

AN INNOVATIVE MODEL TO PREDICT EARTHQUAKES IN INDIAN PENINSULA

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ABSTRACT: *Can earthquakes be predicted? So far, the answer is no. Scientists are unlikely to be ever able to predict earthquakes with any amount of certainty, according to the United States Geological Survey Apr 25, 2013. An Innovative Model for Earthquake Prediction (IMEP) proposed in this paper is a combination of Vedic Astrology (Vedānga), Varāha Mihira's Brihat Samhita and scientific data of magnetic variations, structural geology such as fault zones, tectonic plates' directions, loose soil areas of all the earthquakes occurred in Indian Peninsula shield over a period of 200 years. In the course of preparation of this paper, it is observed that the earthquakes occurred at regular intervals of about 11 years and mostly during bright fortnight due to extraordinary astronomical phenomena occurring in the planets and special movements of the heavenly bodies. Vedānga and Brihat Samhita state that earthquakes are caused by eclipses of the luminaries. It is, therefore, plausible to predict earthquakes in a specific locality within a specific time limit utilising this model. However, as an initial step, the present model has been designed for application for India. The next earthquake in Indian peninsula is predicted to occur on Wednesday, the 16th March, 2016 on the basis of the proposed hypothesis model.*

KEYWORDS: Vedanga, Brihat Samhita, Solar Activity, Planetary Heridity, Solar Eclipse

INTRODUCTION

Earthquake prediction has been a scientific challenge. In the 1970s, scientists were optimistic that a practical method for predicting earthquakes would soon be found. It wasn't until the mid-1800s that scientists began to study and measure earthquake activity in earnest, using a device developed in Italy called the seismograph, but by the 1990s continuing failure led many to question whether it was even possible. In 2013, United States Geological Survey stated that scientists are unlikely to be ever able to predict earthquakes with any amount of certainty. If Scientists are unlikely to predict earthquakes, then are we destined to be at the receiving end of the wrath of catastrophe forever? Earthquakes did occur in the past also. How they dealt with them? What were the predicting methods used then? Science treats Sāstra as highly unconventional. Today our approach is much the same as before; we continue to study a succession of case histories of events leading to strong earthquakes. Topics such as anomalies in the ratio of *P*- to *S*-wave velocities, magnetic fields, resistivity, and so on are no longer at the leading edge of contemporary interest. The issue of prediction has always been one of the establishments of the probability that an earthquake will occur within a specified time interval, a specified space interval, and a specified magnitude range. Contraction of these intervals remains an elusive goal. Over the past one or two decades remarkable progress has been made in detailing the case histories of the precursory state before large earthquakes.

If scientific measures alone are not sufficient enough in the prediction of future earthquakes within reasonable limits to arm the disaster management effectively act in advance to prevent loss of life and limb, it is imperative to explore alternative methods, through unconventional subjects having a great treasure of information on earthquakes, instead of mankind being left to fend for themselves when confronted with such natural havocs even in the 21st century. Ancient Hindus excelled in all subjects that afforded the largest field for abstraction and contemplation. The uncanny ability of the ancient Hindu sages to see the future renders Vedic Astrology, a Vedānga which is one of the six limbs of the ageless Vedas, as an unchallengeable universal science [1]. Hence, there is need for a close collaboration of modern science and ancient Indian thought (śāstras) to fully understand about the earthquakes and volcanic eruptions.

Theory of Earthquakes: Science

The earliest documented earthquake occurred in China in 1177 B.C. But for most of history, people didn't really have any idea what caused them -- though they had some wild theories, such as the belief earthquakes were caused by air rushing out of caverns deep in the Earth's interior. It wasn't until the mid-1800s that scientists began to study and measure earthquake activity in earnest, using a device developed in Italy called the seismograph.

Earthquake forecasting and prediction is an active topic of geological research. Scientists' study and measure earthquake activity using a device called seismograph. An earthquake generates a series of waves that penetrate the entire Earth and travel at and through its surface. Each wave has a characteristic time: each has its own mode of travel. They are quite complex, but a few basic facts will explain how they travel through the Earth and how an earthquake's epicentre can be determined from seismograph records.

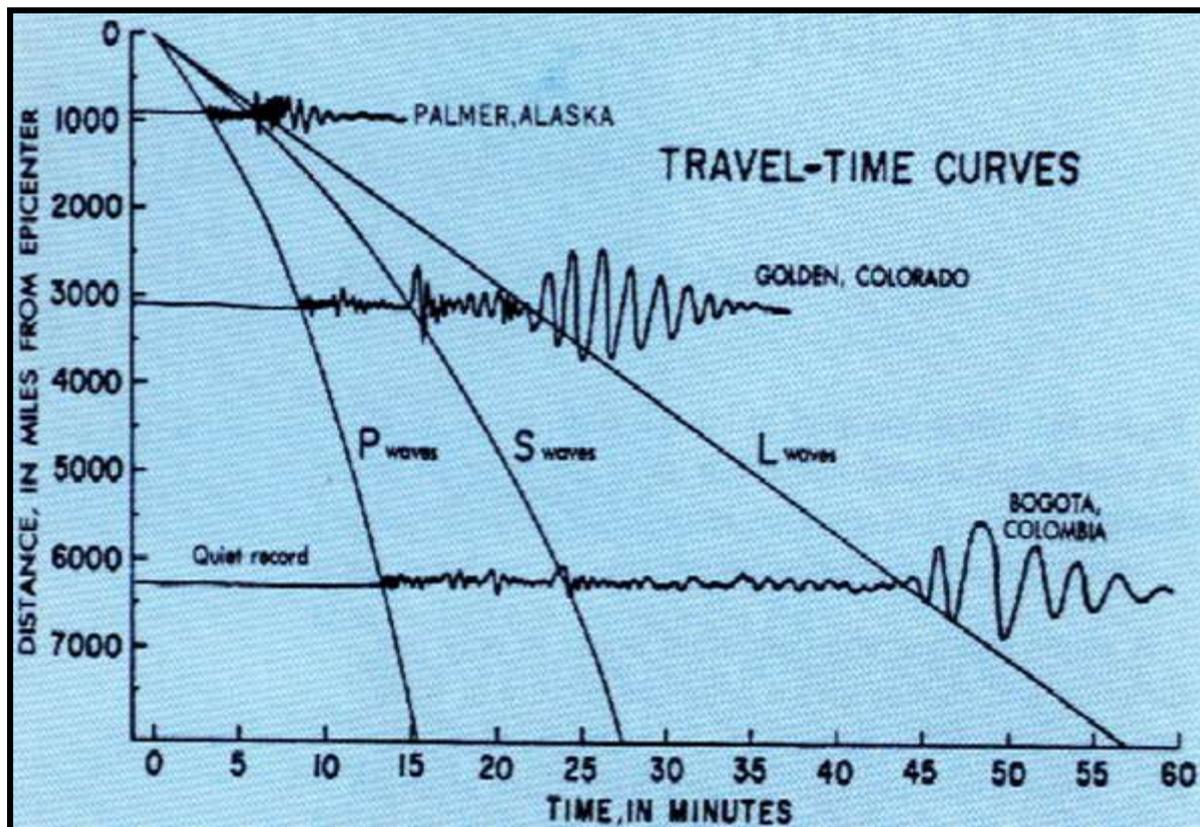
There are four basic types of seismic waves; two preliminary body waves that travel through the Earth and two that travel only at the surface (L waves). Combinations, reflections, and diffractions produce infinity of other types, but body waves are the main interest in this discussion.

