

# Astronomical Evidence on the Dates of Early Cera Kings

K Chandra Hari\*

The present paper is an attempt to cast some light on the antiquity of Kerala, the Sangham Age under Cera kingdoms about which chronological definitions are lacking. Keya Perumāḷ epoch 215 CE corresponding to the alphanumeric chronogram 'Bhūmaubhūpofyamprāpya' is shown to be a sheet anchor to which the regnal years in Patittupattu can be combined to derive the chronology of the eight Cera rulers of the Sangham period. Imayavarampan Nedumceral Ātan to Kudakko Ilamceral Irumporai are shown to have reigned during the period from 43 CE to 213 CE. Chronology derived has been verified by dating the two astronomical references— (1) Song 4 in praise of Palyānai Cel Kezhukuttuvan as referring to the Venus, Moon, Mercury, Jupiter conjunction of May 8, 34 AD and (2) Song 229 of the Puranānūru is dated as describing the zenithal transit of Saturn in February-March 65 CE and the appearance of Halley's Comet subsequently on March 26, 65 CE. The significance of 215 CE, as the sheet anchor of Kerala chronology, is demonstrated using evidence on the Bārhaspatya reckoning of year and Mahā-Maghā festival. Aryabhaṭa tradition of astronomy and the beginning of Kollavarṣam in 825 CE are shown to give supporting evidence for the significance of 215 CE. Use of the chronogram for historical purpose is substantiated by citing evidence the tradition of Kalidina reckoning before the times of Āryabhaṭa. And 215 CE is shown to bear astronomical relationship with the Perumāḷ ascensions of 820 CE and 844 CE by the Vṛścika-Guru rationale and the beginning of Kollam Era; 825 CE is shown to have the luni-solar phenomena comparable in terms of Rasi-Nakṣatra positions.

CE: plz chk  
can we  
change AD  
to CE  
throughout  
the article

## Introduction

CE: plz chk can  
we change  
patittuppatt to  
patittuppattu  
throughout the  
article

In the realm of South Indian History, the date of the early Cera Kingdom praised in *Patittuppatt*<sup>1</sup> (*The Ten Idylls*) remains a topic of confusion. *Patittuppatt* forms a part of the Sangam literature generally dated to the first few centuries of the Common Era.<sup>2,3</sup> The early history of the Ceras and their regnal periods vis-à-vis chronology is a topic of

\* Geoscientist, ONGC, Ahmedabad, India. E-mail: chandra\_hari18@yahoo.com

<sup>1</sup> Aiyar G V (1997), *Patittuppattu* verses along with Malayalam Translation, Kerala Sahitya Academy, Trichur.

<sup>2</sup> Nilakanta Sastri K A (1966), *History of South India*, p. 106, Oxford University Press.

<sup>3</sup> Sharma T R S (2000), *Ancient Indian Literature: An Anthology*, Vol. III, Kendra Sahitya Academy, New Delhi, p. 43. See also, the *Encyclopedia Britannica* 2 (2002), p. 802.

confusion in history books<sup>4,5</sup> and we can find the confusion and ambiguities percolating to the general public in the accounts given at many websites including the official webpages of Kerala Government.<sup>6</sup> Sangham literature has helped the scholars to decipher the political organization of South India, life and culture, economic conditions and trade, wars, religion, etc. But when it comes to the time line of the Sangham Age and the famous kings, we meet with a vague picture only. Conventional approaches to the well known ancient records and legends are unlikely to yield any additional information. Narayanan has observed in 'Perumals of Kerala' that the *Keralolpatti*<sup>7</sup> gives impossible dates as *Kalivākyas* and therefore the accounts therein are unreliable. An incisive astronomical approach to the *Kalivākyas* or chronograms known through legends alters their historical usefulness significantly as explained later under 'Sheet Anchor of Kerala History'.

CE: plz  
note the  
change

| Table 1: Regnal Years as in <i>Patittuppatt</i> |   |              |                 |
|---|---|--------------|-----------------|
| Idyll No.                                       | King  | Regnal Years | Remarks         |
| 1   | <i>Perumcorru</i> Utiyal Ceral <i>Ātan</i>                  | -            | Idyll Not Found |
| 2   | Imayavarampan <i>Nedumceral</i> <i>Ātan</i>                 | 58           |                 |
| 3   | Palyanai Celkezhu <i>Kuttuvan</i>                           | 25           |                 |
| 4   | <i>Kalankāy</i> <i>Kanni</i> <i>Nārmudi</i> Ceral           | 25           |                 |
| 5   | Ceran Cenkuttuvan   | 55           |                 |
| 6   | <i>Ātukot</i> <i>Pāttu</i> Ceral <i>Ātan</i>                | 35           |                 |
| 7   | Celva <i>Kadumko</i> <i>Azhi</i> <i>Ātan</i>                | 25           |                 |
| 8   | <i>Takatūr</i> Erintha Perumceral Irumporai                 | 17           |                 |
| 9   | <i>Kudakko</i> <i>Ilamceral</i> Irumporai                   | 16           |                 |
| 10  | <i>Yānai</i> <i>Kāl</i> Cey <i>Māntaram</i> Ceral Irumporai | -            | Idyll Not Found |

<sup>4</sup> Narayanan M G S, *Perumals of Kerala*, Ph.D. Thesis, Kerala University, private circulation only. Discusses in detail the Cera history from 8<sup>th</sup> century CE onwards but no details are available on the Ceras of Sangham Age. But a reference to Tamil-Brahmi inscriptions of the 2<sup>nd</sup> century in which Cera kings are mentioned is available on p.38.

<sup>5</sup> (a) Menon Sankunni P (1994), *Tiruvitāmkūr Caritram*, Kerala *Bhāṣā* Institute, Trivandrum, (b) Visscher C, "Letters from Malabar", quoted in Padmanabha Menon K P, *History of Kerala*, p. 38 discusses the legends of *Keralolpatti* and the legendary Perumal reigns from 216 CE.

