

Records of sightings of comets from the literature

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In pursuit of observational records of comets we search Rajatarangini, a chronicle from Kashmir, which has a wealth of records on natural phenomenon like earthquakes and famine. The study reveals records of sightings of comets and we identify them based on description and with the help of associated dates and eclipse records. We find that there are records of a pair of eclipses and at least two comets apart from the apparitions of Comet Halley in 1470 and 1531 CE.

Rajatarangini, a chronicle from Kashmir records the political history of the region from about 2000 BC (refs 1, 2) to about AD 1600. The first volume was written by Kalhana in the 12th century AD; with sequels by Jonaraja (1150 to 1459 CE), Srivara (1512 to about 1600), Prajyabhata (1486 to 1512) and Shuka (1512 to about 1596).

These books are well-utilized by historians to identify the dynasties that ruled Kashmir. Kalhana himself has done extensive research on the works of his predecessors to maintain chronology – which he describes in the introductory verses. Stone inscriptions on the walls of temples have been acknowledged for fixing many errors. The text has been searched for possible records of observations of supernovae³.

The time marker in *Rajatarangini* is called the Loukika year. This is also known as Saptarshi Samvat⁴. The conversion becomes easier because of the cross reference provided. The commencement of the work is dated 4224 Laukika era, which is also the 1070 Saka era (Saka count begins from 78 CE). This fixes the date of composition as 1148 CE. Jonaraja's work covers the reign of Zain-ul-Abidin. After the death of Jonaraja in 1459 CE, Srivara continued the work, up to 1470 CE (the year when Zain-ul-Abidin died) and beyond.

The description by Srivara of comets and eclipses is particularly interesting and are discussed here. Although he commenced work in 1459 CE, there may be reports of some events prior to that date for which Srivara was an eye-witness and such events might have been incorporated in the chronicle written later.

The work by Shuka much later in the 16th century describes the comets.

The chronology of celestial events

Three important celestial events have been reported by Srivara: (i) Sighting of

a comet. (ii) Occurrence of eclipses – solar and lunar within a fortnight. (iii) Sighting of a second comet.

The last two events have been narrated as heralding the death of the king Zain-ul-Abidin. Therefore, all these events must have occurred during the period 1459–1470. There is description of a storm and an earthquake in the second chapter. This is followed by the sighting of a comet in the east

उद्भूत पूर्वदिक्पुच्छः केतुर्नभसि विस्तृतः ।
पूर्वं बहामरानेन दृष्टोऽरिष्टस्य सूचकः ॥ ११६ ॥
म द्रविस्तृतः पुच्छः कालकुन्तोपमो दिने ।
स्फुरन् प्रतीचीं प्रत्यायां तस्यैव हृदये जर्नेः ॥ ११७ ॥

‘A comet with a long tail appeared in the eastern sky. Bahram Khan saw this first as an indicator of the evil.’
1.2.116

‘People saw that the long stretching tail was like a creeper and it was visible during the day towards west.’
1.2.117

The word ‘purva’ is used twice in 1.2.116. The first mention includes ‘dik’, implying east direction. The second mention is ‘purvam’, implying he was the first to see it. This may be a second comet.

We see again in the seventh chapter, a reference to comets. The following verses describe the comet as

ईत्यातङ्गागमे सेतुर्हेतुः सर्वजनस्ये ।
अथोत्तरदिशा रात्रौ भूमकेतुर्द्रव्यत ॥ ११ ॥
दीर्घपुच्छोच्छलत्कान्तितक्तेतुकपटाद् ध्रुवम् ।
कालेन द्रुघण क्षिप्तं क्षयायेव महीसिताम् ॥ १२ ॥
मासद्वयं स्फुरन्वासीत् स व्योम्नि विमले सदा ।
सदये हृदये रात्रिचिन्तौघोऽनिष्टशङ्कया ॥ १३ ॥

‘As an indicator of calamity to destroy the entire humanity, a comet appeared in the night in the direction of north.’
1.7.11

‘It had a flag like long tail which was very bright. Surely it was like a sickle sent by Kaala, the Lord of Death, as an indication of destruction.’
1:7:12

‘It was visible in the clear sky for two months continuously; it also was the source of worry for the king.’ 1.7.13

Here the word ‘sadaa’ is used as an adjective for shining. It translates as always or continuously. It may mean that the comet was visible for two months; or it was visible throughout the night for two months.

