did not seem to have any effect on the will to have babies. Finally, we may look at hard transit aspects (squares and oppositions). In the nine month period before the estimated conception, the sum of hard transit aspects had a negative excess (p= 0.03). However, some hard aspects seemed to be beneficial for the will to have babies; the strongest of such aspects were the hard aspects of transiting JU to SO (p=0.0003).

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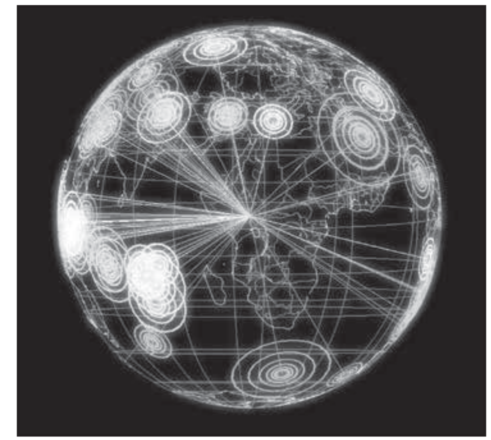
Earthquake Prediction Model III

Jagdish Maheshri



ABSTRACT

The objective of this research is to further continue[1,2] analyzing and investigating correlations between astronomical data and earthquakes, with the intended goal of predicting future earthquakes with a greater advanced warning and higher degree of accuracy than current technology. Specifically, it focuses on severe earthquakes that occurred during the last century, with special emphasis on earthquakes of magnitude 7 or higher. This research work has already shown[1,2] a correlation between certain inter-planetary configurations (encompassing the relative geocentric positions and angles of all planets) and the occurrence of strong earthquakes. Building on the work done since the last publication[1,2], which focused on the validation of data employed from other resources[3] wherever possible, and extending the data set to include the earthquakes of magnitude 7 or higher from January 1900 to December 2009. The previous work included, the Model I, the 15-degree multiple angles, and the model II, the 12-degree multiple angles. This work extends the research

3D Global Earthquake Image from Wolton.Net
Earthquake Imaging software http://www.wolton.net

by including the top 16 most frequently occurred angles for each pair of planet angle. As a result, the new improved model seems to predict earthquake of magnitude 7 or higher with a significant more accuracy. However, further research is necessary to build a useful, predictive model that can assess the probability of a given earthquake occurring during a certain time period at a given geographical location on earth. Predicting earthquakes well in advance of the state of the art will promote, protect, and enhance the world economy, potentially saving millions of lives.

Introduction

There is absolutely no precedent in predicting an earthquake solely based on planetary configuration. An occurrence of an earthquake is a random event and it can sometimes occur more frequently than other times. This research began with the idea that planetary positions along the ecliptic, and therefore, their apparent (geocentric) positions as viewed from earth, may potentially correlate with the occurrence of earthquakes. Based on planetary characteristics and a large amount of earthquake data, several hypotheses were tested to see if these correlations actually exist. The results of this exercise indicated that certain planetary configurations seem to correlate reasonably well with earthquakes. This research has evolved from 15-degree multiple angles (Model I) to 12 degree multiple angles (Model II). The intent of this paper is to highlight the initial findings of the next model (the model III) on prediction of earthquakes.

Although this paper focuses on earthquake prediction model, since 1993, the research began by studying the influence of planetary configurations on natural calamities in general. Starting in 2000, these predictions have been made available to the public on a monthly basis at my website[4]. While further research is warranted to include the place and type of natural disaster in the predictions, the time periods for the occurrences of natural disasters have been predicted in monthly columns at my website[4].

Beginning in 2006, the research of the natural calamities was more focused on the occurrence of earthquakes. One reason for this was the availability of accurate data on earthquakes from National Earthquake Information Center, United States Geological Survey[5].

Research Basis - Methodology

As pointed out earlier the bases for this research are the unique planetary positions (geocentric sidereal or tropical longitude measured along the ecliptic) surrounding earth. Astronomical data provides planetary positions as a function of time. It was observed that the geocentric angles of certain magnitudes between some pairs of planets with respect to the earth appear to correlate well with earthquakes. Correlations between earthquakes of the past and the corresponding planetary angles during those respective periods occur in a statistically significant way.

As explained for the Model II[2] these correlations revealed that with increasing number of geocentric angles- when they occur as conjunctions (zero degrees) and in multiples of twelve degrees all the way to oppositions (180 degrees), the probability of an earthquake becomes greater. In addition, the larger the sum of these angles, specifically: 0, 12, 24, 36, 48, 60, 72, 84, 96, 108, 120, 132, 144, 156, 168 and 180 degrees, the higher the probability of earthquake severity.

The Model

The objective for model development is to predict earthquakes of magnitude 7 and higher. First a simple model was developed based on the assumption that the earthquake severity depends on the total number of angles ranging from zero degree to 180 degrees for the top 16 most frequently occurred angles for each pair of planets during 1900-2009. In other words, the more the number of angles the higher the severity of the earthquake. However, it was found that the severity of the earthquake is not necessarily proportional to the number of angles formed. As a result, it became necessary to account for the influence of each individual angle for each pair of planets by weighing them differently. The weighted model is developed using a simple linear regression technique. Thus, in theory, there are 55 different pairs of planets (6 outer, 2 inner, Sun, Moon and the North lunar node) and 16 distinct angles (from 0 degrees to 180), making a total of 880 maximum possible unique variables that can influence the earthquake occurrence. While the previous model dealt with the fifteen and twelve-degree angle multiples, this model differs from those models and deal with the top 16 most frequently occurred angles during 1900-2009 for each pair of planets as the planetary data correlated better with the earthquakes.