<sup>6</sup> "Based on the literary, epigraphic and archaeological sources, it is established by scholars that the Sangam Age flourished from 3<sup>rd</sup> century BC to 3<sup>rd</sup> century AD", [http://www.tamilnadu.ind.in/tamilnadu\\_history/sangam\\_age/greek\\_and\\_roman\\_contacts\\_in\\_sangam\\_age.php](http://www.tamilnadu.ind.in/tamilnadu_history/sangam_age/greek_and_roman_contacts_in_sangam_age.php), Kerala Government site is silent about the date of the Cera rulers but the <http://keralahistory.net/1b> to 8b sites present some chronological details of the kings: <http://keralahistory.net/4b.html> places Uthiyan Ceralathan who got defeated in the Venni War in 2<sup>nd</sup> century CE, *Nārmudi* Ceral at the middle of the 2<sup>nd</sup> Century CE, Ceran Cenkuttuvan at the end of 2<sup>nd</sup> century CE by taking the reign of *Gajabāhu* of *Lankā* from 171-193 CE. Account takes the last of the reign of Ceras to the beginning of the 4<sup>th</sup> century CE and dates given appear to be inconsistent. *Gajabāhu* -I according to *Kanakasabā* Pillai's work 'The Tamils 1800 Years Ago' (1904) lived during 113-134 CE and the dating is based on the Buddhist chronicle *Dīpavamsā*.

<sup>7</sup> *Keralolpatti* was originally published by Gundert H at Mangalore in 1843. Reprint 1960, Trivandrum.

Early history of the Ceras associated with the Sangham period, as such demands new studies and the present work is an effort to throw some new light on this aspect of South Indian history. The eight Kings who find a mention in the *Patittuppatt* are believed to have reigned for a period of 200 years<sup>8</sup> of the Common Era and they are presented in Table 1.

CE: plz  
note the  
change

Some genealogical details of these Kings are known but they are not relevant to the discussion as the regnal years given indicate the successive periods rather than coeval. Values like 58, 55 and 35 are apparently very high for a generation but such values are not impossible in the case of long living Kings. The reign of these eight Kings totals to 256 years. The present paper is an effort to date the reign of those Kings based on known legends, which may be validated by verification of the astronomical basis of their genesis.

### **Sheet Anchor of Kerala History – Chronogram '*Bhumaubh ūpo fyampr āpya*'**

Even though the historical records, literary and inscriptional, of North India and the Deccan are silent about the Kaliyuga reckoning, in legends of Kerala we come across many dates expressed as Kalidina in the *Katapayādi* notation. *Keralolpatti*, of unknown authorship detailing the *Brāhmnical* tradition, had its origin probably in 17<sup>th</sup> century CE and got printed by Gundert in 1890. This work equates the legendary chronogram, *Bhūmaubh ūpoyampr āpya* Kalidina of 1,211,454, November 30, 215 CE, with the beginning of the 12-year reign of Cera *Keyaperumāl* after the extinction of Cera Kingship over Kerala. Modern historians have attached little value to the historical details given in *Keralolpatti* because of its doubtful credentials, being a compilation of legends presenting the *Brāhmnical* view of Kerala history with the zero year of mythical *Paraśurāma*. Here an important question arises:

Can we reject a historical chronogram treating it as unreliable at par with the *Brāhmnical* history in *Keralolpatti* ?

In the following paragraphs, a scientific answer is sought for the above question.

### **Validity of Chronograms – Kalidina of Socio-Religious Significance**

Chronograms known in Kerala tradition have the colloquial name 'Paralperu' which may be translated into a more familiar terminology as '*Akśarasamkhya*'. Numerals, especially large ones like the Kalidina count of days, derived using the 'Parals' or cowries were given an alphanumeric representation by the technique called *Katapayādi*. It was a method of expression that could be handled by scholars and especially astronomers who were adept in computing the Kalidina and *tithi-nakṣatras* of date. Because of this reason, chronograms associated with historical events may have an astronomical basis related to the event and the respective date, and the event may be validated if we can find supporting astronomical details. An ordinary person or novice of ulterior motives could not have invented a chronogram for interpolating the same into a text after hundreds of years. Further, we must keep in mind that the purpose of Kalidina reckoning was astronomical

<sup>8</sup> *Ibid.*, 1, p. 13.

CE: plz clarify is it  
Bhumaubhupofyamprāpya  
o  
Bhumaubhupoyamprāpya

computations and as such every chronogram may have some astronomical and socio-religious significance.

When viewed against the above mentioned computational and astronomical background of alphanumeric chronograms, it becomes very clear that the chronograms like *Bhūmaubhūpoyamprāpya*, Kalidina of 1,211,454 cannot be brushed aside as the handwork of some novice who compiled the *Keralolpatti*.

### **Astronomical and Socio-Religious Background of *Bhūmaubhūpoyamprāpya*, Kalidina of 1,211,454**

Kalidina in Kerala tradition means the reckoned count of days since the beginning of Kaliyuga marked by a presumed mean conjunction of the nine traditional planetary longitudes. We have no idea as to when the system took roots in Kerala. But it is well known that the Kalidina reckoning existed in Kerala prior to *Āryabhaṭa* (522 CE) and after *Āryabhaṭa* in the same fashion as *Katapayādi*, an alphanumeric notation that *Āryabhaṭa* did not use in his astronomical works. Detailed note is provided under references.<sup>9</sup> Astronomical details of the above Kalidina of 1,211,454 can be therefore worked out using the *Yugādi* based computations we see in the *Siddhāntic* texts of later times.

#### ***Bhūmaubhūpoyamprāpya*, Kalidina of 1,211,454**

Kalidina 1,211,454 refers to the number of days elapsed since the beginning of Kaliyuga on 18.02.–3101 CE at 06:00 Mean Sunrise of *Ujjayinī*. Julian Day (JD) Number for the epoch is 588,465.75 corresponding to TDT of 588,466.5993912 when  $\delta T$  of 5167s is used for astronomical time reckoning to account for the secular variation in earth's rotation. Kalidina of 1,211,454 may be computed accordingly as the date of JD 1,799,919.75, i.e., Thursday, November 30, 215 CE, 06:00, Sun  $\lambda = 247:33$  and Moon  $\lambda = 137:20$ . *Mārgaśr̥ṣa Kṛṣṇaṣṭī*, the mythological lunar date on which *Skanda* had taken over charge as *Devasenādhipati*, Chief of the army of Gods.

Can it be a coincidence that the chronogram of *Perumāḷ* ascension that took place in a cycle of 12 years coincided with the rise of *Skanda* as the General of the Gods?

<sup>9</sup> Vararuci, the legendary author of the *Gīṛṇaśreyādi Candravākyas* and the father of Agnihotri can be dated to the 3<sup>rd</sup> century CE based on the two chronograms available about the life of Agnihotri. Agnihotri is said to have ignited the sacrificial fire for the first time in Kerala on the Kalidina of 'Yajñasthānamsamrak syam' 1,270,701, corresponding to February 13, 378 CE. Date falls on *amāvāsya* and it is likely that Agnihotri lighted fire on *Phālguna-pratipada*, the next day. Kadavallur *Srī Rāma* temple, according to legends, was established on the Kalidina 'Kadavallūrananyam' 1,123,411 which corresponds to *Sukla-navamī* (*Rāmatīthi*) of *Mārgaśr̥ṣa* and the date November 13, –26 CE. *Srivallabha* temple in Tiruvalla had the idol installed on the Kalidina of 1,111,526 corresponding to April 29, –58 CE which corresponds to *Uttarabhadra*, and *Daśamī* tithi auspicious for such functions. *Tirumandhāmkunnu* temple had its renovation on the day 'Cembakadeseramyē' 1,258,116 corresponding to August 31, 343 AD, *Puṣya nakṣatra* of *Kanyā* and tithi is *Daśamī*. Peruvanam Siva temple gives 'Āyātusivalokam' Kalidina 1,345,610, March 18, 583 CE.

