



# Heavenly Bodies, Celestial Phenomena and Calendrical Data in Tamil Epigraphical Inscriptions (Fifteenth to Seventeenth Centuries)

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In this paper, a survey of 180 inscriptions in Tamil between 1346 CE and 1400 CE is analysed for its notions and visualization of astral themes present in the epigraphical inscriptions as well as for the calendrical practices implicit in those inscriptions. I demonstrate the rich diversity of calendrical practices employed in this period. Although there are clear local usages, the applied methods of identification show that in several cases methods from other Indian calendrical traditions have also been used. This applies both to the year and the month. In contrast, the use of the weekday is not widely seen in the inscriptions of this region following the local system. The study also clarifies that the inscriptions are a useful documentary source for other astronomical observations such as eclipses and solstices undertaken in southern Indian locations in the fourteenth and fifteenth centuries.

*Keywords:* inscriptions, calendars, eclipses, Tamil Nadu

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Himmelskörper, Himmelserscheinungen und Kalenderdaten in Tamilinschriften (15.–17. Jahrhundert)

In diesem Artikel werden 180 Tamilinschriften aus einem halben Jahrhundert (1346–1400) auf ihre astralen Konzepte und deren Visualisierungen sowie hinsichtlich ihrer impliziten kalendarischen Praktiken untersucht. Ich weise die reichhaltige Vielfalt der in dieser Zeit benutzten kalendarischen Methoden nach. Obwohl es eine klare Schwerpunktsetzung hinsichtlich technischer Parameter gibt, zeigen die angewandten Methoden der Identifikation, dass in mehreren Fällen auch Methoden aus anderen indischen kalendarischen Traditionen benutzt worden sind. Das gilt sowohl für das Jahr als auch den Monat. Im Gegensatz dazu wird die Woche in jenen Inschriften, die in Regionen angefertigt worden sind, die das System der Tamilmomate benutzen, nur selten angetroffen. Mein Studium der Inschriften zeigt außerdem, dass sie sich als nützliche dokumentarische Quelle für andere astronomische Beobachtungen erweisen, etwa von Beispiel Finsternissen und Solstitien, die in südindischen Örtlichkeiten im 14. und 15. Jahrhundert gemacht worden sind.

*Schlüsselwörter:* Inschriften, Kalender, Finsternisse, Tamil Nadu

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The South Indian corpus of inscriptions constitutes a vital source of textual records of medieval South Indian societies. Carved in stone, mostly in temples, or in copper plates, these epigraphic materials offer the historian critical insights concerning the state, social relations, modes of production

and distribution of resources, and about social and religious lives of the people of southern India, from about the seventh century onward, if not earlier. It might seem tenuous to situate such textual records in a study concerned with the visual record of the understanding of heavenly phenomena. Much of the textual record is indeed neither related to the heavens nor to visualized forms of knowledge. Predominantly, the inscriptions inform us about land revenue and temple administration, gift-centered transactions between institutions of the state and specific occupational communities. In addition, they often contain only fragments of information. However, a small part of the corpus directly addresses matters linking the heavens and earth: calendrical information, astronomical events, gifts dedicated to astrologers or references to special rituals.

Through this investigation, we hope to understand the presence of diverse calendrical practices in spatial and temporal terms in medieval south India. This would also suggest further questions important for studies of itineraries of heavenly pictorial representations: (1) did the diverse calendars, though apparently distinct, encounter each other at all; (2) what do the textual records tell us about the place of stars in defining time; (3) how do we know the place of the sun and the moon in the administration of time, both in realms of the state and in working lives of the people; (4) were celestial beings relegated to the temple complex at all times, as images and figures inscribed in stone and reconstructed in myths and ritual alone, or were they used when defining time in the realms of agricultural production and in commerce? The paper discusses such issues in a modest manner. We also plan to continue our study to probe further into the textual and the visual registers to increase our understanding of the place that celestial divinities occupied in the terrestrial and ritual spaces of medieval societies in South India.

In so far as the widespread usage in inscriptions implies its everyday usage among the populace, from the textual records discussed in this paper, we learned that the 60-year cycle of Jupiter had gained popularity in the administration of time in areas of present-day Tamil Nadu by the fourteenth century, coinciding with the beginning of the Vijayanagara rule. Similarly, calendar systems using Tamil month names often do not give weekdays, while inscriptions using the *rāśi* system of the month usually indicate the weekdays. Such historical data could give pointers to the time period when the weekday or the 60-year *Jovian* cycle became the calendrical norm in South India. Along with this change, we see the representation of the zodiac or the increased popularity of the worship of the so-called nine luminaries, the *navagrahas* (yet marginal to the main sanctum within the temple complex), changing in character around the same time, coinciding with the ascent of the Vijayanagara. Clearly, the place of the celestial in

text and visual depiction changed under their reign. Therefore, it becomes pertinent to the historian to bring the registers of text and image together.