Then comes the description of the eclipse; this has been translated⁴ as

एकपक्षेऽभवच्छन्द्रस्यैग्रहणसंस्थितिः ।
एकपक्षमिवादातुं राज्यं राजनिपर्यायात् ॥ १५ ॥
दृष्टोऽम्बरे द्वितीयस्यां सुषांयुस्तत्र रंजनैः ।
उत्तान इव भूपेऽपमन्यं सूचयितुं विशाम् ॥ १८ ॥

‘An eclipse of the sun and the moon took place within a fortnight to upset the king. The owl was hooting under the “umbrella”. On the second day of the moon that luminary was seen with its face upward in the sky.’

However a realistic translation would be

‘If the kingdom/people go against the king, that is, when the king is ruling unilaterally, it is equivalent to having two eclipses within a fortnight.’
1.7.15

The word ‘ekapaksha’ used here has different meanings in the two contexts. The first line refers to ‘paksha’ as a fortnight; in the second half it refers to a ‘side’. Since having two eclipses within a fortnight was considered very ‘harmful’ for the survival of the king, the verse may be translated as, ‘The insecurity of the Kingdom was like having the two eclipses (lunar and solar) within a fortnight.’

We can assume that the simile arises as a consequence of a pair of eclipses that was observed in the immediate past. Eclipses offer a simple and fool-proof method of fixing the date. Srivara does not provide any detail on the type or time of visibility of eclipses. Therefore, we set out to search for pairs of eclipses that occurred during this period. The basic criterion for selection is the visibility from Srinagar. We have to keep in mind that it is quite common to have solar and lunar eclipses within a fortnight. This is because of the simple fact that the nodes of the moon's orbit are separated by 180°. If one node satisfies the condition for an eclipse, the other node is also likely to meet the same condition a fortnight later. However, a total solar eclipse demands that the node is very close to the sun/moon; therefore, the following/preceding full moon can only marginally meet the requirement. This is easily seen by the fact that they are penumbral eclipses. The passage of the moon through the penumbral region of the shadow is hardly noticeable. Therefore, such passages were not documented or recorded in the past. We can, for all practical purposes, treat them as no eclipses.

Table 1 provides a list of pairs of eclipses that occurred between 1459 and 1470 CE. The visibility criterion is also included in the table. As discussed above, it can be verified that the total eclipses are paired with penumbral eclipses which can be treated as no eclipses. A scrutiny of Table 1 reveals the pair of July 1460 to be the most appropriate, satisfying the condition for visibility from Srinagar.

In the text, the visibility of the comet precedes the eclipse. Therefore, we searched for very bright comets which were visible around 1460–61 CE. The reference to the comet appears at the end of the chapter.

The second part of the other verse referring to the omens of the owl and the rise of the moon, will be discussed later in the text.

The comet of the 15th century

Table 2 lists the comets that were seen in the 15th century. One of the brightest comets that appeared during the time was Comet Halley in AD 1456. It was visible for almost six months from January to June. It was observed by Paolo Toscanli

from Florence, Italy, and was fairly bright with an impressive tail. In the 1456 apparition, Comet Halley moved from Leo to Pisces between 3 and 25 June. Thus, effectively it was visible in the morning sky and it moved from east towards north.

Srivara describes many anecdotes and while mentioning the death of the king, also mentions the comet and eclipses. Therefore, the impressive comet seen 14 years ago and the pair of eclipses seen seven years ago might have been added to create the effectiveness of the calamity (generally eclipses are considered as harbingers of catastrophe and calamity).