CE: plz chk is it a minus

CE: plz note the change

## Features of Mārgaśr̥ṣādi Paurṇamānta Calendar in 215 CE

Mārgaśr̥ṣādi Paurṇamānta calendar had been in existence in India in ancient times as may be noted from the work of Dikshit and in 215 CE, it may be noted that:

- Full Moon of Paurṇamānta Kārttika . Lunar month ended on the first day of the solar month of Dhanus (Sagittarius), Friday, November 24, 215 CE, 05:44, JD:1,799,913.739, Sun  $\lambda = 241:25$  and Moon  $\lambda = 61:25$ .
- New Year, Mārgaśr̥ṣa Kṛṣṇa pratipada must have been observed on November 24, 215 CE.
- November 29, 215 CE: Mārgaśr̥ṣa Kṛṣṇa Śaṣṭhī, Kāmadā , Maghā nakṣatra, Kalidina 1,211,453 expired and 1,211,454 running marked this date.
- According to traditional reckoning of expired days, Kalidina 1,211,454 is Thursday, November 30, 215 CE.
- Another astronomical factor is the heliacal rise of Jupiter on Anurādha . November 24, 215 CE, New year had Jupiter at sunrise at an altitude of 17° and thus the year and epoch was chosen specially by its astronomical significance. Bārhaspatya (Jupiter), Cāndra (Lunar) and the Saura (Solar) year reckoning had a rare and remarkable coincidence.
- Perumāl reign had a 12-year cycle like Jupiter and the Bārhaspatya years were reckoned in a cycle of 60 years. In terms of Kali years elapsed, 55 cycles of 60 and 16 years had passed at this time.

Can we brush aside this date (215 CE) as of legends compiled in the unreliable Brāhmnical history by name Keraḷolpatti or as Kalidina interpolated into the text in later times like 6<sup>th</sup> century, after the time of Āryabha ta ?

## Skanda as War God in Indian Antiquity – Implications of Skanda Śaṣṭī,

It may be noted here that the centuries since the beginning of the Common Era stands illumined by inscriptional and numismatic evidence for the popularity of Skanda as the War God. His name had been most popular with Kaniskā , Yaudheyas and Guptas and Kālidāsa immortalized the glory of Skanda through his work Kumārasambhavam . Kālidāsa also described his abode at Devagiri in Meghasandēsam .

It is well evident against the above historical background of Skanda worship as War God ( Devasenāpati ) that the date November 30, 215 CE, Mārgaśr̥ṣa Kṛṣṇa (6) or Kalidina 1211454, corresponding to the chronogram Bhūmaubhūpo f yamprāpya was chosen on socio-religious grounds for the coronation of a King.

We can find supporting evidence in The Ten Idylls ( Pattupāttukal or Patittu pattu ) and Puranānūru for the fact that the early Cera Kings of the Sangham Age were worshippers of Skanda – Kārttikeya as the War God. Tirumurugatruppadaī by Nakkīrar, Akanānūru , Puranānūru , etc., of the Sangham period also refer to some of the abodes

of Skanda such as *Tiruceṇḍūr*. Thus the epoch of 215 CE representing Skanda-Ṣaṣṭī is definitely of great historical value.

According to *Keralolpatti*, the coronation of the *Perumāḷ* took place during the festival of *Thevar* i.e., *Mahāmaghā* festival and we can understand from the earlier discussions on 215 CE that the festival of *Thevar* may have been originally Skanda-Ṣaṣṭī, the day of ascension of Skanda as General or *Perumāḷ* of the 'Army of Gods' (*Devasena*).

### **Evidence of *Bārhaspatya* Reckoning in *Perumāḷ* Coronations**

We have little details available about the reigns of various *Perumāḷ*s to verify the earlier cited heliacal rise of Jupiter or its position in *Vṛścikā* as the astronomical factor that decided the 12-year cycle. But an important clue is available in quite later times i.e., 9<sup>th</sup> century CE. According to *Nārāyaṇan*,<sup>10</sup> *Rājasekhara* and *Stāṇuravi* took over respectively in 820 and 844 CE, both years of *Vṛścikā* Guru. Is this a coincidence? The following propositions may be noted:

- Astronomical considerations bring to our mind the 605 years separating the epoch of 215 CE and 820 CE and the intervening day-count of 220,982 in fact constitute precisely 554 *Barhaspatya* years.
- When we are speaking of dates and times about which we know very little from records, we are left with the only alternative of deriving maximum benefit out of the apparent astronomical rationale. In this case the 605 years (215 CE to 820 CE) intervening between the enthronements of the two *Perumāḷ*s point towards the prevalence of *Bārhaspatya* Calendar (involving 60 years cycles as may be gleaned from *Āryabhaṭīya*) in Kerala even centuries before the time of *Āryabhaṭa*.
- It may be deduced from the above that originally *Mahāmaghā* (*Māmāṅkam*) considered as coinciding with *Kāmadā Ṣaṣṭhī* of *Mārgaśīrṣa*, may have been the *Maghā nakṣatra* chosen for the 12-year *Satra* (*Pantīrāṇṭu Sabha*) at *Tirunāvāya* or *Tirumāndhāmkunnu* and in later times the coronation may have got shifted to *Māgha-Maghā*. Available records indicate that in later historical times *Māgha-Maghā Pantīrāṇṭu Sabha* was held during the lunation between *Māgha Kṛṣṇa Pratipada* (coming after *Pausa Paurṇamānta Puṣya*) *nakṣatra* (*Purāṇic* birthday of Skanda) and *Māgha-Maghā Paurṇamī*.
- In later times, the statement of the position of Jupiter can be identified as a common feature of the Cera inscriptions. Such a practice obviously is a borrowing from the astronomical tradition, which we may trace back to *Āryabhaṭa* of 522 CE or even to 215 CE as explained later.
- *Māghamaghā* of astronomical Calendar is said to have been instituted by the legendary *Paraśurāma* in 215 CE and as such the astronomical tradition of *Tirunāvāya* can be traced to the same epoch.<sup>11</sup>

<sup>10</sup> Narayanan M G S, *Perumals of Kerala*, Ph.D. Thesis, Kerala University, Private Circulation only. Also seen in an article appearing at the site <http://www.keralahistory.ac.in> which gives the years of their accession to power.