This article begins its inquiry through a study of the inscriptions and treatises of timekeeping available from this period, helping us to detect and situate changing ideas of the heavens among the South Indian people. The preliminary survey examines 180 inscriptions in Tamil issued by the Vijayanagara rulers between 1346 and 1400 CE. The project is to document forms in which the celestial became confined to the temple complex and the profession of timekeeping became the occupational and socially sanctioned expertise of a priestly community. But the variability of the calendrical and other celestial information in those inscriptions suggests that ideas about the heavens and time were not homogeneous, neither inside the temples nor outside.

## Historical Context

Established in 1336 by Harihara I (r. 1336–1357) and his brother Bukka Rāya I (r. 1344–1377) of the Sangama dynasty, the Vijayanagara empire at its zenith, in about 1500, covered almost all of South India south of the Krishna river, except for major parts of present-day Kerala. The war with the Deccan sultanates in 1565 dealt a death blow to the empire, although the kingdom survived until 1646. Subsequent to the weakening of the empire, various subordinate Nayaka dynasties (c. 1550–1730) ruled in southern peninsular India. The period was marked by the construction of expansive temples, demonstrating excellence in architecture.<sup>1</sup>

Along with other arts and crafts, knowledge of the heavens was an area that got the attention and encouragement of the rulers of the Vijayanagara empire. Its sovereigns patronised various kinds of works on such topics, among them poems, inscriptions, architectural representations and city planning. *Āmuktamālyada*, an epic poem in Telugu composed by Kṛṣṇadēva Rāya (r. 1509–1529), a famous Vijayanagara ruler, stipulates that a king should spend the morning in the company of the officers who inquire about his welfare, the doctors and the *jyotiṣin* (Reddy 2011).<sup>2</sup> The astronomical significance of Vijayanagara town planning is well documented. Archaeological studies of Vijayanagara, the capital of the empire, revealed the existence of “a symbolic cosmology or visual astronomical sightlines, primarily to the solstices” (McKim Malville 2015: 1969). Twelve *Rāsistambha* (zodiacal pillars) were erected at the Vidyāraṇya Temple in Sringeri by Vidyāraṇya, 12<sup>th</sup> Jagadguru of the Śringeri Śarada Pītham from 1380 to 1386 (Shylaja 2007: 846; 2015: 1959–1967). The temple carvings

from this period include unusual reliefs on the ceiling representing astronomical events through a new symbolism. It consists either of a disk or a crescent being nibbled at by one or two snakes, or of a lotus medallion accompanied by undulating cobras or *nāgās*. Such motifs are often found on the temple ceilings, *maṇḍapas* (open halls with pillars), beam soffits, temple walls and compound walls enclosing temples. While the two serpents with a disc or a crescent undoubtedly symbolize (solar and lunar) eclipses, the lotus is more difficult to interpret. It is perhaps the corona of the sun represented by the lotus petals and meant to depict a total solar eclipse (Menon 2018: 241–258; Deekshithar 2010a, b).<sup>3</sup>

### Calendrical Literature of the Vijayanagara Period

The Vijayanagara period was a time when improvements were taking place in astronomical computations. The *Vākyakaraṇa* (Kuppana & Sarma 1962) was the main manual in this regard, probably composed between 1282 and 1306. Later sources, including inscriptions, show that it was used widely by contemporary Tamil *pañcāṅgi* (almanac makers) for the computation of the *pañcāṅga* (almanac). The unknown author of the *Vākyakaraṇa* introduced the use of *vākyas* (literally meaning a sentence consisting of one or more words), a collection of mnemonic sentences, which give the true longitudes of heavenly bodies at certain regular intervals (Venkateswara Pai et al. 2018: 245–258; Sriram 2015: 1991–2000; Kuppana & Sarma 1962). True longitudes of a heavenly body at an arbitrary instant can be found to a reasonable accuracy by interpolating the values obtained from the memorized tables. For example, the tables of the true longitudes for instance of the moon at the successive times of sunrise is encoded into 248 *candravākyas* (sentences on the moon). Since each letter was assigned a numerical value, the *vākyas* were “composed in such a way that they not only represent numerical values [but also] convey worldly wisdom or moral values” (Venketeswara Pai et al. 2015: 246). A second very important text on calendar making composed around 1500 (Sarma 1972) is *Laghudīpikā* or *Laghuprakāśika*, a commentary on the *vākyakaraṇa* algorithm by Sundararāja (c. 1500 CE), a Tamil astronomer from the Vijayanagara empire.<sup>4</sup> These had a far-reaching impact on the tradition of *pañcāṅga* computation in southern India.

Numerous historical sources suggest an increase in institutionalization of public officials responsible for predictions and the calendar in the villages and courts. In medieval Indian societies, the *jyotiṣin*, a term that can be understood as astronomer-astrologer, performed essential communal

services (Wilks 1820: 118). The person who held this position announced the seasons of sowing and harvesting, and the “lucky and unlucky days” for various civil acts including undertaking a journey or initiating a new trade. A copperplate inscription dated to 1631 states that the Yalahaṅka nāḍu Prabhu Immaḍi Kempe Gauḍa, a feudatory ruler under the Vijayanagara empire, granted the right of reading the *pañcāṅga* in a few villages to one Avubaḷa Narasiha Bhaṭṭa. He stipulated that the fees attached to the office of reading the *pañcāṅga* in those villages were to be enjoyed by Bhaṭṭa and his descendants (Mahalingam 1969: 218–219).