The P wave is designated the primary preliminary wave because it is the first to arrive at a seismic station after an earthquake. It travels at a speed usually less than 6 kilometres per second in the Earth's crust and jumps to 13 kilometres per second through the core. The S wave is the secondary preliminary wave to be recorded. It follows paths through the Earth quite similar to those of the P-wave paths, except that no consistent evidence has yet been found that the S wave penetrates the Earth's core. The lines labelled P, S, and L in the curves shown on Figure 1 represent the travel time required for each phase at distances of 0 to 1300 kilometres from the earthquake's epicentre. They mark the points on the record at which these waves first arrive at the station.

The simplest method of locating an earthquake on a globe is to find the time interval between the P- and S-wave arrivals at several seismograph stations. The distance to the earthquake from each station is then determined from standard travel-time tables and travel-time curves. Great-circle arcs are drawn on the globe using the distance of the earthquake to the station as a radius. All the arcs should intersect at a common point - the epicentre.

Body waves are composed of two principal types; the P (primary) wave, comparable to sound waves, which compresses and dilates the rock as it travels forward through the Earth; and the S (secondary) wave, which shakes the rock sideways as it advances at barely more than half the P-wave speed. Scientists understand earthquakes a lot better but they still can't match the quake-predicting prowess which can detect seismic activity days in advance of a quake. Besides determining the origin of the earthquake, scientists also want to measure its strength. The strength of an earthquake is measured in units of Richter scale from 0 to 10 [2].

Figure 1: Travel time required for each phase



Seismic Zones of India

India being a large landmass is particularly prone to earthquakes. The Indian subcontinent is divided into five seismic zones with respect to the severity of the earthquakes. The classification of the zones has been done by the geologist and scientist as early as 1956 when a 3-zone (Severe, Light and Minor hazard) Seismic Zoning Map of India was produced. Since then the issue of seismic hazard has been addressed by different experts and agencies. The map (Fig.2) was based on a broad concept of earthquake distribution and geotectonics. The severe hazard zones are roughly confined to plate boundary regions, ie, the Himalayan frontal arc in the North, the Chaman fault region in the North West and the Indo-Burma region in the north east. The lower hazard zone is confined to Indian shield in the south and then moderate hazard zone confined to the transitional zone in between the two.



Fig.2:No. India Seismic Zone Map

Plate Tectonics

Researchers came up with a theory called plate tectonics that explained why the Earth shook. Scientists can predict where major earthquakes are likely to occur, however, based on the movement of the plates in the Earth and the location of fault zones. Most earthquake predictions are vague at best. Scientists have had more success predicting aftershocks, additional quakes following an initial earthquake. Although it is known that most global earthquakes will concentrate at the plate boundaries, there is no reliable method of accurately predicting the time and place. Prediction is concerned with forecasting the occurrence of an earthquake of a particular intensity over a specific locality within a specific time limit.

“The theory, called plate tectonics, is that the Earth's crust, or lithosphere, comprises many plates that slide over a lubricating asthenosphere layer. At the boundaries between these huge plates of rock and soil, the plates sometimes move apart, and magma, or molten rock, comes to the surface, where it's called lava. It cools and forms new parts of the crust. The line where this happens is called a divergent plate boundary.

The plates also can push against each other. Sometimes, one of the plates will sink underneath the other into the hot layer of magma beneath it and partially melt. Other times, the edges of the two plates will push against each other and rise upward, forming mountains. Giving rise to a convergent plate boundary” [3] (Fig.3).

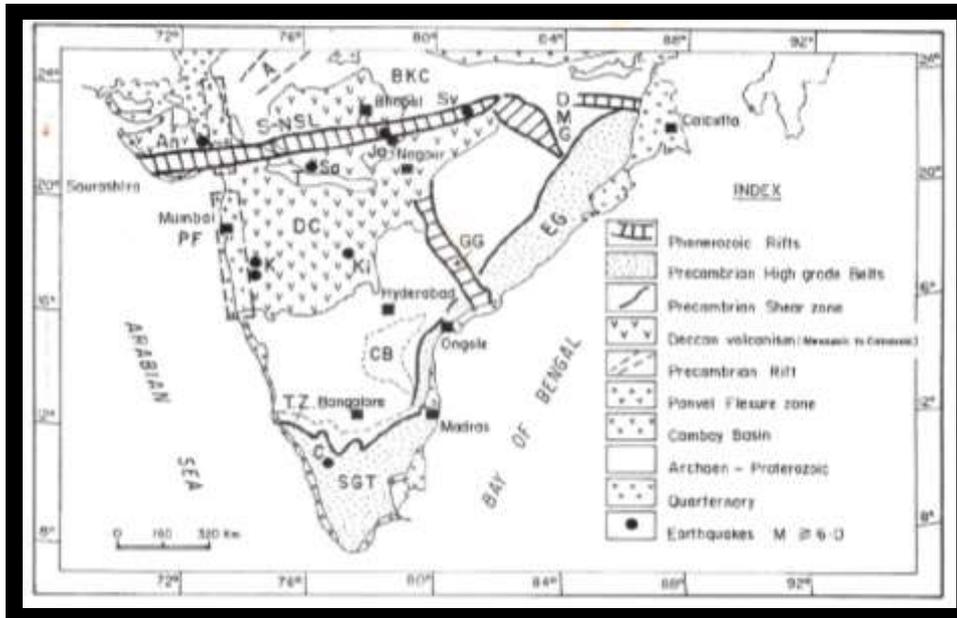


Figure 3. Significant Earthquakes occurred in the Indian Shield Regions. (Magnitude = 6.0 and above) with broad tectonic units. Different patterns for different tectonic units. BKC: Bundelkhand Craton. PF: Panvel Flexure Zone. CB: Cuddappah Basin. GG: Godāvāri Garben. EG: Eastern Ghats. TZ: Transition Zone. SGT: Southern Granulite Terrain Craton. M: Mahānadi. N: Narmada. A: Ārāvāli: Son-Valley. D: Damodar. Earthquakes are shown in solid circle (not to scale). Sa: Satpura. Sv: Son-Valley. K: Koyna. Ki: Killari. An: Anjar. C: Coimbatore; and Ja: Jabalpur and Damooh Hills (2 events) (Courtesy: B. R Rao, NGRI, Hyderabad, India).

Faults

“There are four types of earthquake faults, which are differentiated by the relative position of the fault plane -- that is, the flat surface along which there's a slip during an earthquake.

In a normal fault (see animation below), the fault plane is nearly vertical. The hanging wall, the block of rock positioned above the plane, pushes down across the footwall, which is the block of rock below the plane. The footwall, in turn, pushes up against the hanging wall. These faults occur where the crust is being pulled apart, at a divergent plate boundary.

The fault plane in a reverse fault is also nearly vertical, but the hanging wall pushes up, and the footwall pushes down. This sort of fault forms where a plate is being compressed. A thrust fault moves the same way as a reverse fault, but at an angle of 45 degrees or less.