<sup>11</sup> Menon Sankunni P (1994), *Tiruvitāmkūr Caritram*, Kerala *Bhāṣā* Institute, Trivandrum, p. 21.

## **Evidence of *Āryabha ta* for *Māmānkam* Coeval with *Vr̥scika* Guru**

The following aspects of *Āryabha ta* tradition render supporting evidence for the role of *Bārhaspatya* Calendar and the significance of 215 CE epoch in the early socio-religious life of Kerala.

It is known from legends that in Kerala astronomical tradition, the *Parahitaganīta* of Haridatta got accepted in the *Pantīrāṅṭu* Sabha of 683 or 684 AD. But this legend is fraught with the following infirmities:

- According to the *Vr̥scikā* -Guru rationale identified above *Mahā – Maghā* Satram was not possible in 683 or 684 AD, the date of Haridatta.
- Haridatta had introduced only *bījas* or corrections to the *Āryabha ta* system and as such it may not have been as important as of the introduction of a new *Siddhānta* or reckoning as in *Āryabha tīya* to be referred to as a new system called *Parahitaganitam*, which was to continue in Kerala till the 19<sup>th</sup> century CE despite the introduction *Drgganita* by *Parameśvara* in 1451 CE.

It can therefore be inferred that the legends concerning *Parahita* in fact refer to the system of *Āryabha ta* which got accepted in a *Pantīrāṅṭu* Sabha or *Mahā – Maghā* session when Jupiter was in *Vr̥scikā*. It is interesting to note here that the epoch of *Āryabha ta*'s *Ārdharātrika Siddhānta* was 499 CE with Guru in *Tulā* and it is likely that the *Siddhānta* may have got presented first time in the *Pantīrāṅṭu* Sabha of 500 CE, *Vr̥scikā* -Guru, Kali 3601 when *Mārgasīrṣādi* Calendar began on Friday, Pratipada, November 22. *Pantīrāṅṭu* Sabha would have been from December 22, 500 CE to January 20, 501 CE.

- *Āryabha tīya* also supports the above mentioned contention because the Kali year *Girituṅga* (3623) was *Kanyā – Guru* i.e., Jupiter in 2 signs behind *Vr̥scikā* and hence the completed *Siddhānta* could have been presented in the *Mahā – Maghā* session of Kali 3625 in which *Mārgasīrṣa* had its beginning on November 29, 524 CE with *Kṛṣṇa pratipadā* after the heliacal rise of Jupiter. *Mahā – Maghā* in *Mārgasīrṣa* was on December 1 or 2 while *Māghā – Māghā* *Pantīrāṅṭu* Sabha could have been from December 27, 524 CE to January 25, 525, *Māgha-Maghā Paurṇamī*.
- The fact that *Āryabha ta* had used Greco-Babylonian resources in creating the new *Siddhānta* was known to the assembly, is evident from the name '*Parahita – Gaṇia*' (*Gaṇita* of others) given to it by the *Pantīrāṅṭu* Sabha.

## **Extinction of *Ārdharātrasiddhānta* in Kerala and Elsewhere**

The above discussion on the role of *Mahā – Maghā* tradition and the *Parahitaganitam*, explains the disappearance of *Ārdharātrasiddhāntam* even from its birthplace viz., Kerala. As shown above, the *Ārdharātrika* introduced to the *Pantīrāṅṭu* Sabha in 500 CE was superseded by *Audayika Siddhānta* or *Āryabha tīya* in Kali 3625 and as is well-known, the decrees of the assembly had to be adhered to and so it can be inferred that the *Ārdharātrasiddhānta* fell into disuse in Kerala as early as 524 CE and then

disappeared. Nothing was known in Kerala about it through any work of the Keralites unless we are to assume that *Bhāskara* belonged to Kerala and migrated to Vallabhi. Even during the times of *Bhāskara* -I, *Āryabhaṭīya* had been in the limelight and only Brahmagupta adopted and worked on *Ārdharātrika Siddhānta* to produce his work *Khandakhādya*.

### **Evidence of Kolla Varsam – Significance of 215 CE**

From a historian's point of view no definite information is available about the Calendar reform that we see in Kerala in 825 CE. A number of legends can be found, like:

- Cyrian Christian Merchants who arrived in Kollam (Quilon Port) started this reckoning which came to be known as Kollam.
- Marks the death of *Sundaramūrthi Nāyanār* or *Ceramān Perumāl*
- Started from the foundation day of the Kollam Port
- *Veṇād* King *Udayamāthānda* Varma had the consecration of the Siva temple at Kollam and began the New Calendar on the insistence of *Śaṅkarācārya*. The chronogram of the beginning date is given as '*Ācāryavāgabhedya*' Kalidina 1434160, August 25, 825 CE, 1<sup>st</sup> day of Solar *Kanyā*, *Mahānavamī*, *Mūlam nakṣatram*. The *tithi* and *nakṣatra* (*Bhādrapada–Śuklanavamī* coinciding with the star *Mūlam* of *Durgā*) suggest that the legend regarding the consecration of the temple may be right.

Even though the *tithi* and *nakṣatram* suggest the occasion at which the Era was introduced, we are in dark as to what rationale may have impelled them in the choice of the particular year. The Kalidina cited at the beginning, '*Bhūmaubhūpoayamprapya*' and the epoch we identified viz., 215 CE as marking the reign of the new *Perumāl* comes to our rescue here. When we look at the intervening 610 years with solar year length of *Ārdharātrika Siddhānta*, we can find:

$$610 \times 365.25875 = 222,808 \text{ days} = 7,545 \text{ lunation}$$

It is apparent that the luni-solar cycle had been the same in 215 CE and 825 CE according to the *Siddhāntic* computations. Tropical computations give the following results:

It can be noted from Table 2 that the beginning of Kollam Era on 25<sup>th</sup> August 825 CE was the result of efforts to refix the epoch August 20, 215 CE, *Bhādrapada Śuklanavamī* and *Mūlanakṣatra* in 825 CE as per the *Siddhāntic nirayana* or fixed Zodiac. The 215 and 825 CE epochs are placed almost symmetrical to the zero *ayanāmsa* epoch of *Āryabhaṭa* viz. 522 CE or Kali 3623 with  $\pm 50^0$  precession according to *Siddhāntic* rule.