Epigraphical records from the period also mention gifts of land given to a *jyotiṣin*. In 1515, an unnamed *jyotiṣin* was given the village of Nāgulavaram. In 1556/57, the *jyotiṣin* Sarvabhāṭṭa was given a village and its income as a reward for his great scholarship. Lolla Lakshmīdhara, another scholar, was bestowed a gift by the Vijayanagara rulers. A copperplate inscription dated 1565 records that certain individuals petitioned an agent of the Vijayanagara king Rāmadēva Mahārāya (*de facto* ruler, 1542–1565) for the perpetual rights to the office of *jyotiṣa* (astral science), which their family had enjoyed for generations (Sircar 1952: 342–349).

These various kinds of evidence highlight the importance of astral knowledge practices in the Vijayanagara empire both as a major form of organizing courtly life and an essential tool for planning agricultural and other communal works.

## Inscriptions and their Astral Data

In some pioneering studies, M.N. Vahia and B.V. Subbarayappa (Vahia & Subbarayappa 2011: 16–19; Vahia et al. 2013: 6171), as well as B.S. Shylaja (Shylaja 1997: 601; Shylaja & Ganesha 2014: 1751–1753; Shylaja & Kydala 2016: 206–216; Shylaja 2018: 26–27), have tried to ferret out information on solar and lunar eclipses from inscriptions. They claim to have analyzed about 22,000 inscriptions written in Sanskrit, Kannada and Telugu. They found about 1,400 inscriptions referring to eclipses. The earliest reference to eclipses comes from the Gupta period (c. 320–550). About 340 distinct lunar and 286 solar eclipses recorded for a period from 400 to 1800 could be matched with dates arrived at using modern calculations. But some 30,000 inscriptions in Tamil are not part of this study. In addition to eclipses, these inscriptions also record the sun’s entry into zodiacal signs (*saṅkramaṇa/saṅkrānti*). They focus in particular on such entries into the solstitial signs, because they were considered auspicious.

A systematic study of the calendrical elements in the inscriptions is of great importance to the history of science in southern India. Most inscriptions carry the date on which the endowments were made, donations were bestowed, or a king made a proclamation. The analysis of these dates yields clues to the prevalent calendar systems as well as the astronomical knowledge applied for calculating them. Inscriptions in the Tamil country until the fourteenth century used to give simply the regnal year of the king as their date along with the month, the *tithi* (lunar day), the *nakṣatra* (asterism-lunar mansion), and in some cases the weekday. The *Śaka* era, *Kali* era, and the cyclic year in *Jovian* cycle were not used as in other contemporary territories. The calendrical details became elaborate with the advent of Vijayanagara rule in the middle of the fourteenth century. Thereafter the regnal year was very rarely used, whereas the *Śaka* year and 60-year *Jovian* cycle were generally mentioned in addition to the month, the number of the lunar fortnight (*pakṣa*) and the day of the fortnight (*tithi*), the weekday, the *rāśi* (zodiacal sign), the half-year (*ayana*, that is, *dakṣiṇāyana* or *uttarāyana*), and the time of day in the *ghaṭikās* ("hours" of 48 minutes) etcetera were found in different combinations. A few inscriptions include the *yoga* (a period in which the combined longitudinal motion of the sun and the moon equals one *nakṣatra* or 13°20'), *karana* (half-*tithi*), and *lagna* (zodiacal sign rising).

Some of the used calendrical eras are based on astronomical phenomena. Every twenty years Saturn and Jupiter will be in conjunction, and every 60 years that conjunction will return to the same zodiacal sign. This is the basic *sāṃvatsara* cycle where each of the 60 years of Jupiter's cycle receives a specific name. Nevertheless, the South Indian calendars work with a 60-year *Jovian* cycle, unlike the one followed in the rest of India (see below).

The computation of calendrical specifications such as eclipses, *saṅkrānti*, *nakṣatra*, *yoga*, or the cyclical year of Jupiter involves complex calculations requiring specialized technical knowledge. The emergence and spread of such knowledge as evidenced by the inscriptional records, once plotted, will shed light on the history of its emergence and cultural acceptance. In so far as inscriptions are a mark of the wider usage of a particular system of a calendrical tradition at a particular location, their forms of visualizing such data in numbers, signs and other notifications will inform us about the times when the particular systems evolved.<sup>5</sup>

## Dates in Tamil Inscriptions

This survey was originally meant to examine calendrical and astronomical data found in 576 Tamil inscriptions extant from the period of 1346 CE to 1509 CE (Subbarayalu & Rajavelu 2014). These inscriptions were commanded by 29 rulers at 215 places spreading mainly across present-day Tamil Nadu, but also over the Kolar and Bangalore districts of Karnataka and the Chittoor district of Andhra Pradesh. Given the wealth of information, the originally intended sample had to be reduced to about a third. My preliminary survey now examines the 180 inscriptions produced between 1346 CE and 1400 CE. The geographical extent remained more or less stable.

