On Geometry of Jambūdvīpa

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Jainas thought that the earth was made up of a series of concentric rings of land masse surrounded by concentric ocean rings. The central island of the earth was Jambūdvīpa.[1] The mount Meru is placed at the centre of Jambūdvīpa. According to Tiloya Paṇṇatti[2] (gāthā 4, 1780 et. seq.), Meru is made up of frustrum of cones. A mathematical analysis[3] of the dimensions of the mount Meru shows that the concept of Meru implies the notion of obliquity of ecliptic. Earth's true axis passes along the hypotenuse of an approximate cone of Meru and not along the axis of Meru. So true radius of Jambūdvīpa is equal to apparent radius of Jambūdvīpa less radius of Meru's base on earth, i. e., 50000—5000=45000 yojanas. With this concept the circumference of Jambūdvīpa coincides with the parallel of maximum declination of the Sun, i. e., 23°.5 North.

Now as regards the concept of samatala bhumi, Sūrya Prajñapti. 18, the seventh upāṅga (sub-limb) of Jaina canonical literature, states-that

"From the samatala bhūmi, the Sun moves at a height of 800 Yojanas."

A mathematical analysis of these data shows that samatala bhūmi represents the plane parallel to the plane of ecliptic and bounded by the Parallel of celestial latitude of 73°.7. The centre of samatala bhūmi is coincident with the projection (on earth) of pole of ecliptic. Radius of samatala bhūmi is equal to 90° minus 73°.7, i. e., 16°.3. Obviously with this concept of samatala bhūmi, the Jaina notion that the Moon is 89 Yojanas higher than the Sun, becomes easily discernible. A notion of celestial latitude of the Moon is implied therein.[5] Besides it may be noted that the radius of Meru is equal to height of the Moon over that of the Sun above samatala bhūmi because.

Height of the Moon above that of the Sun$=80$ Yojanas

$$=5000 \text{ yojanas}$$

$$(\because 1 \text{ yojana}=\frac{500}{8} \text{ Yojanas})[6]$$

$$=\text{Radius of Meru's base on flat earth}$$

Besides it may be remarked that the only characteristic for samatala bhūmi as referred to in the text is that the Sun remains above it always at a height (celestial co-latitudinal distance as implied in Jaina texts) of 800

Yojanas. on the other hand the Sun covers 510 Yojanas on its southward Journey from sarvābhyantara maṇḍala to sarvabāhya maṇḍala and vice-versa. The consistency of figures 800 Yojanas and 510 Yojanas support our view[7] regarding the concept of Meru and the concept of samatala bhūmi. Even in the case of Meru, consistency of figures throughout gives a good criterion: It is also worth mentioning that although the apparent geometry confirms the Jainian notion about the shape of flat earth, yet the actual observation and determinations do fit the real geometry of earth.

Now it may be worth noticing that the actual distances were measured both in time degrees[8] and in earth distances[9]. Thus the Sun's southward journey from the sarvābhyantara maṇḍala (innermost mandala, i. e.. Sun's diurnal path on summer solstice day) and vice versa was measured into earth distances of 510 Yojanas. In Jambūdvīpa Prajñapti 7.2, it is stated[10] there are 65 solar maṇḍalas stretched over 180 Yojanas of Jambūdvīpa and then the area of lavaṇa samudra (salt ocean) begins therefrom.

Now since 510 Yojanas are equated with 47°, double the maximum declination of the Sun, this leads to conclude that

$$180 \text{ Yojanas} = 16°.6$$
$$= 23°.5 — 6°.9$$

This suggests that north-south stretch of maṇḍalas in Jambūdvīpa is extended southward from Sun's extreme north position 23°.5 upto 6°.9 in the northern hemisphere as we understand it these days, verisimilarly coinciding with the southern limit of ancient India including modern Sri Lanka. It seems convincing that verisimilarly the southward journey of the Sun was measured in Yojanas starting from a station on earth where the noon-shadow length of gnomon was zero on the summer solstice day, i. e., starting from a station situated in the neighbourhood of terrestrial latitude of 23°.5 north (which is incidently very close to the latitude of Ujjain, a renowned seat of ancient Indian culture) upto the station situated at about the extreme southern limit of ancient India where again the noon-shadow length was observed to be zero after 65 days since summer solstice day. This leads us to conclude that the concept of solar maṇḍalas implies that the outermost limit of Jambūdvīpa coincides with the parallel of terrestrial latitude of 6°.9 wherefrom lavaṇa samudra starts. The dimensions of circumference of Jambūdvīpa have been already dealt with as to how they were generated mathematically[11].

A mathematical analysis of the consistent dimensions of the mount Meru coupled with the study of the concept of samatala bhūmi shows that the outermost limit of Jambūdvīpa coincides with the parallel of terrestrial latitude of 23°.5 North. This conclusion implies that the true radius of Jambūdvīpa with Meru at its centre, is 5000 yojanas (=80 Yojanas) less than its apparent radius. Probably later at some stage the apparent radius of Jambūdvīpa might have been taken for its true radius, as a result of which

the outermost limit of Jambūdvīpa might have been shifted 80 Yojanas southward to the parallel of latitude of 23°.5 North. But the development of the concept of maṇḍala with the help of gnomonic experiments, the outermost limit of Jambūdvīpa had been shifted to 180 Yojanas southward to the parallel of 23°.5 North. Probably to cover up the gap between the sequential shifts from 80 Yojanas to 180 or to account for any error in the gnomonic experiments the concept of Jagatī might have been evolved which the author is yet investigating. Finally it may be envisaged that Jambūdvīpa as implied in the recent model of the concept of solar maṇḍalas (Sun's diurnal paths) is stretched over northern hemisphere of the earth with its periphery coinciding almost with the parallel of terrestrial latitude of 6°.9 North. This study opens many new vistas of research on certain physical theories in Hindu astronomy[12] and the role of Jainacāryas will be further highlighted.

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