STONE ALIGNMENT WITH SOLAR AND OTHER SIGHTLINES IN SOUTH INDIA

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Abstract: We have studied the megalithic site Byse near Hosnagara in Karnataka and we show that there is a strong case for considering it to be an astronomically aligned site. We show that the major sight lines are aligned toward the solstice sunrises and sunsets. This is the first ever direct evidence of a megalithic site in the Indian subcontinent with strong astronomical association. We also show that the design of this site is fundamentally different from astronomical megaliths in other parts of the world.

Introduction:

Large megalithic stone structures were created by man from Neolithic times for sepulchral as well as non-sepulchral purposes, including astronomy[1]. One of the spectacular and well-known of these is Stonehenge in England which has definite astronomical associations[1,2]. While several such sites have been reported in Europe and other regions, so far no reliable report of a megalithic astronomical site is reported from the Indian Subcontinent even though it has a history of habitation going back probably to 40,000 YBP or earlier[3]. The megalithic culture in the subcontinent is rich with sepulchral structures, but possible use for astronomical purposes has not been established. Here we report the first possible megalithic construction used for astronomical observations at site in south India. Apart from solstice sightlines there seem to be specific markers for the setting points of important stars. A unique feature of this observatory compared to the European ones is that they do not have central location from which observations can be made but involve multiple sightlines with shadows of several stones falling on another marking stone during days of astronomical importance.

Megaliths in southern India are believed to have been erected during Iron Age (1200 BC – 500 BC), though the practice may have originated in the Neolithic period (3000 BC – 1200 BC) and continued into Early Historic Period (500 BC – 500 AD)[4]. Several of these monuments are constructed using large stones, but there are adaptations such as chambers carved in soft rock. They are largely sepulchral monuments but stone alignments with a large number of stones are also known. Stone alignments recorded in south India consist of stones arranged in a grid usually aligned to the cardinal directions[5,6]. Here we show that at least one such stone alignment at Byse in south India has strong astronomical associations.

The site at Byse:

Nilaskal Byana (lit. “field with the standing stones”) is a small, flat clearing in Byse village (13° 49’ 45”N, 75° 00’ 43”E) near the town of Hosanagara in Karnataka. The site was reported in 1975 as containing several menhirs (single standing stones) arranged in no particular pattern[6]. The site has not been reliably dated and excavations of cist burials nearby yielded red and black ware but no iron objects were found[7].

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We surveyed Byse between 2007 and 2010. The site consists of 26 menhirs of which 13 are still standing (Fig. 1a). The largest standing menhir is 3.6 m tall 1.6 m wide and 25cm thick (Fig. 1d). They are in two clusters in an area roughly 60 m x 60 m, though 23 of the 26 menhirs are in an area 30 m (E-W) x 60 m (N-S).

Assuming that the fallen menhirs are very close to their original locations, we have studied the layout of the 26 menhirs for alignments of two or more stones to the sunrise/sunset points on the horizon for both solstices (Fig. 1b). Assuming an angular error of $\pm$ 2.5^o, we expect 10 sightlines to align to any 5^o interval on the horizon by chance. We obtain a total of 19 solstitial alignments. Some of these alignments involve 3 menhirs while most involve only 2 stones. There seem to be 3-stone sightlines that "link" the two clusters of menhirs together for the solar alignment.

In order to search for preferential sight lines (figure 1c), we take the two edges of the stones to be to separate points since the stones typically tend to be about a meter wide. We take sightlines formed by any two stones and assume that any stone within 1 meter from the sight line belongs to the same sightline. The distribution of site lines and the solstice points are given in figure 1d. The results are given in Table 1 which shows that the sight lines are intentional rather than chance alignments.. There are 2 sightlines of 7 stones that point 11^o West of North. The significance of the result does not change even if the midpoint of each stone is taken as the location. We have also calculated the alignments assuming each stone as a single object and the results are as expected (Table 1).

The most important are two sightlines in 142^o - 318^o direction and 172^o - 348^o (from north as measured through east) with 16 and 14 lines pointing in this directions.. Important stars that set at 348^o in 1000 BC are Arcturus, Vega, Deneb and Capella while Regulus and Pollux set at 318^o. However, we desist from making stellar alignment interpretations, though, because of the large uncertainty of 2,500 years in dating the monument.

Conclusions:

The alignment of the menhirs at Byse seems intentional and possibly for astronomical purpose. At least for the solstices, there are multiple sightlines to the same point on the horizon. This layout is different from other instances of astronomical alignments found in megalithic monuments elsewhere, which involve a centre of observation for any given astronomical event on the horizon. The intent of the site is not clear but two of the menhirs are currently worshipped by the local population in a form of ancestor worship. There are several unexcavated mounds in the clearing south of the menhirs which also seem to suggest a sepulchral connection. This is the first proven instance of a monument with intentional solar and possible stellar alignments among Indian megaliths.