Most of the inscriptions are found within or around temples. A smaller number is attached to public places in the villages such as rock surfaces (Subbarayalu & Rajavelu 2014: 85).<sup>6</sup> They were put up by different people on different occasions. Kings and regional administrators participated as did wealthy donors. Thus, inscriptions can record various gifts, for instance in the form of the right to tax collection from certain lands. They were most often executed on days considered auspicious. Thus, invariably almost all of the inscriptions contain the date of inscription or the date from which certain instructions are to be derived.

Typically the dates consist of three parts: year, month and day. The year in an inscription is either a year counted from the beginning of the Śaka dynasty in 78 CE or the 60-year cycle of Jupiter (*Bṛhaspati sām̐vatsara*). At rare occasions, the *ayana*, the sun's apparent movement towards north or south in a year, is given.<sup>7</sup> Few inscriptions record the passage or transit of the sun from one zodiacal sign to the next<sup>8</sup> and some have recorded the solar and lunar eclipses.<sup>9</sup> The month stated could be either a luni-solar or a solar month. Various strategies were used to specify a day in the month. If the month used was a luni-solar one, then invariably *pakṣa* (the waxing or waning phase of the moon) and the *tithi* number (the number of lunations that had elapsed from the full moon or the new moon, depending upon the *pakṣa*) is given as the marker. In addition to the *tithi*, the combination of *nakṣatra* and weekday also served this purpose. If the month was solar, there was the option to count the number of days that had elapsed from the last *saṅkrānti* (the sun's entry into a particular *rāśi* [zodiacal sign]) and to give that number as the date of that specific civil day.

Generally, Indian dating systems were based upon the traditional *pañcāṅga* (almanac) that provided five calendrical details, that is five *aṅgas* as the name suggests. These five *aṅgas* are *tithi*, *vāra*, *nakṣatra*, *yoga* and *karaṇa* for each moment. Civil, social and religious life was organized around the *pañcāṅga* elements of the day. A civil day of the *pañcāṅga*

begins at the sunrise at that location, which means that there are as many *pañcāṅgas* as there are longitudes. However, most *pañcāṅgas* would give the ephemeris details for a particular location.<sup>10</sup>

Some of these features are found in the Tamil inscriptions under study. For example, a Chinna Kāñcīpuram inscription of Kampaṇa II (r. 1354–1375) states (in Tamil) “*kampaṇa utaiyārukku cellā ninra śakābdam 1,288 l mēl parābhava samvatsarattu kumpaṇāyirru pūrvapakṣattu ēkātaśiyum viyālakkiḷamaiyum peṛa puṇarpūcattu nāl*” (Shastri & Bahadur 1986 [1923]: 101). The year was Śaka 1288 (current) and *parābhava*, the first year of the *Jovian* cycle. The solar month was that of *Kumbha* (Aquarius) and the *tithi* that of the eleventh day after the new moon. The *vāra* or weekday corresponds to Thursday and the *nakṣatra* was that of *Punarpūsam* (*Punarvasu*), that is the seventh lunar mansion. This information combined yields 1367 February 11.

Another inscription from Kāñcīpuram in the reign of Harihara II (r. 1377–1404) states “*cakāptam 1300-ṇ mēl cellāniṇra kālayutti varuṣam mārkali mātham 2tēti pūrva pakṣattu captamiyum nāyarukiḷamaiyum peṛra catayattu nāl*.” (Subramaniam 1955: 322). This date is composed of Śaka 1300, *kālayukti* (kālayukta the 52<sup>nd</sup> year) of the *Jovian* cycle, the second day of the *Mārkaḷi*, the Tamil solar month, which corresponds to Sunday, and *catayam/Śatabhiṣā nakṣatra*, the 24<sup>th</sup> lunar mansion. It yields 1378 November 27.

## Verifying the Date Details of the Inscriptions

Each of the 180 inscriptions was examined in detail to extract the calendar aspects and information about various astronomical events like eclipses (solar and lunar), or solstices (winter and summer). As explained in the previous section, the inscriptions are dated according to the practice of one of the Hindu calendars. Their conversion into modern dates requires specially constructed tables. Various tables exist,<sup>11</sup> but most Indian epigraphers rely on the one constructed by Lewis Dominic Swamikannu Pillai (Pillai 1922). As Richard Salomon observes the “determination of correspondences for specific dates involves complex calculations” and the “usual practice is to consult the tables provided in Swamikannu Pillai’s *Indian Ephemeris*, which are adequate for general or preliminary purposes” (Salomon 1998: 177).

The information extracted was collated into a database and verified. Verifying a date in an inscription means to decipher its modern equivalent in the Gregorian calendar.<sup>12</sup> This conversion is, however, by no means an easy process. The main reason for the difficulties is due to the many



different calendrical customs to be found across South Asia. Even if we ignore the customs followed in northern India, there remain a variety of options to identify the different components of a date as given in the 180 studied Tamil inscriptions.

