this day that it could be distinguished in the tail with a length of 30 degrees, more or less. It moves with its own motion: because on the 25th of the same month, it was observed that its beginning was at 14 degrees of the sign of Libra, and 25 degrees 20 minutes of southern latitude,

and its end and terminus was found at 7 degrees, 20 minutes of the sign of Virgo, and 27 degrees also of southern latitude. And according to the magnitude that was observed on the 15th, it is evident it has grown, for on this day of the 25th it had 40 degrees, notwithstanding that according to the density, light, and radiance, it is manifestly seen that it has diminished. (Luciano, 1618: 1–2).

The importance of Luciano's treatise is that he gives actual positions for the comet and notes that the tail grew during his observation period while the overall appearance decreased in magnitude. The title image of his treatise (see Figure 1) shows representations of Comet C/1618 V1 and C/1618 W1.

Another observer from Spain was Bartolomé del Valle, a physician, master of arts and philosophy, who served as a Professor and Chair for Astrology at the University of Salamanca. In 1619 he published a mostly astrological treatise on C/1618 V1 and W1, which also contained positions of the comet, probably obtained from Granada. The text and the numerical values he provides are in places quite confusing, and it cannot be ruled out that typographical or printing errors are present, as well as possible confusion between terms such as latitude and longitude. Also, it includes an image of both comets side by side in a nearly realistic situation (Figure 2). Del Valle obtained his first observation on 14 November in the Southeast. Further observations were apparently made on 25 November and 7 December. For all the dates he gives several coordinates in different coordinate systems. (Del Valle, 1619: A3v–A4v). A summary of his usable coordinates is given in Table 1.

The Jesuit mathematician, astronomer and architect Orazio Grassi (1583–1654) observed the comet from Rome, Italy, and wrote:

On the 18th day of November, moreover, between sunrise and noon, another new fire appeared, belonging to the group they call *Xiphias*, shaped like a sword. It was indeed of very slight brightness, but of such great size that it occupied a visual angle of about 40 degrees.

And although on the first day it was seen by us it was threatening the stars of Crater at very close range, later, on the 29th of November, it was not far from seeming to pierce the very heart of Hydra with its point. The lower part of it, which had previously reached the shoulders of Centaurus, was then seen under the triangle of Hydra; from which it resulted that by its own motion, within the span of eleven days, it traversed nearly 24 de-



Figure 1 (above): Depiction of comets C/1618 V1 (left) and C/1618 W1 (Luciano, 1618). The difference in their appearance regarding tail and head is clearly visible.



Figure 2 (right): Depiction of comets C/1618 V1 (right) and C/1618 W1 (left) over the Spanish Sierra Nevada (Del Valle, 1619). The situation might be based on actual observations, probably around 27 November 1618.

Table 1: Positions of Comet C/1618 VI derived from observers based in Spain.

Date (UT) 1618	RA (2000.0) h m	Dec (2000.0) ° ' "	Observer	Location	Notes
Nov 14.25	14 01.0	−20 39	Del Valle	Granada/Spain	
15.24	13 58.0	−24 15	Luciano	Valencia/Spain	
25.25	13 06.5	−34 40	Luciano	Valencia/Spain	adjusted
Dec 07.25	11 40.7	−43 32	Del Valle	Granada/Spain	adjusted

grees. (Grassi, 1619: 6).

He also gave a visual representation of the observations as shown in Figure 3. Here it is apparent that the comet is pictured as a tail only, with no distinctive head. Figure 4 shows another depiction of the long tail with apparently no head.

Another observer of the comet was Johannes Kepler (1571–1630), who saw the comet from Linz, Austria. In his book *De Cometi Libelli Tres* of 1619 he gave an overview of his and others' observations. He begins by saying that C/1618 V1 and C/1618 W1 were often confused with one another and that he suspects that both were split off from one another. He then says that apparently the first report belonging to this comet came from Silesia, Poland, where on "November 10, at 4 hours after midnight ... a fiery meteor in the shape of an ostrich feather, that is curved ..." was seen. (Kepler, 1963: 180). He then continues:

At Rome indeed on November 11 a fiery beam was seen toward the East; the

words of the Observer are added: "In the form of a slightly curved beam in more accurate observation, which was made on November 10, from hour 16 min. 20 up to hour 18 min. 40." Which I understand about hours from noon on day 10, so that it was in the morning of day 11 in the astronomical manner expressed: he calls it a comet according to the common perception, with a huge tail on the side; namely it had extended its tail toward the right side.

He says the extremity toward the horizon was gathered into the form of a handle, not however brighter than the rest of the body, nor distinguished by any star, namely because the star itself was hidden under the rays of the Sun. At the other extremity, he says, it touched the autumnal intersection, and around 18° Libra it deflected from the Ecliptic to the south by 15°. (Kepler, 1963: 180).