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References:

1. Ruggles, C., Astronomy in Prehistoric Britain and Ireland (1999), Yale University Press, New Haven and London.
2. Heggie, D. C., Megalithic Science: Ancient Mathematics and Astronomy in Northwest Europe (1981) Thames and Hudson Ltd., London.
3. Chakravarti A, Nature, 461, 487 - 488, 2009
4. A. M. Bauer, P. Johansen, and R. L. Bauer, Asian Perspectives, Volume 46, Number 1, Spring 2007, pp. 3-35
5. Allchin, F. R., Man, Vol. 56 (Oct. 1956) 133-136.
6. Sundara, A., The early chamber tombs of South India: a study of the Iron Age megalithic monuments of N. Karnataka (1975) University Publishers, Delhi.
7. Sundara, A., In Sundara A., Ed., Proceedings of R. B. Foote Memorial National Seminar (1995) on Indian Prehistory and Protohistory (Recent Studies) (2004) Directorate of Archaeology and Museums, Govt. of Karnataka.

Figure and captions:

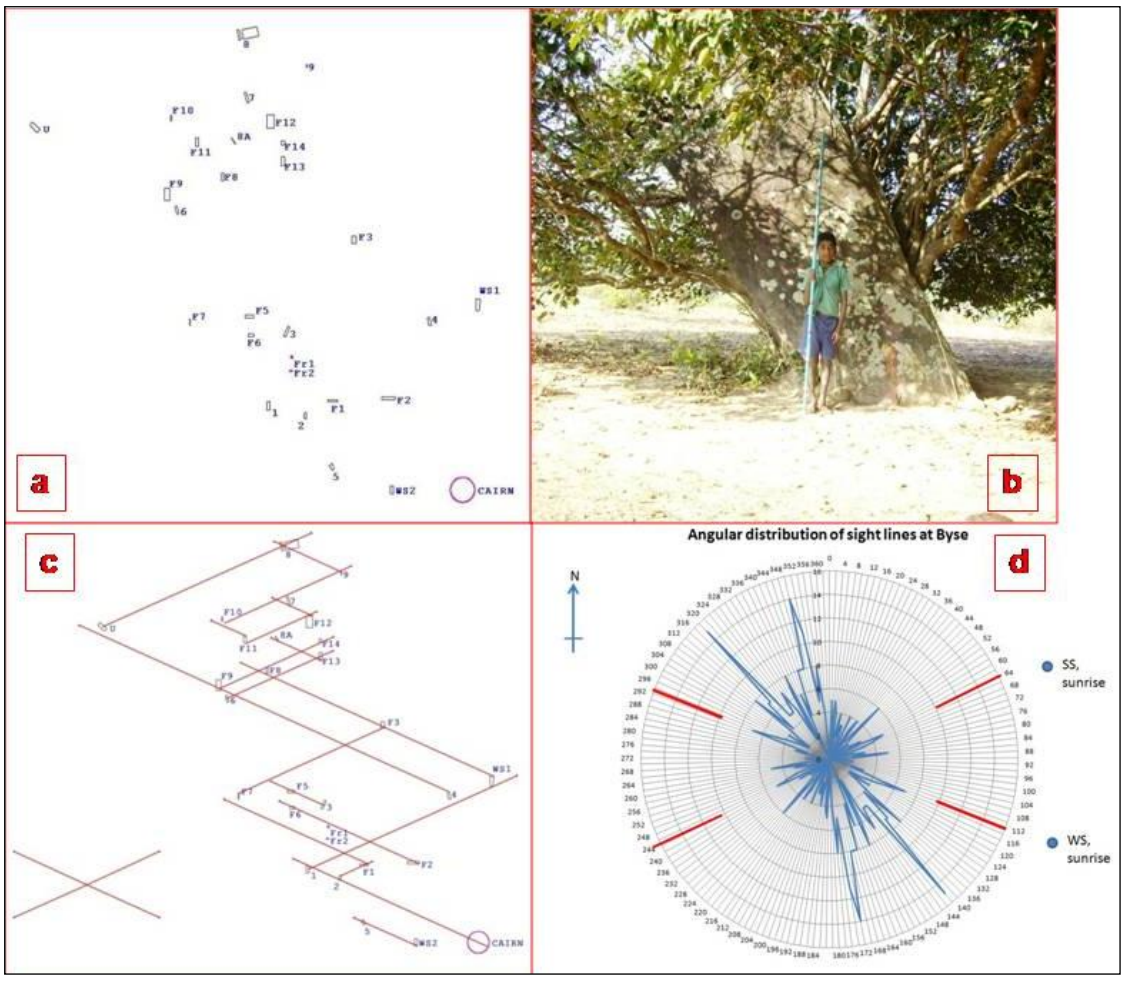

Figure 1: a: Layout of menhirs at Byse; b: Indicating sightlines to the solstices as well as major and minor standstill moonrises and moonsets; c: The plot of directionality of all alignments of more than two stones at Byse; d: The largest menhir at Byse

Table 1: Showing the number of k-stone alignments expected by chance versus that actually observed for k = 2 to 7.

Number of stones	**Taking each edge as sight line**		**Taking each stone as sight line and 2 meter separation**	
	Expected by chance	*Observed*	*Expected by chance*	*Observed*
2	325	325	78	78
3	5.2	140	0.158889	13
4	0.0598	29	0.000221	1
5	0.000526	12	2.21E-07	1
6	3.68E-06	0	1.63E-10	0
7	2.1E-08	2	9.08E-14	0