In these faults, which are also caused by compression, the rock of the hanging wall is actually pushed up on top of the footwall at a convergent plate boundary. The sudden, intense shifts along already formed faults are the main sources of earthquakes. Most earthquakes occur

around plate boundaries because this is where strain from plate movements is felt most intensely, creating fault zones, groups of interconnected faults. In a fault zone, the release of kinetic energy at one fault may increase the stress -- the potential energy -- in a nearby fault, leading to other earthquakes. That's one reason why several earthquakes may occur in an area in a short period of time [4]. (Fig.4)

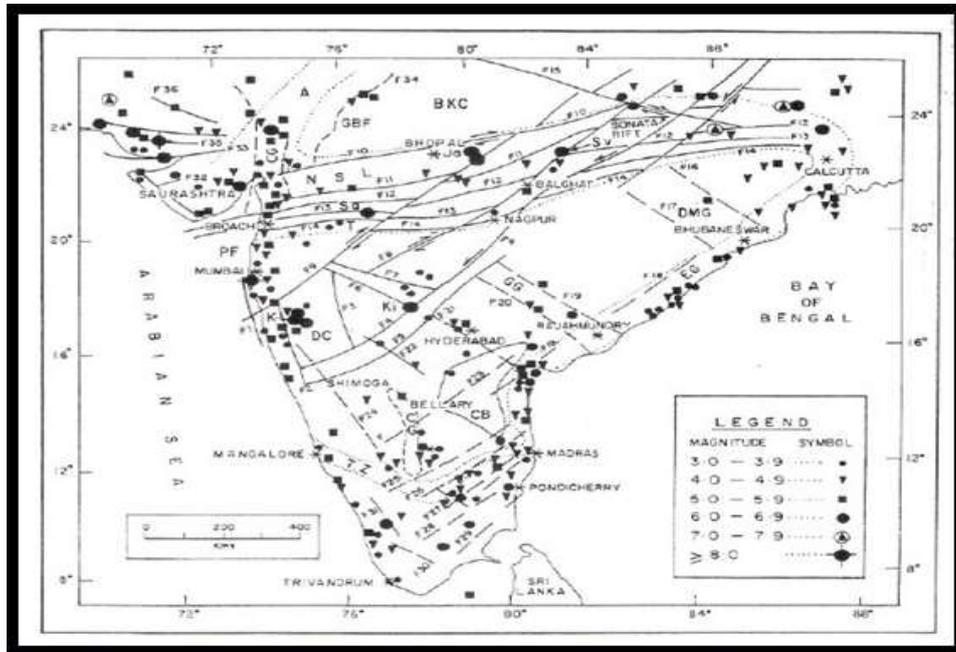


Figure 4: Distribution of Earthquake Epicentres (1700 – 1997) on the tectonic map of Southern Peninsula. F1 F2F36 are active faults recognised by different authors as mentioned in the text. Earthquakes at Koyna, Killari and Jabalpur appear to be located along the intersection of two or three fault segments. Legend of the tectonic units are the same as referred in Figure 1. (Courtesy: B. R Rao, NGRI, Hyderabad, India).

Cosmic Magnetism

Omnipresent is magnetism in the Universe. The Sun has a strong magnetic field that reverses polarity every 11 years creating the sunspot cycle. Sunspots themselves have strong magnetic fields; they come in pairs with a North Pole spot next to a South Pole spot. All planets with strong magnetic fields rotate rapidly (at least once every few earth days) and also contain an electrically conducting liquid.

Gauquelin's planetary heredity work shows that the four-pronged pattern, involving two large peaks and two small peaks, that emerges for Venus, Mars, Jupiter, Saturn, and the Moon [5]. Percy Seymour states that this four-pronged pattern, involving two large peaks and two small peaks of Gauquelin's planetary heredity is very similar to the shape of the average lunar daily magnetic variation for one month (Fig.5).

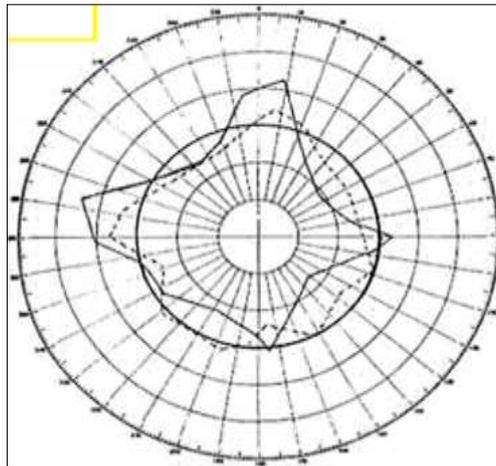


Fig.5: Gauquelin's planetary heredity of four-pronged pattern

“Geomagnetism is known to rise during periods of heightened solar activity. The level and intensity of solar activity waxes and wanes within the eleven-year solar cycle, also called the sunspot cycle. My theory proposes that certain planetary alignments affect solar activity. Thus, the build-up of sunspots within the solar cycle can be accounted for by the complex interactions of planetary forces acting upon the Sun's magnetic field, which in turn affects Earth's magnetosphere. Seymour also proposes that Mercury, Uranus, and Neptune also play a role in orchestrating the sunspot cycle and violent solar activity. The resemblance between Gauquelin's four-pronged pattern for Venus, Mars, Jupiter, Saturn, and the Moon and the pattern for the monthly average of the lunar daily magnetic variation suggested that the tidal tugs of the planets were in some way disturbing Earth's magnetosphere, just as the Moon and Sun are known to do. It suggested a plausible existence of a daily planetary magnetic variation, different for each planet, which might account for Gauquelin's planetary maximums all falling into this same four-pronged pattern”[6].

Does Solar Activity Cause Earthquakes?

A recent study of USGS found no direct relationship between the solar activity and earthquakes. “Scientists assembled historical records of the Sun's interaction with Earth, looking at sunspots, solar wind, and magnetic storms. They then compared these with historical records of earthquake occurrence. They found no significant pattern between solar activity and more or larger earthquakes. There is no demonstrated way to use space data to predict future earthquakes. No reliable short-term earthquake prediction method has ever been developed. Nor do scientists expect to develop a method in the foreseeable future. However, based on scientific data, probabilities can be calculated for future earthquakes”.

The study was recently published in the journal ‘Geophysical Research Letters’. The research was conducted by Jeffrey Love with the USGS and Jeremy Thomas from Northwest Research Associates. The earthquake data were from the USGS, the sunspot data were from NOAA, the solar wind data were from NASA, and the geomagnetic data were from the British Geological Survey and Geoscience Australia [7].

Theory of Earthquakes: Śaṣṭra

The Vedas, Purānas and the epics contain many references of earthquakes. Earthquakes have been occurring from ancient times in India and our ancestors took considerable interest in these as with other unusual phenomena. There has been an effort over centuries, to identify places which suffered from earthquakes [8]. Varaha Mihira's approach of describing earthquakes in terms of the extent of ground shaking is refreshingly scientific. There exist a large number of writings in Sanskrit on natural phenomena. Among these, available in print is Brihat Samhita of Varaha Mihira (5–6th century AD) which states that the four elements namely Wind, Fire and Rain along with Indra (Lightening) cause the earth to shake [9].