The first task is to identify the kind of year and its beginning the inscription refers to. Ordinarily, the years cited in the inscriptions are reckoned as expired (*aṭita, gata*) years. However, some of the inscriptions may give the years in *vartamāna*, that is the current year count. While the luni-solar year often begins with the first *tithi* after a new moon (*amāvasyā* of the month of *Caitra* in Spring), solar years often begin on the *Meṣa saṅkrānti* (the entrance of the sun into Aries), called *Mēṣāti* solar years. However, there too the customs vary. Some luni-solar calendars follow *Kārttikāti* lunar years beginning with the lunar month of *kārttika* (when the full moon occurs near to the Pleiades, corresponding to October/November in the Gregorian calendar), while in Kathiavad and Gujarat the *Vikrama* year commences with the luni-solar month of *Aṣāḍhā* (when the full moon occurs near *Pūrvāṣāḍhā*, the 18th *nakṣatra*, corresponding to June/July in the Gregorian calendar). The solar year also exhibits variation. For example, the Kollam calendar followed in the southern part of Kerala takes *Siṃha saṅkrānti* (around August 16th; entry of the sun into Leo), while in the northern parts inscriptions retain the older tradition of reckoning the New Year from the first day of *Kaṇṇi/Kanyā* (middle September to middle October; the sun transiting into Virgo).

At times the year is denoted by the *Jovian* cycles. As the duration of a *Jovian* year is somewhat shorter than the solar year or luni-solar year due to the discrepancy of about four days, once in about eighty-five solar years, two *Jovian* years proper may fall within a particular civil year. In North India, just as lunar months are added or subtracted to keep step with both the motions of the moon and the sun, in such cases one of the *Jovian* years may be expunged from that cycle. However, in South India the 60-year cycles are sequentially ascribed to sidereal solar years not considering the actual motion of Jupiter. This means that in the southern *Jovian* cycle the year's name has no actual astronomical significance. Hence the inscriptions have to be carefully examined as to which convention of *Jovian* cycles they refer to.

The second task is to recognize the specific meaning of the *Jovian* cycle used by the author of the inscription. In principle, in the studied Tamil inscriptions, the *Jovian* year could have one of the following three meanings: a solar year with a *Jovian* name (the cycle typically used in southern India); a *Jovian* year actually completed at the beginning of a solar year (the common form of the northern cycle only rarely used in the South); a *Jovian* year actually completed at the actual moment (mean *Jovian* year,

mostly followed in northern India). As this study shows, most of the inscriptions work with the first option. In only six inscriptions is the second meaning used, while none of the inscriptions in this preliminary study use the third.

In the luni-solar and lunar calendars followed across India, the name of the months corresponds to the asterism which host the full moon (Saha & Lahiri 1992). For example, when the moon gets full near the *Citrā nakṣatra* (Spica), the full moon is called *Caitra Paurṇamāsī* and the lunar month is called *Caitrī*. This means that at times the name of the *nakṣatra* may signify the asterism or the month. The situation can get even more confused since the same set of twelve lunar months can also be used in different calendars, like the Tamil calendar, to denote solar months (Venkatasubbiah 1918: 66–67). As a result, the verification of the data in the inscriptions is not a simple task. Such deviations in the inscriptions can only be sorted out by calculations. Thus the third task is to determine the identity of the month the inscription adverts to.

As Venkatasubbiah (Venkatasubbiah 1918: vi) clarified, these varied customary practices mean that an inscription date citing the *Śaka* year, *Jovian* year, lunar month, and weekday, can denote from six to 28 different days. The interval between the earliest and latest days so denoted may sometimes amount to as many as ten years or more. He insists that “no śaka date ought to be declared irregular unless every one of its possible equivalents has been calculated and been found to be irregular throughout and unsatisfactory” (Venkatasubbiah 1918: vi). Often, in verifying the date in the inscription, the presence of a weekday is a “crucial test”, and “in absence of a week-day, an Indian date is usually pronounced unverifiable unless there is an eclipse in the date” (Pillai 1922: 4).

## Major Highlights of the Preliminary Survey

Firstly, it must be underlined that this preliminary survey relies on the corpus of Tamil inscriptions issued by the Vijayanagara rulers during the first fifty years (1346–1400) of their empire. Can the inscriptions in Tamil issued by the Vijayanagara empire be analyzed separately from inscriptions in other languages and be treated as a cogent corpus? How do these Tamil inscriptions issued by the Vijayanagara empire compare with other inscriptions in Tamil issued during the same period but in other regions of their territory or to inscriptions in Sanskrit, Telugu, Kannada, and other used languages? Such questions need to be considered when the activities of the empire’s rulers and office holders are studied as a whole and are part

of our plans for the future, in order to understand how regional cultures and their politics shaped calendrical systems. In this article, however, I will present the preliminary results of our study using the limited set of Tamil inscriptions while posing a set of questions to guide us in our further study.

The most general result of my investigations is that the interpretation of the calendar dates could not always be carried out in a satisfying manner. While 71 records could be unequivocally dated and concord with modern dates of Gregorian calendar, 41 records can be read as either using a luni-solar month or a solar month. Forty-three records have inadequate information to derive unambiguous dates. They often contain only the *Śaka* year or the corresponding name in the *Jovian* year cycle. The data in the inscriptions are not adequate to conclude either way, although usually the epigraphists interpret them as belonging to the southern Indian *Jovian* cycle with solar months and solar year and arrive at a suitable modern date according to Gregorian Calendar. Twenty-five records had adequate information for interpretation but were classified as irregular since the calculated dates did not fit all the parameters stated in the inscriptions.