On the other hand, if we go by chronology, the record may point to the other

comet of 1460. We will discuss the comet of 1470 as another good choice.

According to the entry in encyclopaedia⁵, there were two comets in 1468; one was seen in the north and the other in the west. Since the year of sighting has not been explicitly mentioned, it can be a 1468 pair or the other bright one which appeared in January 1470.

There is a reference to the sighting of the moon on the second day in verse 1.7.18 which reads as

‘People saw the moon on the second day as though it was an indicator of a new king.’

Here the word ‘dwitiya’ is used as an adjective to the sky. Grammatically the

Table 1. Pairs of eclipses¹¹ during 1457 to 1470 CE

Lunar	Solar
17 February 1459 Penumbral eclipse; magnitude 0.857	3 February 1459 Annular – total Eclipse only ending phase visible
3 July 1460 Umbral magnitude 0.281	18 July 1460 Total eclipse – shadow path through China, only partially visible from Srinagar: magnitude 0.531
7 December 1462 Penumbral magnitude 0.88	21 November 1462 Annular – total eclipse; only ending phase visible
3 May 1463 Not visible – penumbral, magnitude 0.76	18 May 1463 Annual eclipse visible, magnitude 0.97
1 June 1463 Not visible – penumbral, magnitude 0.28	
27 October 1463 Penumbral – not visible	11 November 1463 Total eclipse – not visible
19 February 1467 Penumbral – not visible	5 March 1467 Visible, magnitude 0.612; path through South and East India
12 May 1473 Penumbral – not visible	12 April 1473 Visible, magnitude 0.612; annular eclipse path through China

Table 2. Comet records as documented in Democritus⁵

Date	Comet record/description
AD 1454	Two comets
*1456	A large comet appeared with an earthquake
*1457	A comet appeared in June in the 20th deg of Pisces
1458	A comet appeared in Taurus
*1460	A large comet appeared
1461	A comet appeared
1463	A comet appeared
1467	A comet appeared above the fishes
1468	Two comets appeared, one of which was seen for 15 days in the north and the other for 15 days in west
1470	A comet appeared on 15 January
1471	A comet appeared in autumn

*These are mentioned in the chronology of comets⁶.

second day after the new moon/full moon fits very well, but the context is not immediately clear. Therefore, it is understood as the second day ‘after new moon/full moon’ according to the convention in the lunar calendar. The comparison is to the rise of a new king. Since this verse continues the trend of bad omens like the hooting of an owl right under the portico of the palace, the bad day (astrologically) of the entry of the sun into a new constellation, it may refer to a second comet, that we will discuss now.

The comet of 1470 was considered a great comet⁶; its tail extended to almost 50 degrees and was visible for almost 40 days. The total duration of visibility was set at 80 days. It was seen at dawn when discovered. It moved from Virgo through Bootes, Draco to Ursa Minor. It was then visible all through the night. Then it moved to Cassiopeia, Andromeda and later to Pisces before fading away. Thus, it started being visible in the west. It was in Cetus when it almost faded beyond visibility.

This description matches the statement given by Srivara. Since it was visible after sunset and all through the night, at dusk the tail pointed towards the east. At midnight the tail appeared to be pointing towards the south and at dawn to the west. Srivara states that it was continuously visible from east to west. Therefore, most probably this was the comet cited. Details on the appearance have been written down meticulously by the great mathematician Regiomontanus. The chronicles of Europe have noted a great drought, a plague, and then a war leading to the death of the Duke of Burgundy. The comet made its first appearance in January and therefore the king’s death as mentioned by Srivara may be the following February/March.

Thus we may conclude that the references correspond to the pair of eclipses of 1460 and the comets of 1460–68 CE. The later description corresponds to the Halley’s Comet apparition of 1470–71 CE.