Stars or Nakshatras

Varaha Mihira in his Brihat Samhita states that the earthquakes are caused by eclipses of the luminaries, unnatural phenomena occurring in the planets and special movements of the heavenly bodies. Thus, an earthquake which occurs from Vāyavya (North-West) in the last quarter of the night or in the first quarter of the day under any of the stars (i) Asvini, Mrigasira, Punarvasu, Hasta, Chitta, Svāti and Uttarapalguni belongs to the wind group (Vāyavya) (ii) an earthquake which occurs from Nairiti (South-West) under any of the stars Abhijit, Sravana, Dhanishta, Rohini, Jyeshtha, Uttarāshādha and Anurādha constitute Indra's Circle (iii) an earthquake which occurs from Āgneya (South-East) under any of the stars Phushya, Krittika, Visākha, Bharani, Magha, Purvabhādrapada and Purvaphalguni constitute Fire Circle, and (iv) an earthquake which occurs from Īśānya (North-East) under any of the stars Revati, Purvashādha, Ārdra, Āṣleśa, Mula, Uttarābhādrapada and Satabhisha constitute Varuna Circle (Fig.6).

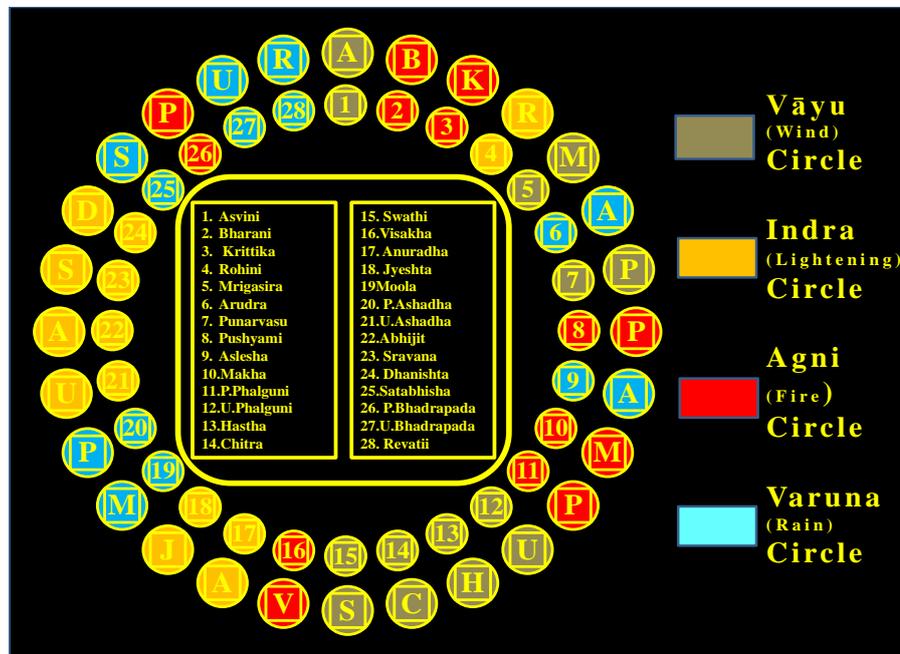


Figure. 6: The 28 Lunar Mansions (includes Abhijit, the 22nd Star in the list) shown in different colours belonging to each of the four different Circles of division

The five natural elements are Ether, Air, Fire, Water and Earth which are present in our Solar System and their cosmic counterparts with their nature are shown in Fig. 7. As a matter of fact, not only the four different circles viz., Agni, Varuna, Vāyu and Indra are formed on the basis of the five natural elements but also on the triplicity of the signs of the zodiac with their Lords. In short, the four circles, the signs of the zodiac occupied by the planets with their nature, the cosmic counterparts (planets) of these natural elements, the lunations and lunar mansions are all interrelated to one another.

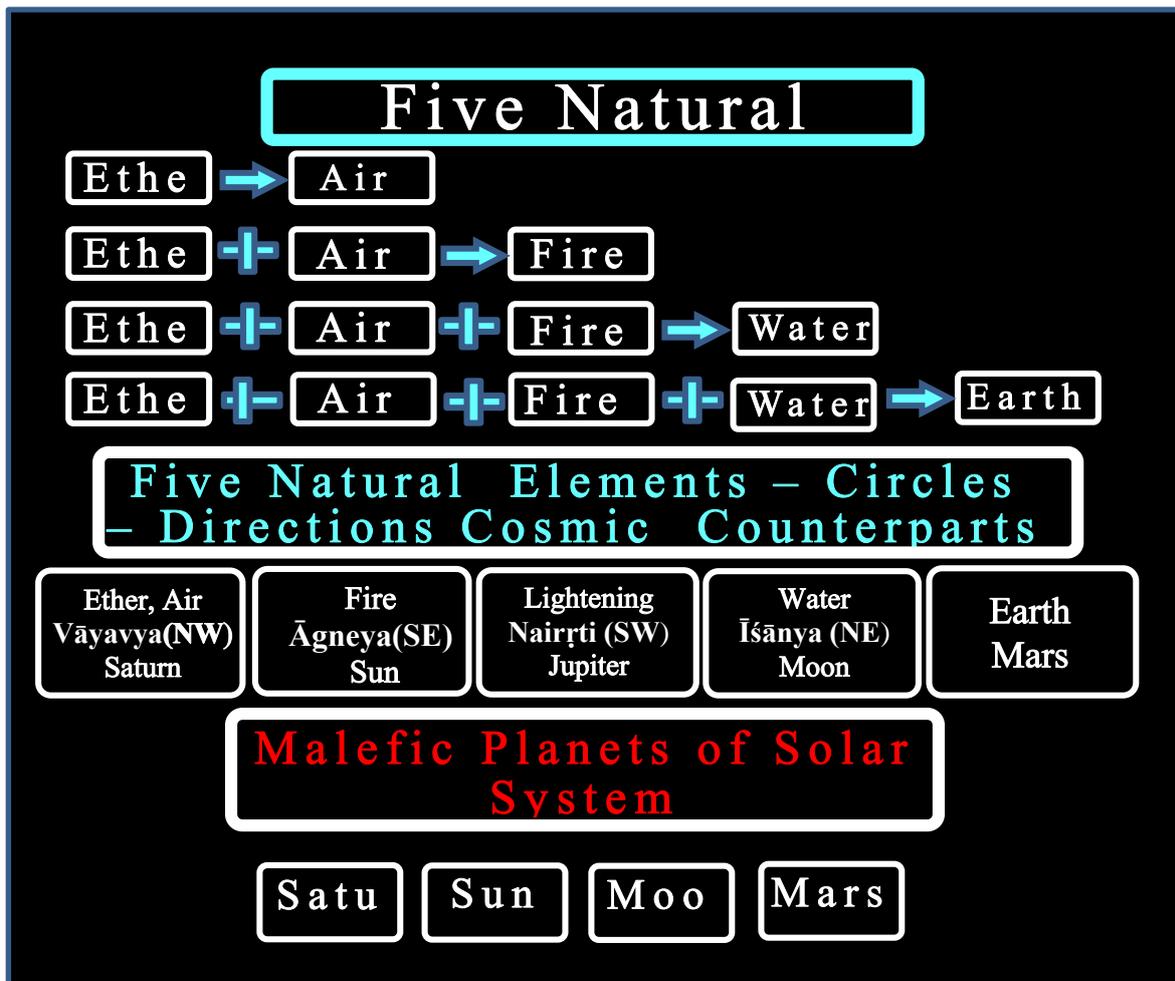


Figure 7: Shows Natural elements, circles, directions and cosmic counterparts and their nature

