I stand by my understanding and analysis given. I have replied to Sharan's comments already. Data given of the new moon and full moon suggests that the *Caitra* that began on *Suklapaksha* (1), i.e. 21 March 402 CE corresponded to sidereal and tropical solar month of *Mesha*. Full moon of that month had occurred at the 15th degree of *Tula* and the month could as well have been called *Vaisakha*. I preferred the nomenclature beginning with *Caitra* according to the later siddhantic practice which considered *Caitra* as synonymous with *Mesha* transit of the sun. When *Caitra* is configured so the next month of sun transiting *Vrshabha* becomes *Vaisakha* and solar *Mithuna* becomes *Ashadha*. Given the full moon position ($\lambda = 222.96$), the *Vrshabha* solar month may have been called *Jyeshtha* also. But the *Mithuna* transit of the sun as we can configure from the data could not have been *Jyeshta*, as suggested by Sharan.

Confusion has been due to the mix-up of the solar and lunar reckoning of the months. Given the positions of table 1, lunar *Caitra* could be considered from 19 February to 20 March, lunar *Vaisakha* from 21 March to 18 April, lunar *Jyeshta* from 19 April to 18 May, and lunar *Ashadha* from 19 May to 17 June.

In 402 CE, *Ashadha* marked the beginning of the rainy season as the month ended close to summer solstice. *Ashadha* was coeval with solar *Mithuna* and ended close to or overlapping summer solstice and the tumult of rains. Therefore, Kalidasa described the appearance of clouds in *Ashadha*. *Chaturmasyam* too had to begin before the heavy rainfall after summer solstice and so I find no contradiction for the date fixed for Sanakanika inscription. There is no missing month if the sun–moon data given in table 1 are named in terms of lunar months from *Caitra* as mentioned above.

(iii) Rao mentions that Indian computation of the tithis may have been in error by several hours. This is a wrong statement; tithi has been one of the most accurately computed element of Indian astronomy. Rao speaks of an old system (pre-Aryabhatan) with poor results. To quote Rao:

> 'Throughout his article, Chandra Hari mentions the sun's rising exactly in the east on the day of summer solstice . . .'.

I have not mentioned so. I have given the correct discussion on azimuth and have fixed the date to be 29 May 402 AD for sunrise due east. Maybe Rao has misunderstood. But he mentions the following to emphasize the alleged mistake on my side.

> 'The sun rises exactly in the east for a non-equatorial place only on the two equinoctial days and not on the solstitial days'.

As I understand, east is defined as 90° azimuth. As the sun's declination changes to north/south of the equator, the respective latitudes shall see the sun rising due east to their location when azimuth equals $90 - \phi$. Direction of $90 - \phi$ azimuth will be at an angle of ϕ from the equator, either north or south. So between the tropics there will be two days when the sun rises due east to the location (see below).

Response to comments from B. S. Shylaja

(i) Confusion about the direction of rays of the rising sun on summer solstice.

I think there is no confusion. It may be noted that for a place of $\phi = 23°31'$, the direction of the rising sun computed as (90-azimuth), i.e. departure from the equator on the summer solstice day is 25°56′, as can be obtained from the standard formula. But on this date when $\delta = \omega$, the rising sun will not be due east at latitude ϕ. For precise eastern sunrise, the value (90-azimuth) has to be equal to the latitude of the place. Or the azimuth value for sunrise due east is $90 - \phi = 90 - 23°31' = 66°29'$. This is what I have shown in table 3 and for altitude zero, this azimuth is achieved on 29 May 402 AD as explained in the paper.

Shift of the solstices has nothing to do with the observed phenomenon of sunrise due east when the dates are given according to the tropical calendar.

Rest of the discussion is irrelevant to the contents of my paper.

(ii) '*The paper mentions of sun rising exactly at east on the day of Sanakanika inscription which cannot be true.*'

This is what I have illustrated in table 3, with the altitude and azimuth data of 29 May 402 AD. Now you say that the sun rises on the east only on the day of equinoxes. According to the basics of astronomy, on the day of equinoxes the sun rises at the equator at $\delta = 0$. As δ increases, the rise due east slowly drifts northward and for any place in between the $\phi = 0$ and $\phi = \omega$, there will be two dates when the sun rises due east. One needs to consider the case when $\delta \neq 0$ and the azimuth is $90 - \phi$ when altitude is zero. Putting altitude as 0 and azimuth $A = 90 - \phi$, we can deduce from the same equation, the declination corresponding to due east sunrise for different ϕ values.

$$\sin\delta = \sin\phi \times \sin 0 + \cos\phi \times \cos 0 \times \cos(90 - \phi),$$
$$\delta = \sin^{-1}(\cos\phi \times \cos(90 - \phi)).$$

It can be seen easily that at $\phi = 23.5$, δ for due east sunrise must be 21.5° and this has been discussed in the paper to establish that on the date of the Sanakanika inscription, the sun rose precisely in the east.

At Bangalore $\phi = 13°$ and δ for due east sunrise must be 12°40′ and this happens during both Uttarāyana and Dakṣiṇāyana as declination waxes and wanes.

(iii) I did not state that on the summer solstice day, the sun is nearest to sun. Distance of the sun from the earth is also not a topic of discussion.

(iv) Against the above background, I think the other comments need not be addressed at all. Algebra on the basic equation can be worked out as I have shown above.

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