The comets of the 16th century

We see references to comets in the fourth volume jointly authored by Prajyabhatta and Shuka. The reference is associated with the Laukika year 4607. This corresponds to March 1531–April 1532 CE.

याति चक्रपतौ वीरे ततः पश्चिमदिग्बधूः ।
रतिहेतुरुषा केतुं भूमिं नित्यमधायत ॥ ३०५ ॥

‘In the year 4607, Kaca Cakrapati, intending to fight with the Margapatis, moved his army and a comet appeared in the west.’

This can be identified with Comet Halley, which was widely observed from August 1531 onwards. Here it states that the comet appeared in the west. According to Kak⁷ and Walter Slaje⁸ the comet seen by Suka is Comet Halley.

Two years later there is a reference again for another comet

इत्थं सतीसरोदेशे पीडाभूत्पापिनां विशाम् ।
पूर्वपश्चिमतः केतोरनिशं दिवि दर्शनात् ॥ ३४६ ॥
॥ इति कास्कारीयोपद्रवः ॥
पक्षशालिवरस्फातिपूर्णक्षेत्रेषु सर्वतः ।
नभसस्तारकाः पेतुर्भूयः केतुरदृश्यत ॥ ३४७ ॥

‘In the year 9, in the month of Jyeshtha, the Muggals returned to their country... and a comet was seen continuously from East to West... Stars fell from the sky on the fields where the full harvest of rice was ripening, and the comet became again visible (p. 373).’

This may be the same comet reappearing after the rainy season. However, the description can be interpreted to indicate the same comet appearing at dawn and dusk. This can also be interpreted as Comet Halley which was visible for almost a year. The description cannot help differentiate it from another Comet which appeared in 1532, and moved from Virgo towards Hercules during September–October. The comet of 1532 was recorded by Democitus in 1681. The comets c/1532R1 and c/1661c1 were studied by Halley for similarity and were expected to return by 1788/89, but it did not happen.

The *Edinburgh Encyclopaedia* records both comets as ‘terrible’. The orbital parameters of 1532R1 have been compared and found similar to that of Ikeya Zhang C/2002 (ref. 9).

References to Venus, dust storm and snow storm

There are many references to eclipses all through the text. However all of them are

used as similes for describing the agony or misfortune of the king. It is not essential that they are observational records of a contemporary eclipse.

The planet Venus is referred to in verse 1.1.144/5. The numbers refer to the Hindi translation by Raghunatha Singh¹⁰. The translation reads

शुक्योगजनामक्षेपरीक्षणविचक्षणः
स्वपक्षरक्षणं स्मापः पृच्छीकृतरविर्न्यधात् ॥ १४४ ॥
राज्ञः पृच्छमतः क्षयः खड्गान्तःप्रतिविम्बितः ।
जयस्ते भवितेत्येव वक्तुं व्योम्नोऽवतीर्णवान् ॥ १४५ ॥

‘The king who was knowledgeable about the movement of Venus, like the Shukra Yoga, turned his back to the Sun for the protection of his own forces: the Sun, who at the backside of the king, seen as a reflection from the sword (held by the King), went down the horizon as through declaring you (the King) are victorious.’

The mention of the knowledge of ‘Shukra Yoga’ here seems irrelevant. The Hindi translation refers to this word as having varied meanings. If it refers to an astrological conjunction, the other body should have been specified. However, considering the date it is quite possible that the reference was to the conjunction of Venus which happened on 19 January 1460 (superior conjunction) or 4 November 1460 (inferior conjunction). This may imply that along with Venus, the king also turned his back to the Sun.

The reference to a comet in verse 1.1.176 appears to be only for the sake of comparison. It reads

राज्यस्थितिविप्रविकसनलिलीहिर्माँषो
लोकक्षयोचितमहाभयभूमकेतुः ।
विघ्नप्रसन्नतयल्लघूकनिशान्धकारः
शापः सुतस्य नृपते स्वजनैर्विरोधः ॥ १७६ ॥

‘Just as the snow storm is to the blooming lotus and the comet is for the destruction of the world, the opposition from his own men is a curse to a prosperous king.’