The Zodiac

The Zodiac, also called 'Bhachakra' in Sanskrit, is divided into 27 lunar mansions or asterisms or Lunar constellations or nakshtras of $13\frac{1}{3}^{\circ}$ each. A nakshtra or lunar mansion is one of the 27 divisions of the sky, identified by the prominent star(s) in them, used in Hindu astrology known as Vedic Astrology. In Bhagavad Geeta, Krishna tells Arjuna, that among Nakshtras he is Abhijit, which remarks the auspiciousness of the Nakshatra [10]. Abhijit is the 28th Nakshatra or asterism in Indian astrology system. Abhijit is the Sanskrit name for Vega, the brightest star in the northern constellation of Lyra. Abhijit means "Victorious" or "the One who cannot be defeated". Its longitude starts from $06^{\circ} 40'$ to $10^{\circ} 53' 20''$ in sidereal Capricorn i.e. from the last quarter of Nakshatra Uttara Ashādhā to first $1/15^{\text{th}}$ part

of Shravan. Hence, Abhijit Nakshatra is not a regular Nakshatra with four *pādas* or quarters, it serves as an intercalary asterism most of the times. It is not mentioned as frequently as other asterisms in mythology. Abhijit Nakshatra is an auspicious time in the Hindu calendar[11]

Planets

The Zodiac or Bhachakra is also divided into 12 signs of 30⁰ each called signs from Aries to Pisces with the major planets of our solar system having lordship over the signs (Fig.8) [12]. From the commentaries on Brihat Samhita, we find that Parāshara was of the opinion that eclipses and planetary aberrations could also cause earthquakes This explanation originating from the Rig Veda has been given in the text as a rudimentary theory on formation of stable continents and not in any religious sense.



Figure 8: The Tropical Zodiac with the 12 Signs and their respective Lords (Planets)

Major Planetary Configurations

Before we proceed to consider the effect of configuration of planets, it is necessary to have some preliminary knowledge of what the symbology means to understand the configuration.

Aspect is the geometric relationship between two planets in the horoscope chart. Aspects are important in analysing a horoscope because they give the combined effect of the functions of the two planets involved. The major aspects between the planets are the conjunction, semi-sextile, sextile, square, trine, square, Quincunx and opposition. The semi-sextile, sextile, trine and conjunction are said to be good or favourable whereas the square, opposition and quincunx are taken to be not favourable. Aspects are the vital factors in the formation of one's character.



The Conjunction – The conjunction is formed when two planets are at approximately the same degree of the same sign or at an orb of not more than 8 degrees. In a conjunction, the energies of the two planets are combined, and the result is often a

strengthening of both. Conjunctions of Lords of 1, 4, 7 and 10th houses produces good effects. Conjunctions of the trine Lords (5th and 9th houses) are always good irrespective of their location. A Moon-Venus conjunction is beneficial whereas a Saturn- Mars conjunction is said to be stressful.



The Semi-Sextile – This aspect is formed when two planets are 30 degrees apart with an orb of two degrees in either direction. This aspect is reckoned to be mildly favorable with the planets working well together.



The Sextile – Sextiles occur when two planets are approximately 60 degrees apart. This is the aspect of opportunity. It is the 3rd and the 11th house Hindu aspect. Initiatives can be taken during this aspect and it reinforces the weak points in life. It is a very benign aspect indicative of talent, confidence and popularity.



The Square – Squares occur when two planets are approximately 90 degrees apart. It is the 4th and the 10th house Hindu aspect. Square causes the friction and the hurdles that help us to grow and become productive. This is the most critical and conflicting aspect. It gives disturbed, prejudiced or adverse conditions and circumstances accompanying it. It is a separative aspect and it turns the tide of fortune.



The Trine – A trine occurs when two planets are approximately 120 degrees apart. It is the 5th and the 9th house Hindu aspect. Trines bring about ease and comfort. This is a fortunate aspect for harmony, peace and does much to improve adverse aspects. When a trine occurs between Sun and Moon it is more fortunate than any other aspect.



The Opposition – The opposition occurs when two planets are about 180 degrees apart. It is the 7th house Hindu aspect. As the name implies, opposition are obstacles that must be resolved. This is a malefic aspect of perfect balance. It includes confrontation and partnership. It indicates change of circumstances. Oppositions can manifest as mood swings [13].

Earthquakes occurred in India over 200 years

A list of all earthquakes occurred in India over 200 years with complete details of date, place, magnitude, lunar mansion (star) relevant circle have been compiled and tabulated for a comprehensive study (Table 1)

PROPOSED METHODOLOGY

Based upon all the literature stated above, Table 1 and maps (Fig. 3 and 4) show the available scientific data designed and represented together with the data from śāstra with all the details of earthquakes occurred in Indian Peninsula over a period of 200 years. The entire data from the figures and the table have been compiled for a comprehensive analysis to draw a conclusion to predicting earthquakes.

S/N	II Location of Epice	III Date of Occurree	IV Lat °N	V Long °E	VI Time 'h'	VII Magni tude	VIII Star (Lunar Mansi)	IX Nature of Circle	X Lunation (Thidhi)	XI Ruling Planet	XII Position of Sun	XIII Position of Moon	XIV Position of Mars	XV Position of Jupiter	XVI Position of Saturn
1	Kutch	16 Jun 1819	23.6	69.6	--	--	Revati	Varuna (Rain)	K.Navami	Moon	Gemini	Aries	Taurus	Aquarius	Aries
2	Bellāry	01 Apr 1843	13.7	79.4	10- 15	5.8	Aśvini	Vāyu (Wind)	S.Vidiya	Saturn	Aries	Aries	Sagittarius	Aquarius	Capricorn
3	Sironcha	22 Nov 1872	18.8	80.0	--	5.0	Āslesha	Varuna (Rain)	K.Sapthami	Moon	Aquarius	Leo	Virgo	Virgo	Capricorn
4	Secunderābād	22 Nov 1876	17.5	78.5	--	--	Śravana	Indra (Lightening)	S.Shashti	Jupiter	Sagittarius	Aquarius	Libra	Sagittari us	Pisces
5	Coimbatore	07 Feb 1900	10.8	76.8	7-0	6.0	Krittika	Agni (Fire)	S.Navami	Sun	Aquarius	Taurus	Aquarius	Sagittari us	Capricorn
6	Kangra, HP	04 Apr 1905	32.1	76.3	--	7.8	Uttārabhādr ai	Varuna (Rain)	Amavasya	Saturn	Aries	Aries	Scorpio	Taurus	Aquarius
7	Mallāni	12 Jul 1907	26.0	72.0	--	5.0	Pushyami	Agni (Fire)	S.Dvitiya	Sun	Cancer	Leo	Capricorn	Cancer	Pisces
8	Bhāvnagar	21 Apr 1919	22.0	72.0	6.3	6.3	Mula	Varuna (Rain)	K. Shashti	Moon	Sagittarius	Libra	Taurus	Scorpio	Aquarius
9	Son. Valley	02 Jun 1927	23.8	82.1	--	6.5	Aslesha	Varuna (Rain)	S.Trutiya	Moon	Gemini	Cancer	Cancer	Pisces	Sagittari us
10	Dhubri	2 Jul 1930	25.8	90.2	--	7.1	Purvāshādha	Varuna (Rain)	S.Saptami	Saturn	Cancer	Virgo	Taurus	ancer	Capricorn
11	Bihar-Nepal	15 Jan 1934	28.0	87.1	--	8.1	Sravana	Indra (Lightening)	Amavasya	Jupiter	Capricorn	Capricor n	Aquarius	Libra	Aquarius
12	Satpura	14 Mar 1938	21.5	75.7	5-0	6.2	Makha	Agni (Fire)	S.Trayodas i	Sun	Pisces	Leo	Taurus	Aquarius	Aquarius
13	Paliyād	23 Jul 1938	22.4	71.8	--	5.5	Rohini	Indra (Lightening)	K.Ekadasi	Jupiter	Cancer	Gemini	Leo	Pisces	Aries
14	Anjār	21 Jul 1956	23.0	70.0	--	7.0	Purvāshādha	Varuna (Rain)	S.Chaturda si	Moon	Cancer	Capricor n	Pisces	Virgo	Scorpio
15	Kurja	10 Oct 1956	28.15	77.67	--	6.0	Moola	Varuna (Rain)	S.Saptami	Moon	Libra	Capricor n	Pisces	Virgo	Scorpio
16	Midnapur	15 Apr 1964	21.7	88.0	0-36	5.5	Krittika	Agni (Fire)	S.Chaturdi	Sun	Aries	Gemin	Aries	Taurus	Pisces