Kepler saw the comet by himself first on 20

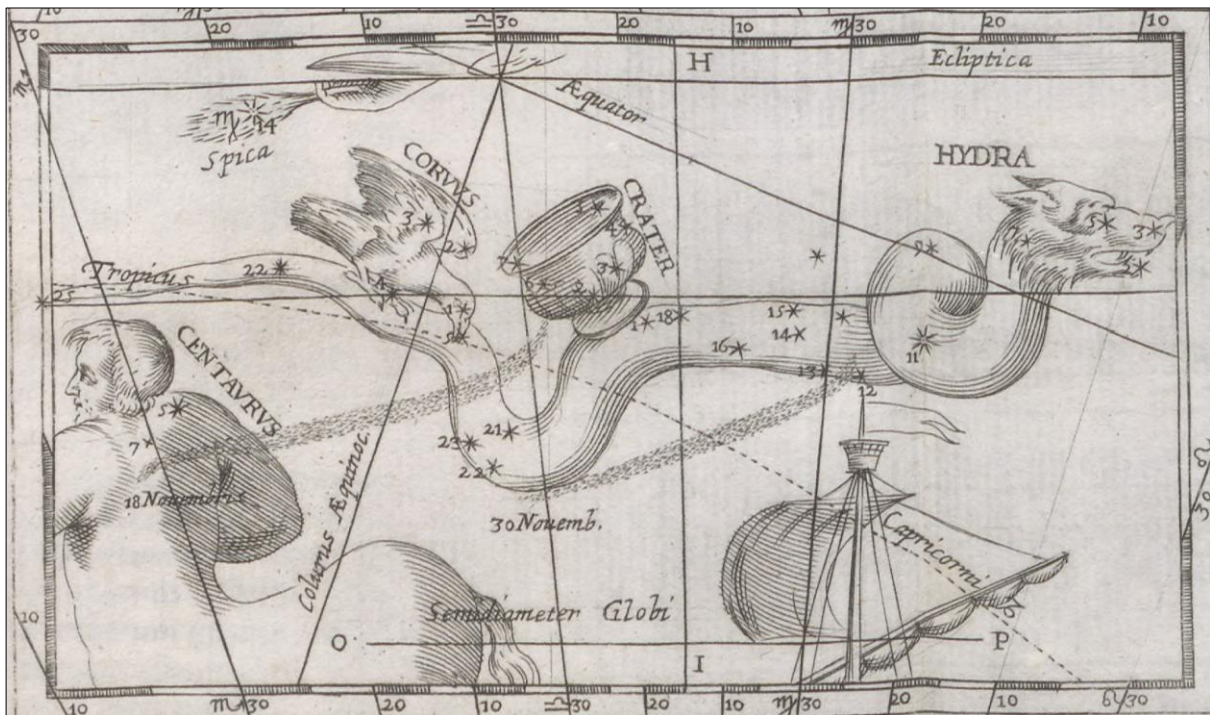


Figure 3: Depiction of the tail of Comet C/1618 V1 on 18 and 30 November 1618 (Grassi, 1619; courtesy: The Linda Hall Library of Science, Engineering & Technology).

November:

For in this way the observations of both places confirm my Linz ones: When on November 10/20, after long-lasting rains with serenity restored, I at Linz, and those who were traveling on horseback a few miles from here at dawn, noticed a certain milky, bright, curved tract, and raised a report: there came forth from the suburban estates farmers who said they had already noticed the same splendor for eight days and more in the same region

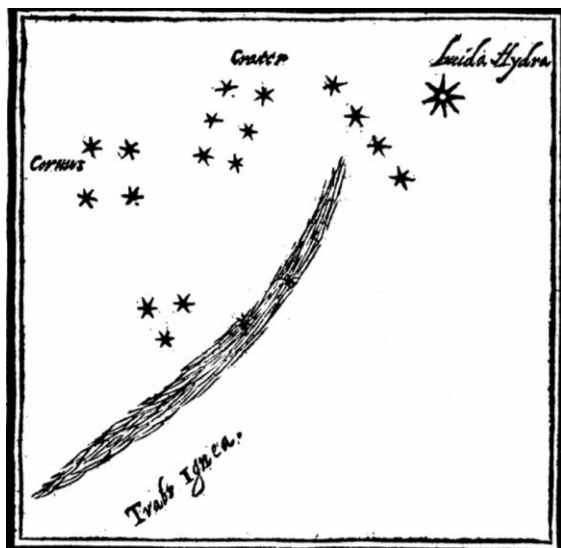


Figure 4: Depiction of Comet C/1618 V1 around 28 November 1618. The tail has a length of about 40° (after Calicrate, 1619: 3).

of the sky at the same hour of night. (Kepler, 1963: 181).

He then gives details of his own observations. On 20 November, 5:30 in the morning, ... a very bright tract, full and milky, was observed very close below the stars in the quadrilateral of Corvus, whose extremity was curved upward, ending as it were in the middle of Crater. These made it credible that they were the rays of some comet, because they went out from the dawn, and thus were directed toward the part turned away from the Sun, as the hairs of all comets usually do. (Kepler, 1963: 182).

On 21 November, he saw the tail of the comet rising already at 2:30 in the morning, and at 6:00 the tail was vanishing in the brightening of dawn. He said that the tail was longer than the day before, curved, more diluted and broader. He next saw it on 23 November, between openings in the clouds, as having moved more Southerly. Again, he says that dawn prevented them seeing the head of the comet. His next observation came on 27 November. He then described the tail as very sensitive to the increasing brightness of the dawn, as between 5:30 and 6:00 the visibility of the still curved tail degraded considerably. On 29 November Kepler says he saw both comets, which is a very rare comment in contemporary publications. This was also the last time he saw the tail, which appeared "... very diluted, and not equal-

central Hydra, but continued to diminish steadily in size, color, and clarity. By 17 December it had become nearly indistinguishable from the Milky Way itself, and by 21 December it seemed to have vanished completely into the background stars. Despite clear skies on 24 December, no trace could be found, and by 25 December the phenomenon was confirmed to have disappeared after more than five weeks of observation. Interestingly, the Korean record is among the few sources that document observations of both C/1618 V1 and C/1618 W1 on several mornings from 26 November through 15 December. The only interval in which both were not recorded coincides with the period of bright moonlight from 28 November to 7 December, when only C/1618 W1 was observed—underscoring the much fainter and more tenuous nature of C/1618 V1 (Joseon Wangjo Sillok, 2025: vol. 132–134).

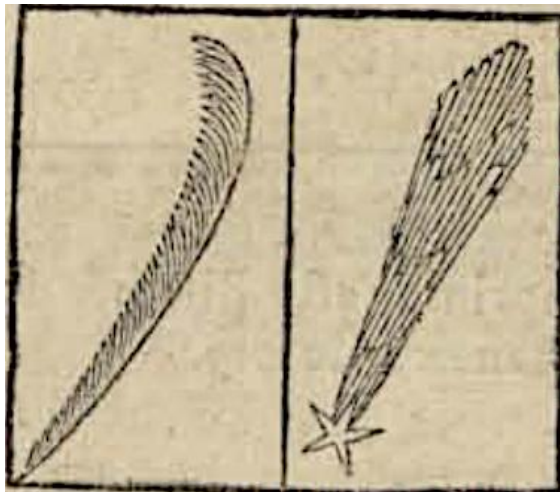


Figure 6: Depiction of Comets C/1618 V1 (left) and C/1618 W1 (after Mexia, 1619). Again, the very different appearance of both comets can be seen. C/1618 V1 has a long and curved tail and almost no head, while the tail of C/1618 W1 is straight and a prominent head is indicated by a large star.