### **Why and How the Two Epochs 215 CE and 825 CE have Resemblance?**

Beginning of *Kollavarsam* or the Kollam Era on August 25, 825 CE, with the 1<sup>st</sup> day of the solar month of *Kanyā* gives us a very valuable clue on the cardinal principle under which Calendar reforms took place in Kerala since 215 CE.



Epochs: August 25, 825 CE, 12:00, Sun tropical  $\lambda = 155:33$ , sidereal  $\lambda = 150:30$

August 25, 215 CE, 12:00, Sun tropical  $\lambda = 150:24$ , sidereal  $\lambda = 150:24$

| 215 AD            | Sun    | Moon   | Difference with AD 522   |                              |
|-------------------|--------|--------|--------------------------|------------------------------|
| August 20, 06:00  | 145:16 | 244:57 | +307                     | <i>Bhādrapadaśuklanavamī</i> |
| August 25, 06:00  | 150:09 | 310:21 |                          | <i>Bhādrapada ś (14)</i>     |
| <i>Siddhāntic</i> |        |        |                          |                              |
| August 20, 06:00  | 150:23 | 259:62 | +05° 07' <i>Ayanāmsa</i> | <i>Bhādrapadaśuklanavamī</i> |
| 825 AD            |        |        |                          |                              |
| August 20, 06:00  | 150:26 | 181:42 | -303                     | <i>Bhādrapada ś (4)</i>      |
| August 25, 06:00  | 155:19 | 252:47 |                          | <i>Bhādrapadaśuklanavamī</i> |
| <i>Sidereal</i>   |        |        |                          |                              |
| August 25, 06:00  | 150:16 | 247:44 | -05° 03' <i>Ayanāmsa</i> | <i>Bhādrapadaśuklanavamī</i> |

Thus we see 215 CE reflected in both the Coronation of the *Perumāḷ* in 820 AD and also in the epoch of Kollam, viz. 825 CE.

It is apparent from the long discussion above that the different aspects of the Kerala history and astronomical cum calendar traditions suggest that the epoch 215 CE, derivable from the astronomical chronogram, marks the end of Cera Kingship as we find recorded in *Keralolpatti*. Also, the date November 30, 215 CE marked the establishment of *Perumāḷ* rule in Kerala with the frequency of 12 years reckoned on the basis of Jupiter.

*Mahā – Maghā* as shown may have been originally *Maghā* that corresponded to the festival of the God of War, Skanda. A second possibility is that the Keya *Perumāḷ* got enthroned on November 30, 215 CE (*Mārgaśīrṣa Kṛṣṇa* (6)) and the ascension got approved by the tribal chieftains during the festival of *Mahā – Maghā* celebrated during the lunation beginning with the full moon of *Tai* or *Taippūyam*, the birth star of *Skanda* and ending with the *Maghā nakṣatra* of *Māgha*.

It is interesting to note that:

- The epochs 215 CE and 825 CE are connected by the sidereal year but both the epochs differed by 5° in the case of Sun's tropical longitude. As such the solar phenomena may have been different if the same place is considered.
- But the two epochs as explained above had been with reference to North Kerala (215 CE) and South Kerala (825 CE) respectively.
- Calendar beginning with the solar month of *Kanyā* is still a Malabar custom (North Kerala) and thus we may infer that the Kollam Era is an adoption of the Calendar prevalent in North Kerala by the *Kulasekharas*.

**Identifying the Astronomical Rationale**

The astronomical observation underlying the above mentioned Calendar reform in Kerala with a shift of the seat of political power from North to South can be understood from the data presented in Table 3.<sup>12</sup>

CE: plz note the change

| Table 3: Sun Transiting Zenith for the Latitudes of Kerala (8°-12°N) <sup>13</sup> |                                 |                                 |
|--|---------------------------------|---------------------------------|
| Latitude $\phi$  | Sun: $\omega = 24^\circ$        |                                 |
|  | $\lambda 1$ for $\delta = \phi$ | $\lambda 2$ for $\delta = \phi$ |
| 12   | 30.74                           | 149.26                          |
| 11   | 27.98                           | 152.02                          |
| 10.85  | 27.57                           | 152.43                          |
| 10   | 25.27                           | 154.73                          |
| 9.5  | 23.94                           | 156.06                          |
| 9  | 22.62                           | 157.38                          |
| 8  | 20.01                           | 159.99                          |

- August 25, 825 CE epoch at Mahodayapuram or Kollam corresponds to the date when Sun transited Zenith for the latitude 10°N.
- Further, it may be inferred that the Onam celebrations may be a relic of the New Year celebrations of ancient times fixed on the basis of the Zenith transit of Sun.
- Epoch August 25, 215 CE marked the Zenith transit of Sun at Tirunāvāya or Tondi (ancient Cera capital) which lay close to the place of Āryabha ta (10N51, 75E45) who in 499 CE and 522 CE reformed the computations with the Ardharātrika and the Audayika Siddhānta s.
- Intervening Āryabha ta Epoch of Kali 3600 elapsed: Kanyā year beginning on 23.08.499 CE with Bhādrapada Sukla – pratipada . New Moon occurred at 22.08.499 CE, 20:57 on the Ujjayinī meridian with  $\lambda$  Sun =  $\lambda$  Moon = 150°00' precisely. Declination of the new moon Sun had been 11°34' and two days after Sun had transited the Zenith at 10N51  $\approx$  11°N. Kanyā year beginning on 23.08.499 had the observation of Moon in Hasta after sunset and the 10<sup>th</sup> day was Onam with Moon in Sravana nakshatra . Calendar as above reflects the thumb rule of Onam reckoning 'Attam Pattonam' i.e., the 10<sup>th</sup> day is Onam . It may be noted from the table that for tropical  $\lambda = 150$  to 160, Sun transits the Zenith for the Kerala latitudes of 12°N to 8°N (Kanyākumāri).

It is against the above background of the astronomical tradition of Kerala traceable to 215 CE, the dating of the Cera Kings is attempted in the following discussion.

CE: plz note the change

<sup>12</sup>  $\lambda 1$  and  $\lambda 2$  are longitudes symmetrically placed to the summer solstice and having the same declination for Sun equal to the local latitude  $\phi$  . Basic relationship involved is  $\text{Sin} \lambda * \text{Sin} \omega = \text{Sin} \delta$  .

<sup>13</sup> Computations are based on modern popular algorithms of Burea des Longitudes, Paris.