In the following I report my results for each part of the calendrical notation, beginning with the representation of the years, followed by the months and weekdays. The final sections contain miscellaneous material.

## Results of Calendrical Notation

### Years

As mentioned above the present corpus contains only a few dates in regnal years following the earlier practice. Most of the 180 inscriptions contain the year in the *Jovian* cycle. This emphasizes the popularity of the *Jovian* cycle in southern Indian calendrical scheme. Eighty-eight inscriptions employ both *Śaka* and *Jovian* years. Of the total of 162 inscriptions using *Jovian* years, 93 cases relied on the South Indian solar *Jovian* cycle, while in six cases the North Indian luni-solar *Jovian* cycle was used. In 63 cases, no definitive decision could be made. Thus, they might use either the South Indian type or the North Indian cycle. Epigraphists, however, opt in such cases for a South Indian type.

For example, the Kāñcīpuram inscription of Kampaṇa II (r. 1354–1375) (Shastri & Bahadur 1986 [1923]: 95) mentions as follows: “*āṇanta varuṣam āṭimātam 17tēti Aṣāḍhabahula caturdaśi cukravaramum*” (48th Jovinan year of *ānanda*, 17th day of the fourth Tamil solar month of *āṭi*, waning 14th lunation, which is also the ritualistic day of *Aṣāḍhabahula*—also known as *āṭi ammāvācai* in the Tamil region, observed in the northe-

rn 3rd luni-solar month of *Āṣāḍha*). The epigraphist, taking the *Jovian* year to mean the usual southern cycle, interpreted this as signifying 1374 July 14 (Subbarayalu & Rajavelu 2014: 79). However, the said date is not part of the month of *Āṣāḍha* nor is the *tithi caturdaśi* (14). But if we interpret it as the northern *Jovian* cycle, then 1361 July 14 is *āṭi*, *Āṣāḍha*, *caturdaśi* and Friday. All the calendrical elements in the inscription match. Thus, the *Jovian* year cycle should be northern and not southern.

### Months and Date

Twenty-nine of the records do not have a month name or the month name could not be deciphered from the inscriptions. Of the remaining 151 records with a month name in the date information, 76 have Tamil names of solar months. However, three of these were found to be actually northern luni-solar months. Instead of the Sanskrit names of these northern months, the author/s used Tamil forms that seem to have been in use by then for about a millennium. Therefore 73 inscriptions have Tamil solar months and out of these, 16 do not specify a day, while 57 include such a specification. They count their days from the entry of the mean sun into the corresponding Zodiacal sign. The three inscriptions with northern luni-solar months, but similar sounding Tamil names, denote their specific civil day by the lunar *pakṣa* and *tithi*.

Seventy-four out of the 151 records have the name of the *rāśis* (zodiacal signs) as the month name. This means they use solar months. In fact, the inscriptions clearly specify that the sun is in a particular *rāśi*, for example, *makara ṅāyīru*, literally meaning sun in *Makara*, that is in Capricorn (Subbarayalu & Rajavelu 2014: 35). They specify, however, almost invariably the days of their dates with the lunar indicators *pakṣa* and *tithi*. Six inscriptions do not refer to *pakṣa* and denote the day in *tithi* only. This is contrary to expectations, because as said above Tamil solar months use the day count to denote the date. This use of lunar identifiers necessitates additional information on the *nakṣatra* and *vāra* to identify the specific day in the month, because the same *tithi* can occur twice in a solar month. There were certain rare occasions when both the solar month in *rāśi* and the Tamil solar month name are given together, as in the case of the Tiruvaṅṅāmalai inscription in Tamil Nadu of Kampaṇa II (r. 1354–1375) (Subbarayalu & Rajavelu 2014: 35).<sup>13</sup>

### Weekdays

Historians believe that the idea of *vāra* (weekday) was probably introduced in the fifth century into the Indian calendrical system (Yano 2005: 383; Markel 1987: 128–134). The earliest epigraphical inscription with *vāra* in India is the Gupta inscription on the Eran pillar that says “year 165 *Āṣāḍha*

śukla 12; Thursday,” which corresponds to 483–484 CE. The earliest inscription quoting a weekday in peninsular India is the Āṇaimalai inscription of Parāntaka caṭaiyaṅ, *Kali* year 3871, *kṛttikā*, Sunday, equivalent to 770 CE. In fact, this inscription states it as the “day of the sun,” that is Sunday, alluding to the tradition of ascribing each day to one of the seven heavenly bodies.

Out of the 180 inscriptions, 82 do not carry the weekday. While 67 out of the 74 inscriptions that use a *rāśi* system of the month indicate the weekday, only 23 of the 73 inscriptions with Tamil month names give the weekday. This raises the question as to whether the use of the weekday was not widely prevalent in the regions following the Tamil month system: this has to be checked further.

## Difficulties

The primary objective of the preliminary survey was to get a first impression of the astral and calendrical content of a subset of the extant Tamil inscriptions. The interpretation of the dates requires more work. The published results do not make clear whether Venkatasubbiah’s demand to test all of the 28 possibilities was executed before an interpretation was proposed. The following examples reflect my doubts and indicate some of the difficulties facing any interpretation of the dating practices of the authors of the inscriptions.