The *Đại Việt sử ký toàn thư*, an official history of Vietnam from the seventeenth century, includes a very interesting description for this comet:

During the last decade of the ninth month (of the nineteenth year of the Hoang-dinh reign-period) (7 November to 16 November 1618) a 'black star' was seen during the dan double-hour (03.00 to 05.00 hours) at the south, measuring over ten feet in length. (Ho, 1964: 133).

From the above observations it seems apparent that the comet was mostly seen as a tail, curved and as long as about 40°–50° and with no distinctive head (Figure 6). The tail lengths from the Korean observations are more than twice that value and seem doubtful. The head

was often so close to the horizon that it was not possible to derive a position. However, observers from Southern Europe, like Luciano and Del Valle, had an advantage as the comet was situated more favorably. Luckily, there exist reports from even lower latitudes which indeed give positional information.

The most important source for observations of Comet C/1618 V1 is the treatise *Observationes Cometarum Anni 1616* (sic!) by Jesuit missionary and astronomer Wenzel Pantaleon Kirwitzer (1588–1626). Kirwitzer and other Jesuits set sail from Lisbon on 17 April 1618 to Goa, India, where they arrived on 4 October. Shortly afterward the Jesuits were greeted by two large and bright comets that are recorded in the above-mentioned treatise. Details about the observing locations, the instruments and other circumstances can be found in Kapoor (2016: 264–297):

In the year 1618, on the 10th of November, a report spread among the people and reached us that in the early morning hours the sky had flared up with great brightness. Some of the more prudent immediately suspected that it was a comet and asked us to devote the following day to observing the stars and to explain what the phenomenon might be. That day still had all of us gathered at Goa, we who that year had arrived from Portugal to India. And by order from our superiors, we were to depart that same evening for various places. Therefore, having entrusted the task to one another, we separated, each of us to investigate this new phenomenon in whatever way he was best able, since instruments were lacking, and afterward to bring all our observations together. (Kirwitzer, 1620: 5).

Information about Comet C/1618 V1 derived from Kirwitzer is summarized in Table 2, but what follows here are observations carried out by different Jesuits at different places around Goa and Kochi. The main observers were Jacobus (Giacomo) Rho (1593–1638), Johann Adam Schall von Bell (1592–1666), and Antonius Rubinus (Antonio Rubino) (1578–1643). Not much is known about the instruments employed. Kapoor said that probably astrolabes or cross-staffs were used and as can be seen from Kirwitzer's comment below, a telescope (i.e. "optical tube") also was employed. This is the earliest-known use of the telescope in India (Kapoor, 2019).

Meanwhile, Kirwitzer writes about attempts to observe the comets:

The 11th, 12th, and 13th days kept us in suspense, for in the morning hours the sky

Table 2: Positions of Comet C/1618 VI derived from Jesuit observers mentioned by Kirwitzer and located in India. The RA and Dec positions are epoch 2000.0. The Locations are given with their modern names. The Method is the type of position indication: *alt/az* means that heights and horizontal distances between stars and the comet were given, *dist* indicates that distances from at least two stars were given. The ecliptic latitude given for 30 November is a printing, writing or observation error, and should be around -35° .

Date (UT) 1618	RA (h m)	Dec ($^\circ$ ')	Location	Method	Tail ($^\circ$)	Notes
Nov 14.011	13 52.7	-21 28	Rachol	alt/az		
15.001	14 03.4	-26 16	Rachol	alt/az	~25	
16.005	13 56.6	-27 07	Rachol	alt/az		
16.985	13 44.3	-27 17	Rachol	alt/az	~35	
18.000	13 55.9	-25 16	Velha Goa	dist	29–30	Curved tail
18.016	13 53.5	-20 57	Rachol	alt/az	~35	
22.993	13 41.6	-32 20	Rachol	alt/az		
24.000	13 19.0	-33 54	Velha Goa	dist	39	
26.981	12 49.8	-35 26	Divar Island	alt/az		
27.001	12 59.6	-34 05	Divar Island	alt/az	37.5	Tail measured from Goa
27.976	12 38.7	-39 10	Divar Island	alt/az		
28.004	12 41.7	-38 01	Divar Island	alt/az	40	Tail measured from Goa
28.985	12 34.4	-37 13	Divar Island	alt/az		
29.002	12 44.9	-35 21	Divar Island	alt/az		
29.980	12 30.6	-39 48	Divar Island	alt/az		
30.004	12 26.9	-39 14	Divar Island	alt/az		(-45° ecliptic latitude)
Dec 17.940			Kochi			-57° ecliptic latitude
21.940			Velha Goa		44	located in Vela

was covered with thick clouds, and it showed us only a flickering glimpse of the comet. The only thing clearly noticed by all was that it grew more and more each day. Moreover, no star appeared in its head, which does not usually happen with other comets. But this error was corrected when an optical tube happened to be brought to us, through which we very clearly observed a small, hazy star in its head — and later, in the course of time, we often saw it throughout the comet as well.

The color of the comet was somewhat pale, leaning a little toward reddish. Its shape could not be better described than as a palm leaf, for it ran straight from the east into the middle of the sky, its extremity bending somewhat toward the north. (Kirwitzer, 1620: 6–7).

Beginning on 14 November, Kirwitzer gives positions, tail length indications and general descriptions of the comet. The Jesuits managed to observe the comet almost every day until 30 November. The measurements were basically azimuths and altitudes of a reference star and the comet. On two dates distances from different reference stars were given. These reference stars were taken from a star catalog by Jesuit Christoph Grienberger (1561–1636) that he published in 1612.

While the formal positional observations ceased on 30 November, the comet was still visible on 18 and 22 December, with the actual

observation dates in UT being 17.94 and 21.94 December:

From this day onward, because of the light of the Moon, this comet was so obscured that we were in no way able to observe it. Only Father Rubinus of Cochin writes that he observed its declination on December 18 and found it to be 57° degrees. For us it disappeared on the 22nd of the same month, after it had left the mast of Argo Navis a little behind it. Nothing else regarding this comet was observed by our members, except that Father Rubinus reports that its tail had grown to 44 degrees, whereas at the beginning it had been only 25 degrees. (Kirwitzer, 1620: 11).