17	Mahad	25 Apr 1967	18.2	73.4	0-50	5.6	Visākha	Agni (Fire)	K.Padyami	Sun	Taurus	Scorpio	Libra	Cancer	Aries
18	Koyna	10 Dec 1967	17.5	73.7	0-10	6.3	Uttārabhādra	Indra (Lightening)	S.Navami	Jupiter	Sagittarius	Aries	Aquarius	Virgo	Aries
19	Bhadrāchalam	13 Apr 1969	17.9	80.6	0-10	5.3	Satabhisha	Varuna (Rain)	K.Dwadasi	Moon	Aries	Pisces	Sagittarius	Virgo	Aries
20	Mount Ābu	24 Oct 1969	24.8	72.4	0-15	5.7	Revati	Varuna (Rain)	S.Chaturdasi	Moon	Scorpio	Aries	Capricorn	Virgo	Taurus
21	Broach	23 Mar 1970	21.7	73.0	0-15	5.4	Haṣṭha	Vāyu (Wind)	K.Padyami	Saturn	Aries	Libra	Taurus	Scorpio	Taurus
22	Shimogas	12 May 1975	13.8	75.3	0-35	5.0	Krittika	Agni (Fire)	S. Padyami	Sun	Taurus	Gemini	Pisces	Aries	Cancer
23	Jaisalmer	08 Nov 1981	26.3	70.6	0-22	5.6	Anurādha	Indra (Lightening)	S.Vidiya	Jupiter	Scorpio	Sagittarius	Scorpio	Virgo	Aquarius
24	Latur, Killāri	29 Sep 1993	18.0	77.5	0.7	6.2	Purvābhādra	Agni (Fire)	S.Chaturdasi	Sun	Libra	Pisces	Scorpio	Libra	Aquarius
25	Bhāvnagar	08 Dec 1993	22.0	72.0	--	5.0	Hastha	Vāyu (Wind)	K.Dasami	Saturn	Sagittarius	Aquarius	Sagittarius	Sagittarius	K.Dasami
26	Jabalpur	21 May 1997	23.0	80.0	0-35	6.0	Visākha	Agni (Fire)	S.Chaturdasi	Sun	Gemini	Scorpio	Aquarius	Aries	Virgo
27	Kashmir	08 Oct 2005	--	--	--	7.6	--	--	--	--	--	--	--	--	--
28	Bihar-Nepal	26 Apr 2015	28.0	87.1	18.05	5.1	Pushyami	Agni (Fire)	S.Ashtami	Moon	Taurus	Cancer	Taurus	Leo	Sagittarius

Table 1: Details of Lunations, Lunar Mansions, Planets' Circles, Planets' Places in the Signs for all the dates of earthquakes occurred in India over 200 years

DISCUSSION OF RESULTS

Scientific Data

Seismic Map of India (Fig.2) is self-explanatory in that the area falling under Zones IV and V are with higher and highest seismic activity and vulnerable to earthquakes.

Fig.3 shows Earthquakes occurred in the Indian Shield Regions (Magnitude = 6.0 and above) with broad tectonic units. Indian Peninsula is broadly divided into different patterns for different tectonic units. Indian Peninsular Shield had been considered as a stable continental region but it had experienced around 13 earthquakes of magnitude $M \geq 6$ since the 18th Century.

Fig. 4 shows distribution of Earthquake Epicentres (1700 – 1997) on the tectonic map of Southern Peninsula. F_1 F_2 F_{36} are active faults recognised by different authors. Earthquakes at Koyna, Killari and Jabalpur (Sl.No.18, 24, 26 respectively in Table 1) appear to be located along the intersection of two or three fault segments. Legend of the tectonic units is the same as referred in Figure 4. Killari Earthquake occurred at the intersection of two faults F_4 and F_6 , Jabalpur Earthquake occurred at the intersection of two faults F_{10} and F_{11} . The mega fault system of Saurashtra (S) – Narmada (N) – (Son) – Lineament (L) in Figure 5 is considered seismically active faults with high magnitudes [14].

Sāstra Data

In Table 1, it is observed that 37 percent of all the earthquakes are falling under the Rain Circle, 33.5 percent of all the earthquakes fall under Fire Circle, 18.5 percent fall under Lightning Circle and a mere 11.5 percent of earthquakes fall under Wind Circle (Fig.9).

It is also observed that 63 percent of Earthquakes in India occurred in Bright Fortnight and only 37 percent of Earthquakes occurred in Dark Fortnight.70 percent of Earthquakes in India occurred on dates near the New moon and only 30 percent near the Full Moon (Fig.10).

This clearly shows that the two planets, the Sun and Moon, signifying the Fire Circle and Rain Circle seem to be paramount in the occurrence of earthquakes besides being the cause of the lunations and Lunar Mansions.

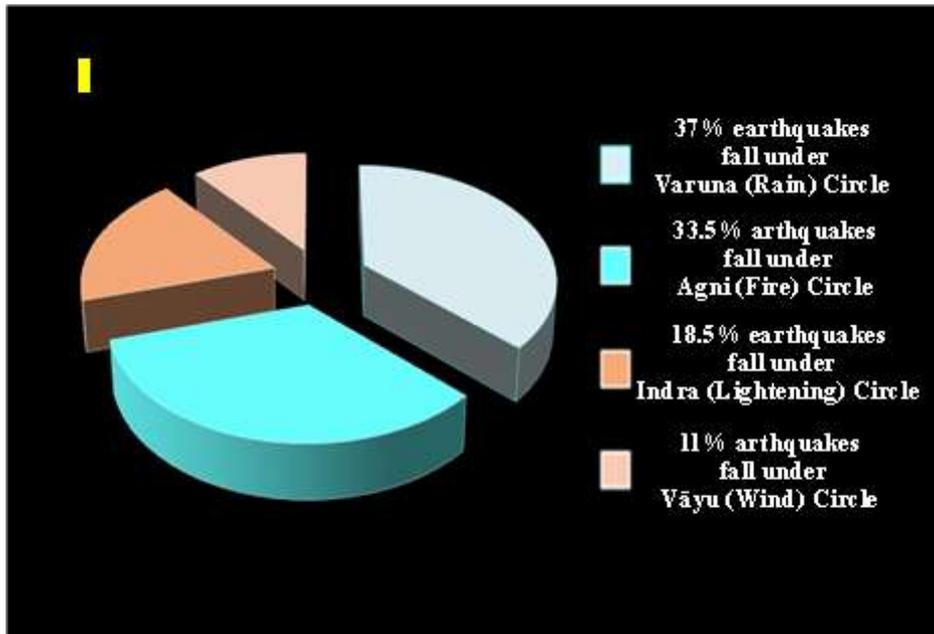


Figure.9: Distribution of Earthquakes falling under different Circles defined by Varahamihira