The Kambainallūr inscription of Bukka II (r. 1405–1406) states, for instance, “*kāṣya varuṣattu paṅkuṇi mātam mutal tiyati pūrvaṅkaṣattu uttirāṭṭaiyum perra nā!*” (Subramanya Aiyer 1932: 4) (the last *Jovian* year of *kāṣya*; 12<sup>th</sup> Tamil solar month of *paṅkuṇi*, 21<sup>st</sup> lunar asterism of the *uttirāṭṭai* (uttara-phālguna) waxing moon period). The epigraphers interpreted this to refer to the solar month of *paṅkuṇi* in the southern *Jovian* cycle of *ākṣaya* (60<sup>th</sup> year in the *Jovian* cycle), which falls on 1387 February 24, Sunday, which was *pūrva tithi* 6 (6<sup>th</sup> day of waxing moon) and the *nakṣatra Mṛgaśīrṣā*. This makes the date irregular, as the *nakṣatra* does not match the remaining information. However, if we take the month to be the lunisolar *phālguna* and *mutal tiyati* to be the first day of the lunisolar month, that is the first *tithi* of the *pūrva*, then we obtain the date of 1387, February 19, Tuesday which is *pūrva* 1, with the *nakṣatra Revatī* current on that day. The completed *nakṣatra* was *Uttṛṭṭādhi* (*Uttṛṭṭāti*). The calendrical information is much closer to my conversion than to the one proposed by the epigraphist. Does the inscription pertain to 1387 February 24 or 1387 February 19? In the absence of the weekday, it may not be e

asy to assert the conclusion that it is the latter. In order to achieve a more reliable interpretation one needs to carefully sift the inscriptions for possible luni-solar interpretations of Tamil months.

The Nukkanahalli and Kolar inscriptions of Kampaṇa II (r. 1354–1375) say “*cakarai āṇṭu āyirattu iranūrṛāṇṭu āyirattu iranūrṛu eṇpattu mūṇṛiṇ mēr cellaniṇṛa pilavaṇka varuṣattu āṭimācam .9it triyōtaciyum viyālakkilamaiyum*” (*Śaka* 1283, 41<sup>st</sup> *Jovian* cycle *Pilavaṇka* corresponding to 1367, 9<sup>th</sup> day of the 4<sup>th</sup> Tamil solar month of *Āṭi* corresponding to July–August, Thursday and the 13<sup>th</sup> lunation). The inscription does not state whether the moon is in its waxing or waning period. The epigraphists interpreted it as July 1376. They could not obtain a more precise date. Moreover, the *Śaka* 1283 and the southern *Jovian* cycle of *Pilavaṇka* do not correspond, while the northern *Jovian* cycle concurs with the *Śaka* year count. Thus, if the *Jovian* year is from the northern cycle, then 1361 July 1 as well as July 5 are Thursdays and possess the appropriate *tithis* to fit the inscription. However the another part of the date, namely the 9<sup>th</sup> day of 4<sup>th</sup> Tamil solar month of *Āṭi*, does not fit. Thus the conversion of the date information given in this inscription to the Gregorian calendar is not yet satisfactorily achieved.

## Suggestions for Further Research

Clearly, the preliminary results suggest multiple practices of accounting for time in this period in South India. While I have considered the epigraphic difficulties and the factual record of the inscriptions together, what is persuasive from the data is the multiplicity of cultural techniques, and the itinerant character of computing and working with time and the heavens. To map such results along with the visual registers of the heavens will yield new evidence, as to how the heavens were conceived and inscribed. Encouraged by the preliminary survey I propose to examine and collate information about various astronomical events like (solar and lunar) eclipses or (winter and summer) solstices from all the known Tamil inscriptions and map them along with varied calendrical conventions practiced during the Vijayanagara kingdom to investigate the influence of the changing astronomical and mathematical practices on the social and cultural life during that period. The aim of this database is to visualize the temporal and geographical change in South Indian calendrical practices and astral knowledge.

One of the important issues that should be addressed by such a project is the significant shift in Tamil Nadu from what might have been once

a luni-solar to what is now a solar calendar.<sup>14</sup> Today, the Tamil calendars are solar and each of the Tamil months like *cittirai*, *vaikāci*, and *āni* correspond with the solar months of *meṣa vṛṣabha mithuna* (Aries, Taurus, Gemini). We do not know when and how this switch took place. Neither do we know whether they were always solar months or originally luni-solar months that were later used to represent purely solar months. This, however, could also mean that calendrical and computational practices moved and transformed, remaining itinerant and local at the same time, as professional groups and working people took to these changes. We clearly need more evidence and a renewed study of the literary, archaeological and epigraphic records with new methods and new approaches to contextualization to see if such changes aligned with political changes or the mobility of occupational groups or the people themselves.