It might be interesting to note that German astronomer and physician Heinrich Wilhelm Matthias Olbers (1758–1840) tried already in 1821 to derive an orbit from Kirwitzer's observations. He wrote:

These observations are partly so poor, partly so distorted by copyist's and printing errors, that it has been impossible for me to derive a tolerable orbit from them. Consequently, I have not yet published anything from my research, still hoping to obtain some further clarification on this comet. (Olbers, 1821: 475–478).

There might exist even more positions obtained by these Jesuits. Kirwitzer mentions that Schall von Bell started observing together with him from 26 November from Divar Island.

Table 3: Orbits for Comet C/1618 V1 discussed in the text. All orbits are parabolic ($e = 1$) and no perturbations were applied. The observations were treated as geocentric. The orbit in yellow is the new orbit for Comet C/1618 V1 and suggests membership of Subgroup II of the Kreutz Group.

Orbit	T [TT]	q (au)	ω (°)	Ω (°)	i (°)	Mean residual (°)	Notes
Orbit 1	1618-10-27.9	0.744	155.9	229.5	8.4	2	Landgraf (1985)
Orbit 2	1618-11-07.884	0.0147	86.91	6.22	148.50	2.0	unrestricted, all
Orbit 3	1618-11-07.906	0.0115	84.94	5.05	148.08	1.6	unrestricted, excl
Orbit 4	1618-11-08.065	0.0070	66.33	347.33	143.00	1.6	
C/1843 D1	1843-02-27.911	0.0055	82.64	3.53	144.35		Kreutz Subgroup I
C/1965 S1	1965-10-21.184	0.0078	69.05	346.99	141.86		Kreutz Subgroup II

These observations are not given in the treatise by Kirwitzer since he argued that they might be useless for Europeans as they refer to the stars of Crux and Centaurus whose positions were not well determined. Olbers hoped that Schall von Bell's observations might re-appear sometime in archives of the Vatican library, where they were sent by Schall von Bell.

3 THE NEW ORBIT

Table 2 gives the data obtained from Kirwitzer's treatise, converted to equatorial coordinates by the authors for the equinox 2000.0.

The times for the observations were determined by using the statements about the height of the main reference star for the respective observing location. It is apparent that the values are not progressing smoothly but exhibit rather large jumps in some cases. Even the double measurements taken one after another on 27–30 November show differences of up to 5°. Despite these uncertainties this series of positions shows a general movement towards the South.

Table 2 also includes two very important additional observations. Both are among the latest mentions concerning the visibility of the comet. The observation on 21.94 December is in fact the latest mention together with the final detection by the Korean observers. While neither gives a formal position, they can be used to confirm the accuracy of the derived orbit, as will be shown later.

Table 1 shows positions derived from other treatises, converted to equatorial coordinates for the equinox 2000.0. The second position from Luciano (25.25 November) was adjusted as a calculation error was suspected. Luciano gave ecliptic longitudes and latitudes. These fit for the first date (15 November) but are 7.5° away for the second date (25 November). On this date he said the comet was at ecliptic longitude $L = 194^\circ$ ("14° in Scorpio") and at ecliptic latitude $B = -25^\circ 20'$ (both are for the equinox of observation). While the B value fits the predicted position, L is off by 10°. We therefore adjusted L to 204° , i.e. 10° more, which gives a very good agreement with the new orbit within 1°. A similar adjustment was made for the 7

December observation by Del Valle. The ecliptic latitude was given as -31° and was adjusted by -10° .

The unrestricted orbital solution from the above observations shows a decidedly different orbit to the one by Landgraf, which is given for comparison as Orbit 1 in Table 3. This is not surprising, since Landgraf's orbit predicted the comet to move only slightly to the South and then slowly Northward. As already mentioned, Landgraf did neither mention nor use the observations by Kirwitzer nor the ones by Del Valle and Luciano. His derived positions are from extrapolated tail orientations, and single coordinates partly based on dates using the wrong calendar.

Orbit 2 in Table 3 lists the unrestricted solution. For the first two early observations we have given a third of the weight compared to the other observations as these were made in twilight and show large deviations in one of their co-ordinates. The mean error of the resulting orbit is about 2°. The observations which show the largest errors are Kirwitzer's observations of 14, 18, and 22 November, and the 14 November observation by Del Valle. We decided to set the cut-off for the exclusion to an individual residual of 5°, so we excluded the observations of 18.016 and 22.993 November and arrive at Orbit 3, which has a mean error of 1.5°. Residuals for the observations used for the different orbit determinations are listed in Table 4.

When looking at the orbital elements of the unrestricted Orbits 2 and 3, two things are apparent: First, the comet's perihelion distance was quite small. This differs markedly from Landgraf's orbit and neatly accounts for the exceptionally long tail lengths reported by observers. Second, the inclination of the orbit is around 145° – 150° . This value closely matches the typical value for Kreutz sungrazing comets. This group is named after German astronomer Heinrich Carl Friedrich Kreutz (1854–1907) who described this group in three publications between 1888 and 1901. Kreutz was not the first to suggest such a group, but he was the first to describe it in a long and detailed study which then led to the naming of this group after

him. In modern times the Kreutz group was extensively studied, especially by astronomers Brian G. Marsden (1937–2010) and Zdenek Sekanina. The latter published, and continues to publish, an extensive series of papers during the last 25 years investigating the characteristics of the group.

Kreutz sungrazing comets are among the most impressive comets that have been observed throughout history. This comet group is thought to have originated from a very large parent object that underwent successive break-ups during its perihelia. A few of the brightest comets are C/1843 D1 (Great March Comet), C/1882 R1 (Great September Comet), and C/1965 S1 (Ikeya-Seki). Until now nearly 1500 members of this group have been observed, with the majority as very small comets that were only observed by coronagraphs aboard spacecraft like SOLWIND, SOHO, and STEREO. However, it is suspected that quite a few of the historic comets for which no orbit has been calculated are also members of the Kreutz group. The main characteristic of these comets is the very small perihelion distance in a range of only 0.005 to 0.010 au and, especially for the bright objects observed from Earth, very long, slim and curved tails. The comets are prone to break-up or even disintegration and some of them were indeed observed after perihelion as so-called headless comets, where only the tail survived for a certain time after perihelion.