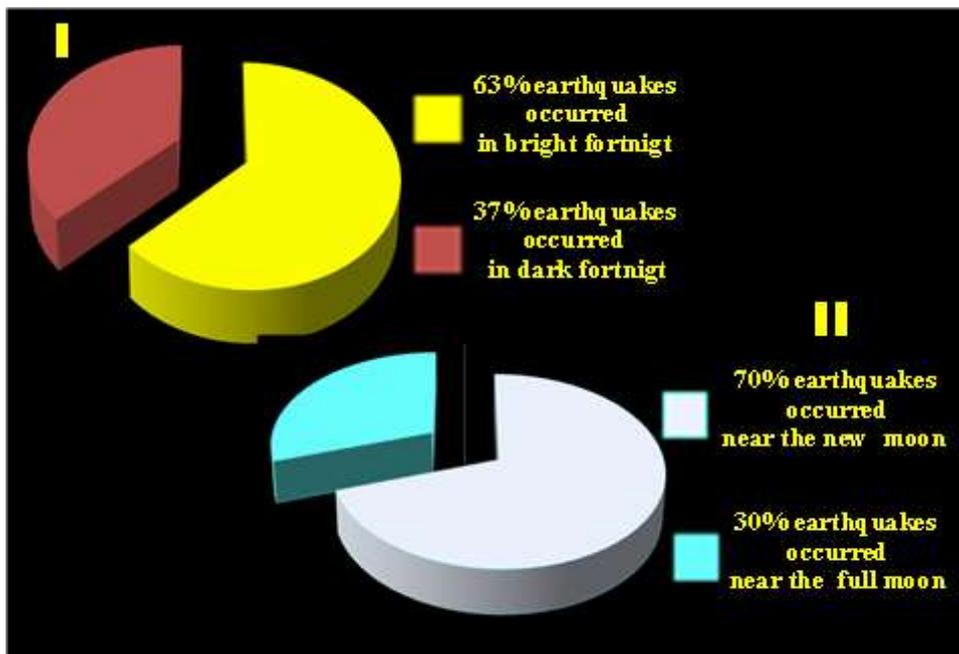


Figure.10: Distribution of Earthquakes occurring during Bright Fortnight and Dark Fortnight (I) and near the New Moon and near the Full Moon (II)

The positions of the planets, Sun, Moon, Jupiter, and Saturn signifying the Fire Circle, Rain Circle, Wind Circle and Lightening Circle respectively are also considered most important as their magnetism plausibly holds the occurrence of an earthquake. In Vedānga, Mars is known as ‘Kshetrakāraka’ being the significator of land (the Earth) [15]. The position of our Planet is also considered equally important in view of the fact that ultimately the combined magnetism of all the cosmic counterparts targets our Mother Earth.

Eclipses in immediate future, if any

A partial Solar Eclipse occurs in India on March 9, 2016 (New Moon Day – Lunation: Amavāsya – Lunar Mansion: Uttarabhādra, the 27th Star) at about 06.00 AM and traverses through places, Bhubaneshwar, Jamshedpur, Calcutta, Ranchi, Asansol, Dhanbad, Patna, Shiliguri, Guwahati, Aizawl, Imphal (Fig.11).

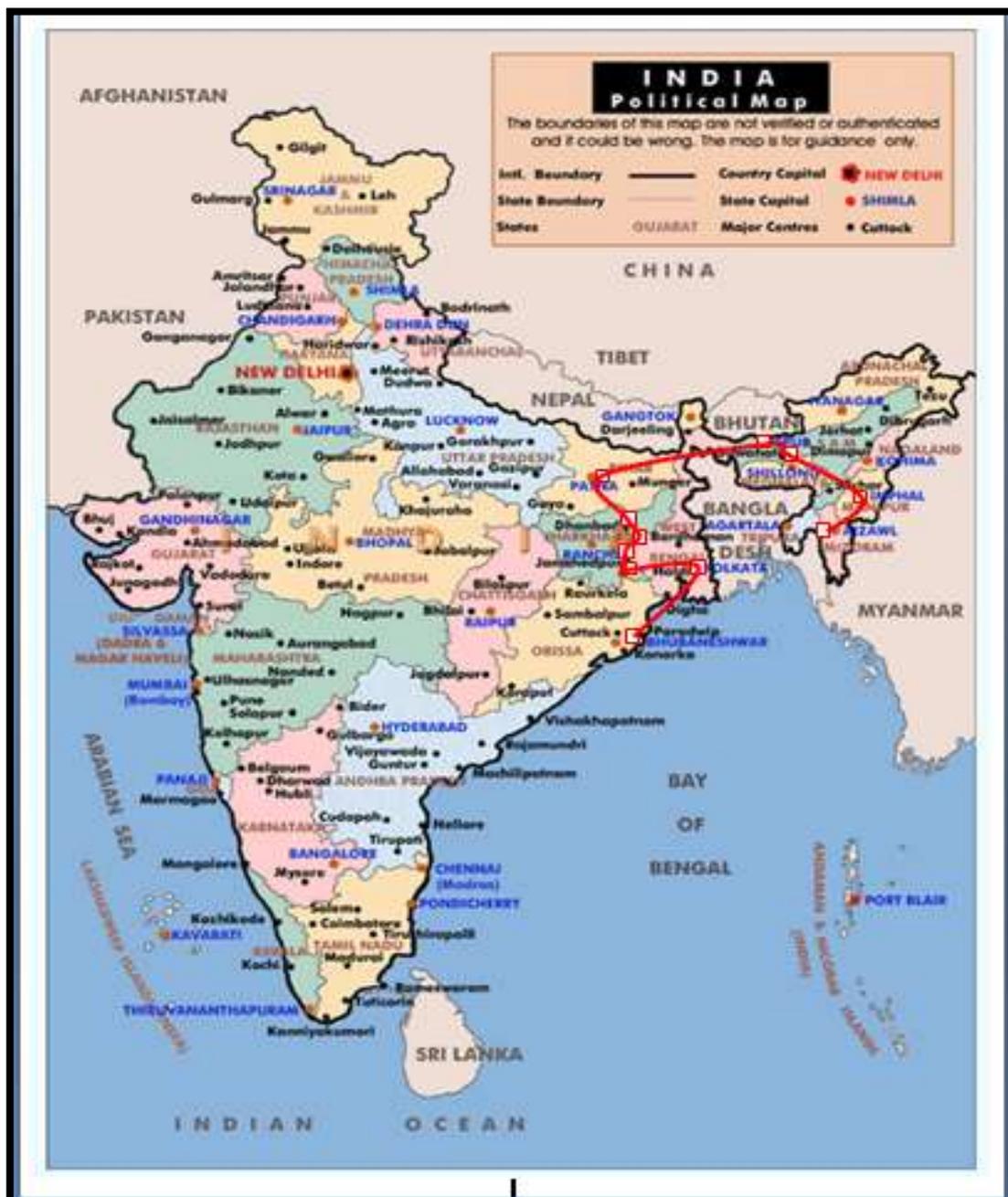


Figure 11: Map showing the area likely to be affected by a possible Earthquake

Planetary configuration on Solar Eclipse Day

The Planetary configuration with longitudes of planets from the Vernal equinoctial point on the Solar Eclipse day is obtained from Astronomical Ephemeris of Planets' Places and Hindu Almanac. A chart is prepared for analysing the same for its strength for a possible earthquake (Fig.12).