## Dating of the Cera Kingdoms based on 215 CE Anchor

### Cera Chronology

Against the above background, when we look at the Cera Kingdoms and their regnal years available in 'Patittupattu' (*The Ten Idylls*),<sup>14</sup> we can place the 10 Cera Kings during the period 215 CE to (-) 43 CE with a difference possible of around 20 years up to (-) 60 CE for the 2 *Patikams* that have not been found.

| Kings           | Scheme-I    |              | Scheme-II   |              | Scheme-II Interval |
|-----------------|-------------|--------------|-------------|--------------|--------------------|
|                 | Reign Years | CE-Beginning | Reign Years | CE-Beginning |                    |
| <i>Perumāls</i> | 10          | 215          | 2           | 215          | -                  |
| Cera 10         | 16          | 205          | 16          | 213          | 213-215 CE         |
| Cera 9          | 17          | 189          | 17          | 197          | 197-213 CE         |
| Cera 8          | 25          | 172          | 25          | 180          | 180-197 CE         |
| Cera 7          | 35          | 147          | 35          | 155          | 155-180 CE         |
| Cera 6          | 55          | 112          | 55          | 120          | 120-155 CE         |
| Cera 5          | 25          | 57           | 25          | 65           | 65-120 CE          |
| Cera 4          | 25          | 32           | 25          | 40           | 40-65 CE           |
| Cera 3          | 58          | 7            | 58          | 15           | 10-40 CE           |
| Cera 2          | -           | -51          | -           | -43          | -43 to 15 CE       |
| Cera 1          | -           | -            | -           | -            | -43to XX CE        |

CE: plz chk as the details of the last cera king is missing, can we write From -43 CE

CE: plz note the change

Schemes I and II take 10 and 2 years for the last Cera King whose details are not available (Table 4). Interval is given as per Scheme II which puts the reign of Cera 3 from 15 to 40 CE. And 34 CE is taken as the cut off for the reign of Cera 3, *Palyānai Cel Kezhukuttuvan*, based on Song 4 in praise of his valor.

It is shown below that the Scheme II meets with adequate substantiation in the dating of two astronomical references available in *Patittupattu* and *Puranānūru*.

### Dating Song 4 in Praise of *Palyānai Cel Kezhukuttuvan*

Song 4 in praise of *Palyānai Cel Kezhukuttuvan* speaks of "Shining Venus in the northern sky along with planets favorable for rains" and praises Cera for feeding the people despite the fact that the rains are yet to fall in the rainy season. This observation by the poet *Pālai Kautumanar (Pālai Gautamanār)* may be interpreted as Venus having north

<sup>14</sup> Aiyar G V (1997), *Patittupattu* verses along with Malayalam translation, Kerala Sahitya Academy, Trichur.

<sup>15</sup> It is possible that the years given in *Patittupattu* may not be the regnal years of the superior king. They may have been of the next to succeed to the throne—*Ilaya* Raja as known in the Kerala tradition.

declination becoming visible along with Moon, Mercury and Jupiter before the onset of rains. This is a rare event and the date of observation is May 8, 34 AD.

### **Date of *Kalankāikanni Nārmudiceral***

*Puranānūru*, Puram 229 mentions that the King *Nārmudiceral* died at the time of an earthquake seven days after sighting of celestial body in the sky. It was in the month of *Mīnam*, that is, March-April. Existing date of the event is March 141 CE on the basis of the argument that the celestial body was the Halley's Comet.<sup>16</sup> Present author seeks to correct the above date as 65 CE, 76 years earlier; at this epoch too Halley's Comet must have made its appearance. *Sesa Iyyer* has given the following translation for verse 229 where the verse is interpreted to mean the fall of a meteorite rather than citing the Comet.

CE: plz chk  
does it refer  
to the author  
of this article

On the day of *Kuddam* (*Karttika*) when the Sun was in the sign of *Adu* (*Mesha*) at midnight when the asterisms from the first star of *Mudappanai* (*Anurādha*) to the last star of *Kulam* (*Punarvasu*) were visible in the sky, and while the asterism which is in the zenith during the first half of the month of *Pankuni* (*Phalguni*) was declining from the zenith, the eighth asterism before it was setting and the eighth asterism after it was rising, a brilliant meteor which illumined the whole sky fell towards the northeast...<sup>17</sup>

It is therefore apparent that 65 CE heavenly event finds interpretation as meteorite fall as well. It is crystal clear that a description as above, of a meteorite fall cannot be dated by any astronomical methods. No datable planetary phenomenon is apparent in the song. May be we can understand the Poet's description if the date of the event described is known by contrasting the record as above in Puram 229 with the celestial phenomena of Feb-March 65 CE as follows:

In the first half of the month *Painkuni* a star (celestial body, may be a star or a planet) was found to transit the zenith at midnight. As days passed and Sun entered *Ātu* or *Medam* (*Aries*), midnight had the first star of *Anurādha* on the Eastern horizon and the last star of *Punarvasu* on the West. The zenithal body of the *Painkuni* first half was now found to decline from zenith at midnight and at this time on the day when Moon was in *Krttikā* (*Alcyone*), a brilliant Comet lighted the North East...

Based on this rendering of the astronomical observation, we can deduce that:

- A celestial body is cited to transit the zenith at midnight in the first half of the month of *Phālguni*. Considering the *Paurṇamāntha* system, the period can be understood as from February 8, 65 CE to February 21, 65 CE.

---

<sup>16</sup> Pillai *Paramesvaran V R* (1997), *Puranānūru -Songs and Translation*, Kerala Sahitya Academy, Trichur, pp. 311-312. (Hart's translation is of little help in identifying the celestial event described. *Puranānūru*, The 400 Songs of War and Wisdom, Translated by George L Hart and Hank Heifetz, Penguin Books India, 2002. Satisfactory translation of the verse 229 could be seen only at the website <http://www.keralahistory.net/> History of Ancient Kerala by donbosokuriapilly@gmail.com

<sup>17</sup> <http://www.keralahistory.net/> History of Ancient Kerala by donbosokuriapilly@gmail.com

CE: plz note the change

- The celestial body transiting zenith at midnight in the above period was Saturn (Table 5). On February 18, 65 CE, Saturn had transited zenith exactly at midnight. Thus the celestial body was overhead at all places and reminds us of the star of Bethlehem of the Biblical and Chaldean fame.
- It must be noted that no other significant stellar upper transit could be observed at midnight during the first half of Painkuni ( *Phālguni* ).
- At the upper transit of Saturn in the midnight,  $\alpha$  -Scorpio ( *Anurādhā* ) could be seen rising in the East and  $\gamma$  -Geminorum or last of *Punarvasu* could be seen in the West.
- As Saturn declined from the Zenith at midnight in the solar month of *Medam* ( *Ātu* ), **Comet appeared in the North-East on March 27, 65 CE** when Moon was in *Kṛttikā*. Jupiter, Venus, Mercury and Moon could be seen before twilight in the East on March 22, 65 CE.

| Date                      | Midnight at 10N51, 75E45 | Saturn Transit |
|---------------------------|--------------------------|----------------|
| February 8, 65 CE         | 00h 18m                  | 00h 44m        |
| February 12               | 00h 18m                  | 00h 28m        |
| February 16               | 00h 17m                  | 00h 10m        |
| February 20               | 00h 17m                  | 23h 49m        |
| February 24               | 00h 16m                  | 23h 32m        |
| February 28               | 00h 15m                  | 23h 16         |
| March 28 ( <i>Medam</i> ) | 00h 06m                  | 21h 19         |

- Figures 1 and 2 derived using SkyMapPro software depict the skies as on February 18, and March 28, 65 CE respectively, which illustrate the phenomena described in Puram 229.