For our orbital solution, not only are the small perihelion distance and the inclination similar to that of a comet of the Kreutz group, but the values of the argument of perihelion (ω) and the longitude of the ascending node (Ω) also match those of a Kreutz-group comet exceptionally well! Moreover, the comet's observed behavior and morphology closely match those expected for such an object. For the refinement of the orbit we introduced some restrictions, for which we had two possibilities. The Kreutz group consists of at least two main subgroups, which have characteristic differences in the inclination and the perihelion distance. Subgroup I has perihelion distances usually below 0.006 au and a mean inclination of around 142° , while Subgroup II has perihelion distances around or larger than 0.007 au and a mean inclination of around 144° . However, it should be noted that the groups are not sharply defined, and transitional members or outliers do exist.

Our tests did not reveal a definite decision about what subgroup is more likely. Depending on the weighting and selection of the observations and the applied restrictions a membership in both groups could be forced. We finally de-

cided to only restrict the inclination to a value of 143° , roughly between the mean value for the two main subgroups. The resulting orbit is given in Table 3 as Orbit 4. The resulting values for argument of perihelion (ω) and the ascending node (Ω) agree almost perfectly with what would be expected for a comet of Subgroup II. For comparison, two examples of both subgroups with well-established orbits, C/1843 D1 (Great March Comet) and C/1965 S1 (Ikeya-Seki) are listed in Table 3 and the similarity with Subgroup II is easily recognizable.

Table 4: Residuals in degrees for the observations used for the orbit determination.

Date	dRA ($^\circ$)	dDec ($^\circ$)
Nov 14.011	−4.0	+2.5
14.250	−1.7	+3.6
15.001	+0.0	−1.3
15.240	−0.9	−0.1
16.005	−0.2	−1.2
16.985	−1.6	−0.5
18.000	+2.4	+2.5
18.016	(+1.9)	(+6.8)
22.993	(+5.3)	(−0.0)
24.000	+1.7	−0.7
25.250	+0.7	−0.3
26.981	−0.6	+0.5
27.001	+1.4	+1.8
27.976	−1.5	−2.4
28.004	−0.9	−1.2
28.985	−1.1	+0.4
29.002	+1.0	+2.3
29.980	−0.5	−1.3
30.004	−1.2	−0.7
Dec 07.259	+0.3	+0.6

According to a personal communication from Sekanina ([per. comm., 2025](#)) the temporal difference between the suspected sungrazer of 1702 (X/1702 D1) and C/1618 V1 is within a few months equal to the temporal difference between comets C/1882 R1 and C/1965 S1. As X/1702 is suspected of belonging to Subgroup II, it might be a supporting argument for adopting this solution, assuming a similar history of splitting and separation.

A Kreutz-type orbit also has the advantage that the comet would have been hardly visible pre-perihelion (as discussed below), while at the same time providing an excellent fit to the final observations from India. For 17.94 December the comet was seen at an ecliptic latitude of -57° (apparent), while the orbit would put it at -55.4° , and on 21.94 December the comet is said to have “... left the mast of Argo Navis a little behind.” Argo Navis is a former constellation that consists of the modern constellations Puppis, Carina and Vela. The mast, or the sails, is now the constellation Vela. Our selected Kreutz comet orbit would put the comet indeed

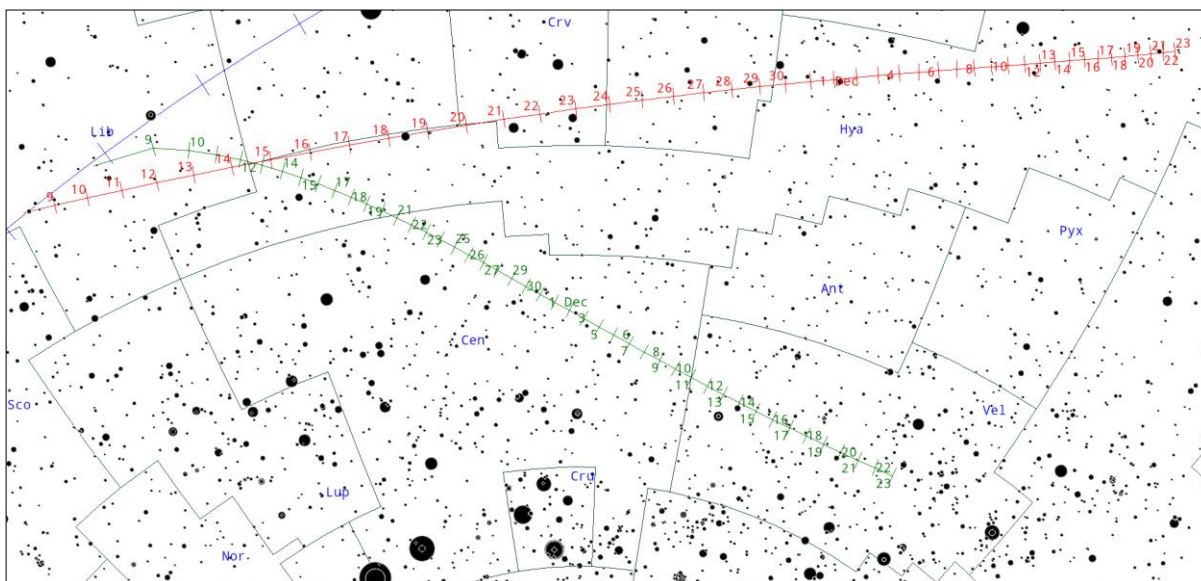


Figure 7: The course of the comet from 8 November to 28 December. It shows the new Kreutz group orbit (green) and the former Landgraf orbit (red). The ecliptic is shown in blue. The Landgraf orbit clearly shows the comet moving in a region not supported by the observations. Image prepared with *GUIDE 9.1* software.

at a position that could be described as having “... left the mast of Argo Navis a little behind”! Summarizing these facts, it seems certain that C/1618 V1 was a member of the Kreutz sun-grazing comet group! Figure 7 shows a comparison of the apparent movement of the comet in the sky for both Landgraf’s former orbit and the new orbit.