The dust storm is described in verse 1 : 2 : 7 as having occurred in the 36th year in the month of Chaitra (March/April). This corresponds to AD 1460. The same year in the month of Margashira (December) there was a snow storm (verse 1.2.12). Therefore, the reference above may imply a comet seen in 1460 if

it can be understood as ‘For a king the rebellion of his own people is a curse, just as the snowfall to a lotus flower, just as a comet which can generate calamities.’

This is the last verse of this chapter. The next chapter continues with the description of many natural calamities.

Here is a description of a conference of poets in verse 2.5. 92–93. The words ‘Budha’ and ‘Kavi’ have been interpreted to mean planets Mercury and Venus⁸. The word used for comparison, ‘Tula’ has also been interpreted to mean the constellation Libra.

गगन तारकापूर्णं दीपाह्वयं रङ्गमण्डपम् ।
यत्रान्योन्यं तुलां चक्रे राशौ कविशुभाक्षितम् ॥ ९२ ॥
अमावस्यादिने श्रावर्षीनामानामरिकासुखैः ।
शुशुभे शुभद यत्र शतचन्द्रं भ्रुवस्तलम् ॥ ९३ ॥
दीपवृक्षो नृवाहोऽपि यत्र रङ्गान्तरे स्फुरन् ।
दत्रे चारकामध्योत्कृष्टिकर्णचयोपमाम् ॥ ९४ ॥

The description has no astronomical significance. The stars decorating the sky are compared to the learned men and poets assembled for the conference. The stage was decorated with lights just as

the stars do to the night sky. It appeared as though hundreds of moons descended onto the earth on a new moon night. The lights (held in front of the men) resembled the Krittika (Pleiades) constellation rising amidst stars.

The astronomical bodies need not be invoked with the translation as

‘In the night, the stage decorated by poets and knowledgeable people with lamps compared very well with the sky filled with stars’.

Conclusion

It is seen that the chronicles of Kashmir record a pair of eclipses in 1460, comets in 1460, 1468 and 1532, and the apparitions of Comet Halley in 1470 and 1531.

1. Dutt, J. C., *Kings of Káshmira*, Trübner & Co., 1879.
2. Dutt, J. C., *Kings of Kashmira, a Translation of Rajatarangini Vols II and III*, I.C. Bose and Co, Calcutta, 1894.
3. Narlikar, J. V. and Bhate, S., *IJHS*, 2001, **36**(3–4), 171–202.

4. Stein, M. A., ‘Chronological and Dynastic Tables of Kalhana’s Record of Kashmir Kings’, *Kalhana’s Rajatarangini: A Chronicle of the Kings of Kashmir*, Motilal Banarsidass, 1979 [1900].
5. Democritus, *The Petitioning of Comets or a Brief Chronology of all the Famous Comets*, Google Books, 1681.
6. Mather, I., *A Discourse Concerning Comets, Earthquakes, Famines and Wars*, Google Books, 1683.
7. Kak, S. C., *Three Interesting 15th and 16th Century Comet Sightings in Kashmiri Chronicles*, 26 September 2003; arXiv:physics/0309113v1 [physics.hist-ph].
8. Salje, W., *Kingship in Kashmir, From the Pen of Jonaraja, Court Pandit to Sultan Zayn at Abidin*, Universitetsforlaget, Halle-Wittensburg, 2014.
9. Asher, D. et al., *Astron. Astrophys.*, 2002, **43**(2), 91–92.
10. Singh, R., *Hindi Translation and Notes of Jain – Rajatarangini*, Chowkambha Amarbharathi Prakashan Varanan, 1977.
11. <https://eclipse.gsfc.nasa.gov/SEsearch/SEsearchmap.php?Ecl=14730427>

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