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## Endnotes

- 1 Karashima (1992); Mahalingam (1969); Krishnaswami (1964); Aiyangar (1919); Bridges (2016).
- 2 *Jyotiṣin* is a professional with the knowledge of astronomy and practices astrology & computation of almanac, for the employment of *jyotiṣa* in the court of Kṛṣṇadēvarāya, see Reddy (2011: 57)
- 3 See Menon (2018: 254), Deekshithar (2010a). <http://www.asianart.com/articles/pavilion/index.html#14> (Last accessed on: 16 December 2018) and Deekshithar (2010b). <http://www.asianart.com/articles/pavilion2/index.html> (Last accessed on: 16 December 2018) for visual iconography of heavens in public spaces such as temples.
- 4 Two Tamil *uḷlamuṭaiyān* manuals, *cūṭā-maṇi-y-uḷlam-uṭaiyān* attributed to *Maṅṭala-puruṭaṇ*, the 16th-century Jaina author of *Cūṭāmaṇi nikaṇṭu* (Citamparam Poṅṅucāmi Mutaliyār 1890) and *vīmēc-cura-v-uḷlamuṭaiyān* (Taṅkavēlu Mutaliyār 1923), author known only as *Uḷlamuṭaiyān*, are based upon the methods of the *vākyakarāṇa*, were composed during this period. They are widely used even today to cast the Tamil *pañcāṅga*. [Surprisingly, Zvelebil assigns him to the twelfth or thirteenth century (Sweetman & Ilakkuvan 2012: 5)].
- 5 In addition to specific numerals, alphabets in various scripts were also used as an indicator of numerals. The analysis of the inscription record will thus also provide insights into the use of different sets of numerals and scripts across southern India.

- 6 Fr example, the Mēkalaciṅṅampalli inscriptions of Bukka II were inscribed on a rock face known as Katti KuNTu.
- 7 The Rāyasandra inscription at Bowringpet Taluk of Bukka II (r. 1405–1406) states “*śakābdam āyirattu-munnūrṟu-onbadin mēl śellāniṅṟa vibhava savatsarattu utarāyaṅa-sakramattu [...]*” (Rice 1905a: 79) Śaka 1309, *vibhava Jovian* cycle, the day of the winter solstice and records the construction of a reservoir at Pālpaḍu to improve cultivation of lands for the benefit of two temples and 14 Brahmins of Nandigrāma. Incidentally this inscription is not housed in a temple, but on a stone near Holagere, near Hassan in Karnataka.
- 8 The inscription of Harihara II (r. 1377–1404) at the Tirumullaivāyil Caitāpēṭṭai Mācilāmaṅṣvara Temple at Ambattur, near Chennai, states “*cellā niṅṟa prabhava varuṣattu makara ṅāyirru pūrvapaḱṣattu tiṅkaḷ kiḷamaiyum pañcamiyum perṟa aṅiḷattu nāl [...] caṅkramap pāṭiveṭṭaikkku [...]*” (Krishnan 1964: 350), which means *prabhava*, the second *Jovian* cycle, Makara (Capricorn) month corresponding to January–February, Monday, waxing fifth moon day, *aṅiṣam* (Anurādhā), the 17<sup>th</sup> lunar asterism. The inscription records the gift of land, whose proceeds were to be used for the conduct of the hunting festival on the Saṅkramana days (the passage or transit of the sun (at times of a planet) from one zodiacal sign to the next).
- 9 An Anekal inscription of Bukka I (r. 1356–1377) dated 1376 July 18 (Rice 1905b: 138–139) reports the annular solar eclipse visible from the southern tip of the Indian subcontinent. At Anekal, the eclipse was partial. It records gifts given, but the details are lost. A Śrīraṅgam and Tiruccirāppalli inscription of Virūpākṣa II (r. 1465–1485) (Srinivasan 1982: 311) register the gift of perpetual lap at the Śrī Raṅganātha Temple by Dēvarasar of Vēḷūr on the occasion of a partial lunar eclipse of 1384 February 7.
- 10 Often an imaginary point on the equator called *laṅkā* coinciding with the longitude of Ujjain [75°46′ 6″ east of Greenwich]
- 11 Jacobi (1892: 403–460); Jacobi (1894: 487–98); Sewell & Dikshit 1896; Sewell (1985); Sewell (1912); Ketkar (1923).
- 12 See Sircar (1996) for issues connected with the chronology of Indian Inscriptions.
- 13 The Tiruvaṅṅāmalai inscription in Tamil Nadu of Kampaṅa II (r. 1354–1375) states “*kampaṅa uṭaiyārukku cellā niṅṟa makara nāyarru pūrvva paḱṣattu pañcamiyum tiṅkalkiḷamaiyum perṟa aśvatināl kiḷakkavaruṣam mārkāḷi mātam paṭiṅ aṅcān tiyati nāl*” (Subbarayalu & Rajavelu 2014: 35). This means that the sun is in Makara *rāśi* (Capricorn), on the waxing fifth moon day, Monday, in *aśvini/aśvini*, the first lunar asterism, 15<sup>th</sup> day of the month of Mārkaḷi, which corresponds to December–January. This is one of the interesting cases in which both the solar month in *rāśi* and the Tamil solar month name are given together. The said day corresponds to 1369 January 15.
- 14 For an account of the contemporary practices, see Fuller (1980: 2–63) and Yano (2005: 6–392).

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