4 EPHEMERIS AND BRIGHTNESS EVOLUTION

In the absence of quantitative brightness estimates, reconstructing the comet’s brightness evolution is not straightforward—especially in cases such as this, where the comet appears to have been observed primarily via its tail rather than through a luminous coma or nucleus. Interestingly, this is something typical for some of the Kreutz group comets. Their very close perihelion passage can lead to very bright apparitions, splitting or even total disintegration of the nucleus. The small sungrazers that are only observable by spacecraft are evaporated without a trace close to perihelion. The large ones, like the Great Comets of 1843 or 1882, do survive and may show signs of fragmentation. But there is a fraction of medium-sized Kreutz group comets that undergo a total disintegration that leads to the visibility of a long and bright persistent tail after perihelion.

If we nevertheless assume a continuous brightness evolution and look at the final observation from Kirwitzer for 22 December, then, for an observer with very dark skies and who knows where to look, a visual magnitude of 5.0 can be adopted. If we use this latter magnitude,

we arrive at an absolute magnitude of $H_{10} = 4.0$. This is quite a large value and would present some problems, e.g. the comet would have been visible prior to perihelion, and around perihelion it should have been visible at -17 mag close to the Sun during daytime! As this was obviously not the case another explanation is needed.

There is a recent comet that shares quite a lot of characteristics with C/1618 V1, namely C/2011 W3 (Lovejoy). This Kreutz group comet, discovered by Australian amateur astronomer Terry Lovejoy, was quite faint during its pre-perihelion leg and was expected to disintegrate. While it did indeed disintegrate, it was accompanied by a surge in brightness near perihelion and the formation of a large, bright tail that remained visible for weeks afterward, while the head or coma remained relatively inconspicuous. Later analyses showed that the absolute magnitude for the pre-perihelion leg of the orbit was 5.5 magnitudes fainter than for the post-perihelion leg. Also, the comet’s morphology and appearance shared many similarities. For observers in the Southern Hemisphere the tail was long and narrow, slightly wider at the center. The brightness of the tail was so high that the tail could easily be seen rising before the head of the comet rose. The head itself was not as apparent as the tail itself—a result of the disintegration of the nucleus of the comet.

We therefore suspect that Comet C/1618 V1 was similar to C/2011 W3 in size, and maybe a little brighter. Invisible from the ground prior to its perihelion passage, it underwent a brightness surge near perihelion and disintegrated al-

Table 5: Ephemeris for Comet C/1618 V1 from the date of the perihelion passage covering the observation period based on the new orbit.

Date 1618 UT	RA (2000.0) (h m)	Dec (2000.0) (° ')	r (au)	δ (au)	E (°)
Nov 08.0	15 15.6	−18 23	0.0148	0.9786	0.6
13.0	14 16.9	−23 00	0.3119	0.9353	18.4
18.0	13 45.4	−27 46	0.5014	0.8894	30.4
23.0	13 16.6	−32 20	0.6602	0.8525	41.3
28.0	12 46.3	−36 47	0.8019	0.8223	51.7
Dec 03.0	12 12.3	−40 59	0.9320	0.7993	62.0
08.0	11 32.6	−44 38	1.0537	0.7853	72.1
13.0	10 46.8	−47 20	1.1687	0.7822	82.0
18.0	09 56.7	−48 39	1.2784	0.7922	91.5
23.0	09 06.3	−48 23	1.3835	0.8166	100.1



Figure 8 (left): Image of C/2011 W3 (Lovejoy) by Rodney R.D. Austin (New Plymouth, New Zealand). This image was acquired on 21.63 December 2011 (UT) and shows the comet's tail extending about 18 degrees into the morning sky. 15-second exposure using a Canon Kiss DSLR and a 55-mm lens (courtesy: R.R.D. Austin).

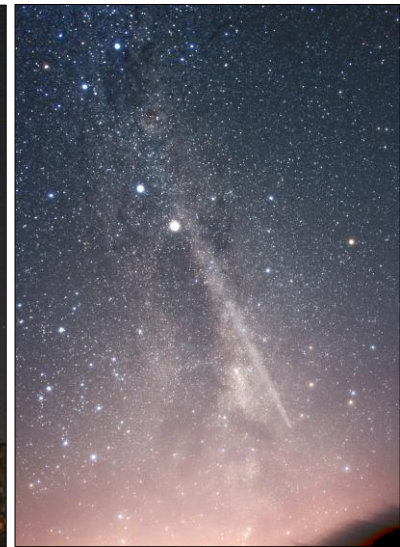


Figure 9 (right): Image of C/2011 W3 (Lovejoy) by John Drummond (Gisborne, New Zealand) on 29 December 2011. The tail length is about 20° (courtesy: J. Drummond).

most completely, leaving a bright and persistent tail. The ephemeris in Table 5 therefore gives no magnitude. Figures 8 and 9 show two images of Comet C/2011 W3 (Lovejoy) which bear a lot of similarity to the descriptions of Comet C/1618 V1.

5 CONCLUDING REMARKS: COMPARISONS WITH OTHER OBSERVATIONS

After we have derived an improved orbit for this comet based on actual positions, we will now look at some of the observational reports from Section 2 to see how good they agree with it. In principle, the comet could have been seen as early as 10 November, maybe even 9 November, if the comet was bright enough. As the perihelion time is uncertain by several hours and the indicated positions are also uncertain to a few degrees, so the indicated distances are given to allow a judgment of a general agreement.

The report by García de Silva y Figueroa from Isfahan indicates that the comet's tail was first noticed around 8 or 10 November three hours before sunrise. Since the comet passed perihelion on 8 November, the first date can be excluded, as the tail was still directed to the South. By 9 and 10 November, its direction had changed to the west, allowing the tail to be visible when the comet was still over 30° below the horizon.