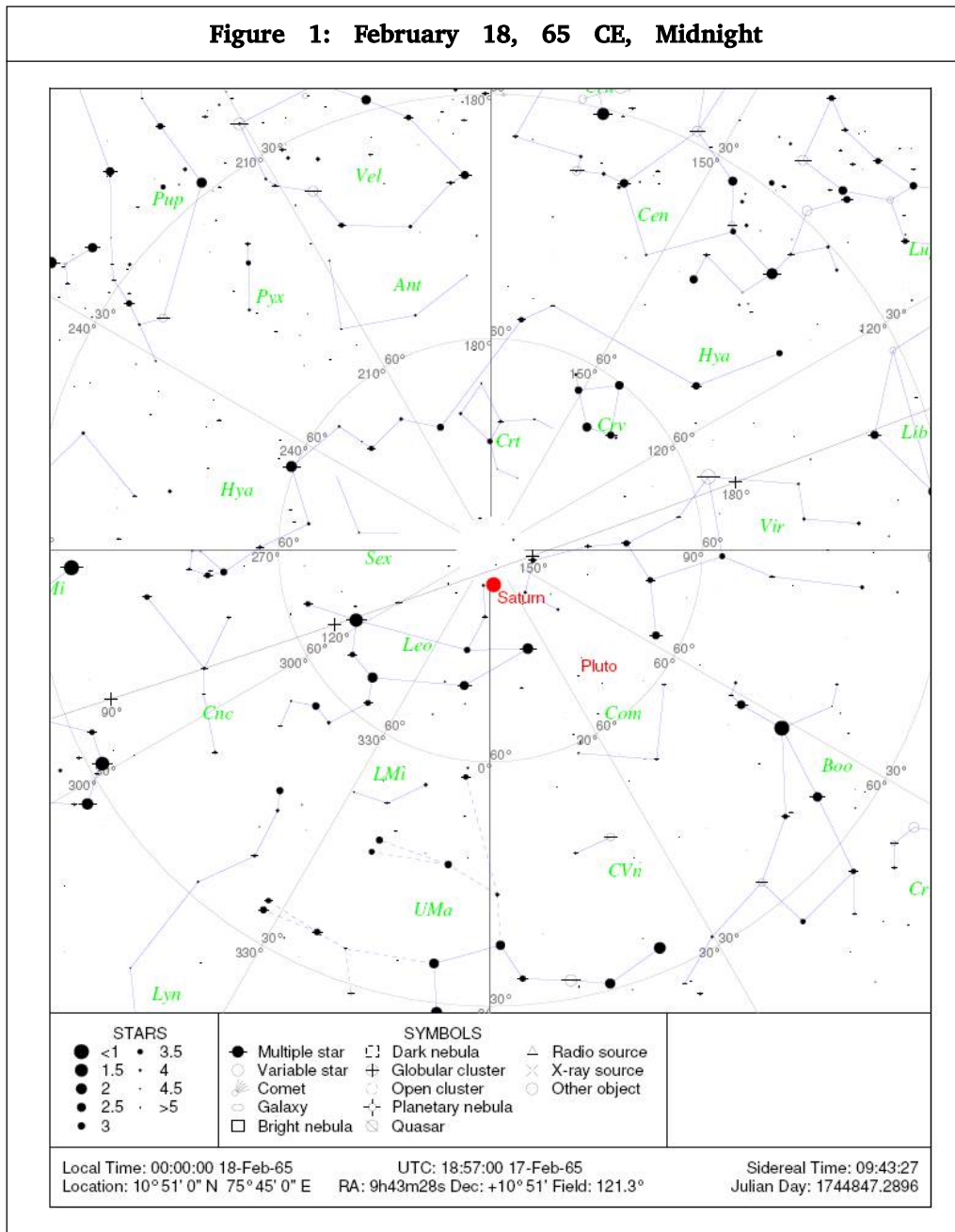
Figure 1, February 18, 65 CE: Celestial Body Transiting the Zenith at Midnight in the first half of the month *Phālguni*. Stars of *Punarvasu* and *Anurādhā* marked the intersection of horizon with ecliptic at midnight. It may be noted that around this time no significant star transited the Zenith in south latitudes of Cera Kings and thus the celestial body observed can be identified as Saturn. Saturn transiting the zenith at midnight may have been interpreted as inauspicious as the King was suffering from illness.

Figure 2, March 28, 65 CE: Celestial body which transited Zenith at midnight drifted away in *Medam* and then meteor struck or the Comet appeared and on the Karttika day the King died.

- Cera King *Kalankāikanni Nārmudiceral* died on the 7<sup>th</sup> day of *Kṛttikā*, i.e., on April 2, 65 CE when Moon occupied the *Āslesā* nakshatra .