Figure 12: Position of Planets in the Zodiac relevant to India on partialSolar Eclipse Day, the 9th March 2016.

Sun, Moon and Mercury are in conjunction at South Lunar Node. Saturn and Mars (Malefics) are in conjunction in Sagittarius, an earthy sign. A Saturn- Mars conjunction is said to be stressful. Sun, Moon and Mercury are in conjunction and in square to Saturn and Mars. It gives disturbed, prejudiced or adverse conditions and circumstances accompanying it. Saturn aspected modified Jupiter situated in the earthy sign Virgo aspects all planets in Pisces (Fig. 13).



Fig. 13. Major Planetary Configuration in the Zodiacal Signs on the 9th March 2016 with reference to Vernal Equinoctial Point

Application of Proposed Model for predicting future earthquakes

All the available data both from Science and Sastra have been combined as a multilink theory in the prediction of an earthquake likely to occur in India in 2016. It is observed from Table.1 that the last earthquake occurred in India was in 2005 and the next is likely to occur in 2016 after 11 years in tune with the eleven-year solar cycle. Certain planetary alignments affect solar activity.

Next in importance is the position of Sun and Moon and extraordinary astronomical phenomenon, if any. It is observed that a partial Solar Eclipse occurs on March 9, 2016 (New Moon Day – Lunation: Amavāsya – Lunar Mansion: Uttarabhādra, the 27th Star) at about 06.00 AM. Star Uttarabhādra falls under Varuna Circle presided by Moon having a direction of North-East for earthquakes occurring under this cycle.

It is observed from the Almanac or Ephemeris, a Hindu household necessity in India, that only two stars Ārudra and Āslesha stars belonging to Varuna or Rain Cycle are present in the bright fortnight. It is, therefore, expected that the next earthquake would occur in any one of these two stars relating to Varuna Circle. Of these two stars, the earthquake occurs in Ārudra Star being the nearest to the New Moon which occurs on Wednesday, the 16th March, 2016.

The partial Solar eclipse traverses through places Bhubaneshwar, Jamshedpur, Calcutta, Ranchi, Asansol, Dhanbad, Patna, Shiliguri, Guwahati, Aizawl, Imphal. It is observed that all these places lie in the North-East region in the India Map. A thick red line is drawn connecting the above places in the map and the area surrounded by these places is prone to be affected by a possible earthquake on the 16th March, 2016. [12].

Interestingly enough, the places above mentioned connected by a red line in Fig. 11 and the area surrounded by the marked line are falling under Zone V is highest seismogenic and more vulnerable to severe earthquakes. Further, the zone has number of intersections of faults where severe earthquakes of $M \geq 6$ were experienced (Figs.3 and 4) .

It is also observed that 67 percent of earthquakes occurred during bright fortnight, (never on any day of Solar Eclipse) and 70 percent of earthquakes occurred near the new Moon. Therefore the earthquake is likely to occur after the occurrence of Solar Eclipse and very early after the eclipse.

The major planetary configuration is observed for the complex interactions of planetary forces acting upon the Sun's magnetic field, which in turn affects Earth's magnetosphere and in turn their effects on our planet according to Vedānga for the day of Solar Eclipse of 9th March, 2016 for possibility of an earthquake occurrence..

It is also observed from the Ephemeris that the planetary configuration of the planets on the 16th March 2016 is identical to their configuration of 9th March 2016 (Solar eclipse day) except in that the Moon has moved from Pisces to Gemini during the course between the 9th March and the 16th March (Fig.13). It is also observed, on considering the new position of Moon in Gemini, it is still under Saturn – Mars effect being in opposition to them and also under the influence of Sun-Mercury, South Lunar Node being in square to them. remained

under Saturn – Mars effect (Fig.14). The influence of Moon on Jupiter- North Lunar Node still continues being in square to it.



Figure 14: Position of Planets in the Zodiac relevant to India on the 16th March 2016.



Figure 15. Major Planetary Configuration in the Zodiacal Signs on the 16th March 2016 with reference to Vernal Equinoctial Point

The combined and maximum evil effect of all planets brings an earthquake of magnitude $M \geq 6$ with its epicentre between Patna and Guwahati on the 16th March 2016 when and where the Solar eclipse visibility is maximum. Further, the effects of magnetism of planetary configuration remains the same even on the 16th in spite of Moon having advanced to Gemini from Pisces and will be still under the influence of Saturn-Mars combination being in opposition.

This earthquake falling under Varuna Circle causes floods and landslides. It appears that the predicted earthquake may be plausibly the after effect of recent Nepal – Bihar Earthquake of April 25, 2015.

CONCLUSION

An earthquake of $M \geq 6.0$ with its epicentre near Guwahati is predicted to occur on Wednesday, the 16th March, 2016 – Solar Eclipse Day - Uttarāyana (Winter Solstice) – Sisira Routhu (Season) - Phalguna Māsam (Month) - Sukla Paksha (Bright Fortnight) - Ashtami Lunation – Ārudra Star.

While Earthquake Preparedness is Mandatory for any country, it is suggested to monitor the seismic intensity more vigorously, in the present case, at least for a substantial period spread over couple of months from now on to the predicted date of occurrence of a plausible earthquake in the North-East region.

Earthquake Preparedness

Knowing the likelihood of future earthquakes allows prudent actions to be taken to mitigate their effects, no matter when they may happen to strike. As destructive as earthquakes are, the resulting secondary effects such as landslides, tsunamis, fires and floods can be even more devastating. Landslides are especially damaging and often account for the majority of lives lost. In the future, improvements in prediction and preparedness should further minimize the loss of life and property associated with earthquakes. But it will be a long time, if ever, before we'll be ready for every substantial earthquake that might occur. Just like severe weather and disease, earthquakes are an unavoidable force generated by the powerful natural processes that shape our planet. All we can do is increase our understanding of the phenomenon and develop better ways to deal with it on knowing its likely occurrence through this hypothesis.

Future Research

If the earthquake actually occurs true to prediction as mentioned herein, even if with deviations in respect of any or all of the parameters involved in the analysis, the author cannot but exclaim 'eureka'. All factual details of such an earthquake would form the basis for fine tuning of the hypothesis model for future application to Indian conditions and similar hypothesis model can be worked out applicable to country specific of the world with relevant modifications.

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