The observations from Manila are quite confusing at first glance as it is not clear whether the observations are given for the Julian or Gregorian Calendar. Furthermore, the indicated declinations might be ecliptical or equatorial. As the text also mentions a position for Comet C/1618 W1, this information may be used to help identify which of these possibilities is correct. The text says that on 24 November another, much brighter comet appeared with a declination of 8° pointing towards Scorpio (Blair and Robertson, 1904: 224–227). This observa-

tion was around a UT date of 23.9 November. On this date, comet C/1618 W1 was at an ecliptic declination of -4° and at an equatorial declination of -22° (all apparent) and the comet was pointing toward Ophiuchus, which does not agree very well. If we take the date as Julian, then the actual date would have been 3.9 December. The corresponding ecliptic and equatorial declinations of $+19^\circ$ and $+4.5^\circ$, respectively, would enable the comet to indeed point towards Scorpio. For 4.9 December the equatorial Declination would have been $+7.5^\circ$. This seems like an indication that the dates given are for the Julian Calendar and the declinations are equatorial. Using these settings, then the first observation would have been on a UT date of around 20.9 November. For this date only the declination of the South-eastern end was given, which refers to the end of the tail. As this position is dependent on the local observation conditions and the eye of the observer it cannot be used for an accurate comparison. However, if we are assuming the reported curvature and the given length of the tail of 30° then the declination of -20.5° would in principle agree with the given date. Eight days later, on 28.9 November, the end of the tail was observed at -24.5° declination and the head at -31° declination. Our orbit predicts the head at -35.5° and the declination of the end of the tail could well be at the indicated declination again considering the observed curvature and length. So, all in all a good agreement. The only confusing detail is the statement that the end of the tail was 8° from Spica on the same day. For that date the end of the tail was maybe 40° from Spica and the head of the comet 30° from it. A possible explanation could be that this statement already refers to Comet C/1618 W1, which was situated in such a way that its tail passed rather close in a range of 5° to 15° from Spica for that date.

The single observation by del Valle which is not a coordinate pair, also agrees very well with our orbit. For 25.25 November, he gave a single value for the ecliptic latitude as $-23^\circ 20'$ and our orbit places it at a latitude about 2° South of it.

The observation report by Hoppener of 13 November is problematic. He said that he saw the comet from Rostock at around 6:30 local time, when the comet was just rising and Mercury was 6° above the horizon. The Sun was only 8° below the horizon. Hoppener said the distance between Mercury and the comet was 5° . Our orbit places it at a distance of 11° from

Mercury, however, the height difference between Mercury and the comet was 5.5° , so he could be referring to the height distance between the two. We do not know how Hoppener measured the values nor how he was able to do so in the already bright sky. The 5° value might also be a measurement or printing error, e.g. 5° instead of 9° .

The observations by Grassi seem to indicate that he never saw the actual head of the comet. For 18 November he said that the lower end of the beam "... reached to the shoulders of Centaurus ...", which would be θ and ι Cen, and on 29 November it was situated below the "... triangle of Hydra ...", which would be β , ξ and α Hya. Interestingly, for 18 November, the shoulder stars of Centaurus would rise only shortly before sunrise for him, so he would not have been able to see the head of the comet there or even the stars due to atmospheric extinction and haze. It seems possible that he took γ and π Hya as the two shoulder stars of Centaurus, since our orbit places the comet between these two stars which are about 10° North and were higher in the sky and certainly visible. His position would also disagree with the measurements from Luciano, del Valle and Kirwitzer, which agree well with each other. On 29 November the comet was indeed below the triangle of Hydra but placed more to the east than to the west as shown by his engraving (Figure 3). But since the tail orientation in his engraving agrees with what can be expected from the new orbit, it seems likely that he did not see the real head of the comet, which was then maybe 7° above the horizon and washed out by twilight and atmospheric extinction.

In summary we see that most of the verbal and pictorial descriptions are also in agreement with our new orbit, which was based on positional data from three different observers. We can conclude that the currently catalogued orbit for Comet C/1618 V1 is incorrect, and that—based on the available observations and the visual appearance—the comet is a member of the Kreutz group and the new orbit provides a satisfying explanation of the available observational data.

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7 REFERENCES

- Biancani, G., 1620. *Sphaera Mundi seu Cosmographia*. Bologna, H. Tamburini (in Latin).
 Blair, E.H., and Robertson, J.A. (ed.), 1904. *The Philippine Islands 1493-1898, Volume XVIII*. Cleveland, The Arthur H. Clark Company.