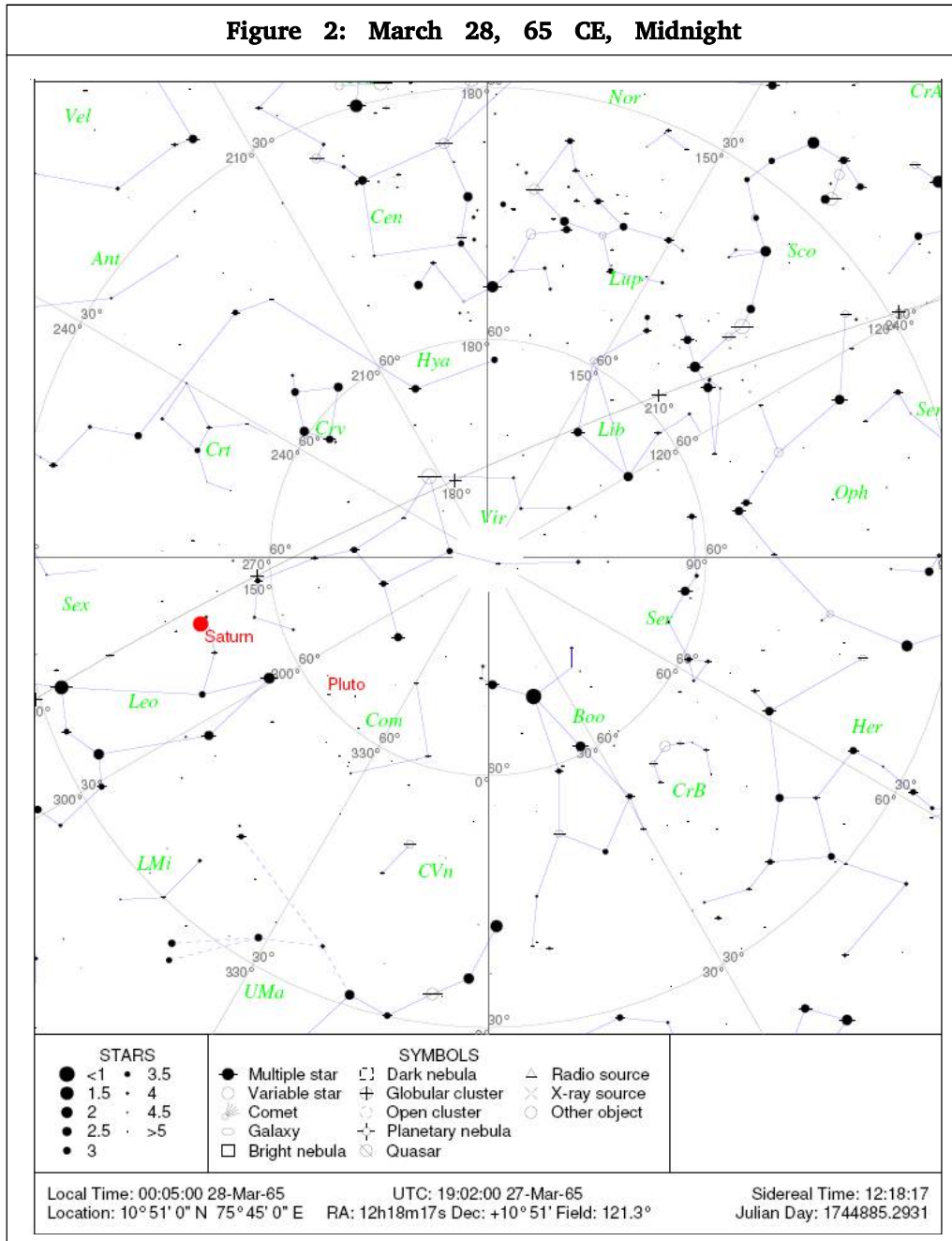
<sup>18</sup> These computations are based on the Skymap Pro software.

**Figure 1: February 18, 65 CE, Midnight**



Western interpretations on the star of Bethlehem, based on the Halley's Comet appearance in 65 CE and significance that the year achieved by the death of Seneca, etc., point towards the fact that in places other than Rome and Jerusalem too the celestial phenomena may have been viewed as ominous. Historical evidence suggests that the Gospels were written around/after 65 CE and it was the above phenomena observed in 65 CE that inspired the Gospel writers to create the legend of

a star that stood above Jerusalem. Only a celestial body transiting the zenith can be interpreted as standing over a place.



Chinese chronicles have recorded Halley's appearance of -11 CE and thus the event referred to in Puram 229 is most likely the appearance of the Comet in the North-East direction. From March 26, 65 CE onwards, for two to three weeks, early morning could

see Jupiter, Venus and Mercury rising just before twilight and the simultaneous appearance of the Comet may have been interpreted as ominous by people.

Dating of the Cera rulers as above in reverse order from 215 CE receive support from the following historical facts known through other sources:

- *Gajabāhu* synchronism dates Ceran Cenkuttuvan (65-120 CE) to coeval with *Gajabāhu-I* whose reign is dated to 113-134 CE.
- *Irāvataṁ* Mahadevan<sup>19</sup> is stated to have dated the Irumporais to 2<sup>nd</sup> century CE. Irumporais according to the above Chronology of the Kings are the last two of the Cera Kings about whom the songs have been obtained. They are Cera 8 and 9 in the above Table and the period is 180-213 CE. *Takadūr* Erintha Perumceral Irumporai reigned during 180-197 CE, perfectly within the 2<sup>nd</sup> century CE.
- Foreign sources like Strabo's *Geography*, Pliny's *Natural History* (77 CE), *The Periplus of the Erythrean Sea* (77 CE), Ptolomy's *Geography* (125 CE), etc., have described Kerala as a place with many important centers frequented by Romans and Greeks. Coinage discovered in recent times has supported such references.

## Conclusion

- Chronograms of Kalidina, even though the sources are legends, may contain valuable historical information as the alphanumeric capsule could have been derived only by ancient astronomers who had its use in the computation of tithi, *nakṣatra* and other elements of Calendar.
- Chronogram ' *Bhūmaubhūpo f yamprāpya* ' of the beginning of *Perumāl* reign is shown to be corresponding to the date November 30, 215 CE, *Mārgaśīrṣa Kṛṣṇa-ṣaṣṭī* coinciding with *Maghā nakṣatra* . Date is shown to be of socio-religious significance as the tithi marked the ascension to Lordship of the Army of Gods by Skanda.
- Significance of 215 CE as the sheet anchor of Kerala chronology is demonstrated using evidence on the *Bārhaspatya* reckoning of year and *Mahā – Maghā* festival. *Āryabhata* tradition of astronomy and the beginning of *Kollavarṣam* in 825 CE are shown to give supporting evidence for the significance of 215 CE.
- With 215 CE as the sheet anchor, Cera Chronology is brought out and the eight Kings whose glory is sung in *Patittupattu* is shown to have reigned during –43 CE to 213 CE. Ceran *Cenkuttuvan* of *Kannaki* fame in Kerala legends is shown to have reigned during 65-120 CE with some overlapping years with *Gajabāhu-I* (113-134) while Cel *Kezhu Kettuvan* is assigned the period 10-40 CE.
- *Kalankāikanni Nārmudiceral* is shown to have reigned during 40-65 CE and the year of his demise has been shown to agree with astronomical dating of the observation recorded in verse 229 of *Puranānūru* . ❀

Reference # 52J-2008-04-xx-01

---

<sup>19</sup> <http://www.tamil.net/list/2000-12/msg00937.html> – Interview With Iravatam Mahadevan (excerpt) <http://www.harappa.com/script/mahadevantext.html#12>