- Bocarro Francês, M., 1619. *Tratado dos Cometas queue Apareceram em Novembro Passado de 1618*. Lisboa, P. Craesbeeck (in Latin).
- Calicrate, P., 1619. *Del gran trave infocato vedutosi dall citta die Roma per molti giorni, cominciando a 18 di Novembre 1618*. Venetia, P. Farri (in Italian).
- Cunningham, C.J. (ed.), 2026. *Cosmic Events - The Three Comets of 1618*. Cham (Switzerland), Springer Nature.
- Del Valle, B., 1619. *Explicacion y Pronostico de los dos Cometas*. Granada, F. Heylan, P. de la Cuesta (in Spanish).
- De San Esteban, G., 1618. Memoria y Relación e historia verdadera de lo sucedido en las Islas Molucas 1609 1619, Archivo Franciscano Ibero-Oriental Madrid, box 21, file 12 (in Spanish).
- Da Silva Figueroa, G., 1667. *L'Ambassade de D Garcias de Silva Figueroa en Perse*. Translation by A. de Wicquefort. Paris, Louis Billaine (in French).
- Frolichius, J., 1618. *Cometologia Oder Bericht von Cometen ins gemein Und insonderheit Dem jetzt erscheinenden welcher im Octobri lauffendes 1618. Jahrs*. Güstrow, M. Sachs (in German).
- Grienberger, C., 1612. *Catalogus veteres affixarum Longitudines, ac Latudines conferens cum novis Imaginum Caelestium*. Roma, B. Zannetta (in Latin).
- Granada, M.A., and Boner P.J., 2022. *Michael Maestlin's Manuscript Treatise on the Comet of 1618*. Leiden, Brill.
- Grassi, O., 1619. *De Tribus Cometis Anni MDCXVIII*. Roma, J. Mascardi (in Latin).
- Hintzsch, P., 1619. Flagelli Saturni & Martis, Das ist: Beschreibung des erschrecklichen Cometsterns. Leipzig, N. & C. Nerlich (in German).
- Ho, P.-Y., 1964. Natural phenomena recorded in the Đại Việt sử ký toàn thư, an early Annamese historical source. *Journal of the American Oriental Society*, 84(2), 127–149.
- Hoppener, J., 1618. *Kurtz Erklerung und Beschreibung Des Newen Geschwantzten Cometens*. Rostock, J. Fueß (in German).
- Joseon Wangjo Sillok, Volume 132, <https://sillok.history.go.kr/> (retrieved on 22 November, 2025).
- Kapoor, R.C., 2016. Nūr ud-Dīn Jahāngīr and Father Kirwitzer: the independent discovery of the Great Comets of November 1618 and the first astronomical use of the telescope in India. *Journal of Astronomical History and Heritage*, 19(3), 264–297.
- Kapoor, R.C., 2019. The first astronomical use of the telescope in India. In Orchiston, W., Sule, A., and Vahia, M. (eds.), *The Growth and Development of Astronomy and Astrophysics in India and the Asia-Pacific Region. ICOA-9, Pune, India, 15–18 November 2016*. Pp. 57–66.
- Kepler, J., 1663. De Cometis Libelli Tres. In Hammer, F., and Beck, Ch. (eds.), *Johannes Kepler Gesammelte Werke*, Band VIII. München (in German).
- Kirwitzer, W. P., 1620. *Observationes Cometarum Anni 1616* (sic!). Wien, J.T. Schönwetter (in Latin).
- Landgraf, W., 1985. Über die Bahn des zweiten Kometen von 1618. *Die Sterne*, 61, 351–353 (in German).
- Luciano, A., 1619. *Discurso Mathematico, sobre los dos Cometas*. Valencia, F. Mey (in Spanish).
- Mästlin, M., Astronomischer Discurs von dem Cometen, 1619, Manuscript Württembergische Landesbibliothek Stuttgart, Cod. Math. 4° 15b, Nr. 8 (in German).
- Marius, S., 1619. Astronomische und Astrologische Beschreibung deß Cometen so im November und December vorigen 1618. Jahres gesehen worden. Nürnberg, J. Lauer (in German).
- Mexia, P., 1619. *Discurso sobre los dos Cometas*. Lisboa, P. Craesbeeck (in Portuguese).
- Olbers, H.W.M., 1621. Letter XIV. *Correspondance Astronomique, Géographique, Hydrographique et Statistique*, 4, 475–478.
- Pacheco de Brito, M., 1619. *Discurso em os dous Phaenominos Aereos*. Lisboa, P. Craesbeeck (in Portuguese).
- Schickard, W., 1619. *Cometen Beschreibung, Cod.math.qt.43*. Stuttgart, Württembergische Landesbibliothek (in German).
- Rogers, A. and Beveridge, H. (transl.), 2003. *Tūzuk-i-Jahāngīrī, Volume 2*. New Delhi, Munshiram Manoharlal Publishers Pvt. Ltd.
- Ursinus, B., 1619. *Außführlicher Bericht von den Cometen welcher im Jahr 1618 im November erscheinen*. Berlin. M. Guth (in German).

Maik Meyer graduated from Chemnitz Technical University (Germany) in 1995 as an engineer. He has



observed comets since 1987 and has logged almost 2000 visual observations of more than 160 comets. Always interested in the history of comet hunting and observing, he has specialized in identifying and linking historic comet apparitions with known comets and calculating new and improved cometary orbits. Identifications include the long-lost comets 157P/Tritton, 205P/Giacobini, 206P/Barnard-Boattini, 271P/van Houten-Lemmon and 273P/Pons-Gambart. In 2020, he was able to identify the historic comets of October 1385 and January 1457 as earlier apparitions of Comet 12P/Pons-Brooks.

Maik is the namesake of the 'Meyer Group' of sunskirting comets which he identified in 2002 from orbital calculations of comets found in the data of the SOHO spacecraft. In 2010 he discovered Periodic Comet 312P/NEAT in archival survey data.

The minor planet (52005) was named in his honour.

Maik served as the head of the German Amateur Comet Observers working group within the Vereinigung für Sternfreunde (VdS) for several years, and is Assistant Editor of the *International Comet Quarterly*. He is also co-author with Gary W. Kronk of Volumes 5 and 6 of *Cometography : A Catalog of Comets* (Cambridge University Press) and the two-volume *Catalog of Unconfirmed Comets* (Springer Nature).

Gary W. Kronk obtained a Bachelor's degree in journalism from Southern Illinois University at Edwardsville, USA. He is an amateur astronomer who began observing comets in 1973, but the more he read about comets and meteor showers the more he became interested in their history. He has now spent nearly 50 years researching and writing about comets and meteor showers. This has led to the publication of twelve books on these subjects, which include his six-volume *Cometography* series for Cambridge University Press. He has also written articles for *Sky & Telescope*, *Astronomy*, *StarDate*, *Mercury*, *Astronomy Technology Today*, and other magazines, and authored or co-authored research papers that have appeared in this journal and in *Icarus*; *Earth, Moon, and Planets*; the *International Comet Quarterly*; and the *Journal of the International Meteor Organization*.



In 1992, Gary examined ancient Chinese observations and found that comets seen in 69 BC and AD 188 were previous observations of Periodic Comet 109P/Swift–Tuttle. In 2003, he discovered that observations of a comet made by the Reverend Leo Boethin in January 1973, but not seen by anyone else, were actually prediscovers observations of Periodic Comet 104P/Kowal, which was not discovered until 1979 (Brian Marsden confirmed both of these findings and published the details on the *IAU Circulars*).

Gary was invited to participate in Leonid MAC 99, a NASA/US Air Force mission to study the Leonid meteor shower over the Mediterranean Sea in 1999. The aircraft were equipped with cameras to photograph the meteors using various filters to learn as much about this meteor shower as possible. Minor planet '48300 Kronk' was named after him.