Since the Moon's average daily variation is about 13 degrees it can form almost equal number of angles with every other planet during a daily twenty-four hour period. Nonetheless to test the influence of Moon, two sets of models, one with the inclusion of Moon and the other without are developed.

The earthquakes of magnitude 7 or higher that occurred during January1900 – December 2009 were obtained from the USGS[3,5] website. Two data sets of 1900-1972 and 1973-2009 were combined to create one large data set of 1672 points. To avoid the co-linearity in data employed, if there were more than one earthquake of magnitude 7 or higher occurred in one day, the only one with the highest magnitude was selected for that day for this analysis. The accuracy of the data sets was verified against the Centennial Earthquake Catalog[3]. The first step of the analysis was to determine the top sixteen frequently occurred angles during the 1900-2009. An example of Neptune-Saturn pair is shown in Figure 1. The top 16 angles for this pair are: 152, 42, 130, 8, 19, 30, 57, ------- 151. And the corresponding frequency of the occurrences of these angles is: 30, 22, 21, 19, 18, 17, 17, ------ 15 respectively. Then computations of angles for all the 55 planetary angle pairs were performed. Using an orb of one half degree the planetary data pertaining to the top 16 angles were extracted for all 55 planetary angle pairs for the model. Thus, there are 880 unique variables. A linear model is assumed as follows.

Earthquake Magnitude = Σ Cn * (angle pair)n + constant for n =1 to 880

where Cn is the coefficient of the n^{th} angle pair; and the n^{th} angle pair equals unity when true and zero otherwise.

For example, Neptune-Saturn 152 degree angle is represented by the $X_{184}{}^{th}$ variable which becomes unity only when the angle between Uranus and Saturn lies between 151.5 and 152.5 degrees. For all other angles between Uranus and Saturn, $X_{184}{}^{th}$ variable equals zero.

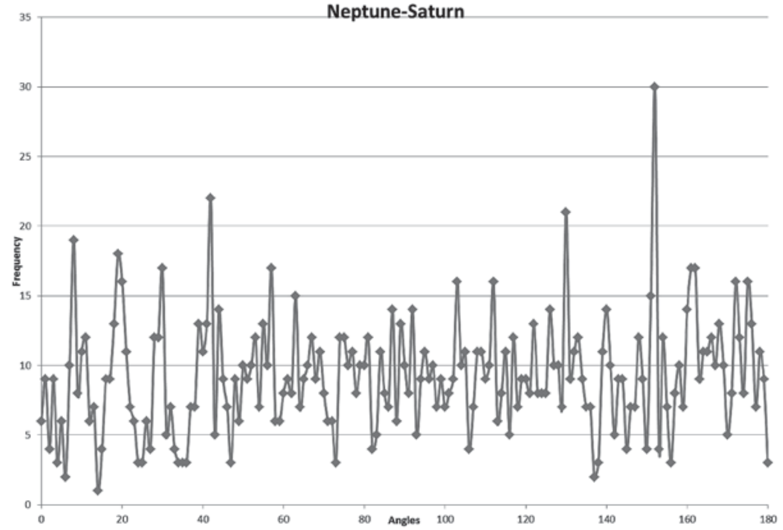
Linear regression was performed and all the coefficients were estimated by generalized least squares. A number of coefficients were so small in magnitude that their influence on the model was deemed negligible. The corresponding variables were omitted one at a time and the regression was repeated to confirm that their influence on the model indeed was negligible. As mentioned earlier two sets of the models were developed, one with the inclusion of Moon (referred here as with-Moon model) and the other without Moon (referred here as without-Moon Model). For each of these models, three cases were obtained as follows:

The first case includes all the variables (880 variables for with-Moon Model and 720 variables for without-Moon model)

The second case where the insignificant variables were omitted subject to the criteria of t>=1 where "t" is statistical test that measures the significance of the coefficient. For this case there were 410 variables for with-Moon model and 280 variables for without-Moon model.

For the third case statistical criteria is extended to t>=1.64 for further omission of the insignificant variables producing the models of 158 and 134 variables for with-Moon and without-Moon respectively.

Figure 1
Neptune-Saturn



A typical set of coefficients of model variables are shown in Table-1 for the 410-variable with-Moon model. There are 55 rows representing planetary pairs and 16 columns for the corresponding angles. Naming of the planetary pairs employ characters Pl, Ne, Ur, Sa, Ra, Ju, Mr, Ve, Mc and Su for Pluto, Neptune, Uranus, Saturn, Rahu (the North lunar node), Jupiter, Mars, Venus, Mercury and Sun respectively. Thus, PlNe represents the planetary pair Pluto and Neptune, and SaRa represents the planetary pair Saturn and Rahu (the North lunar node).

The value of the constant in the linear equation of these cases as calculated by robust linear regression ranged between 7.27and 7.30. The simulation results showed that the first two cases were almost identical in their performance as the successive omission of coefficients of insignificant magnitude did not seem to degrade the model performance while allowing the data noise reduction. With further discarding of the lowest magnitude coefficients, the model-fit slowly began shifting, and the third case of 158 variables seemed to indicate fairly good amount of noise reduction in data but at the expense of some loss in model fit. The

Table - 1 - 410 Variable with Moon Model

Angle--->	1	2	3	4	5	6	7	8
Angle Pair								
Pl-Ne		0.09	0.06	-0.12			-0.05	-0.05
Pl-U						-0.10	0.14	
Pl-Sa				0.09			-0.39	0.18
Pl-Ra			0.22	0.20			-0.06	0.15
Pl-Jup								-0.08
Pl-Mr	-0.20				-0.11	0.08		
Pl-Ve				-0.12				
Pl-Mc	-0.19			-0.12		0.11	0.09	
Pl-Sun		0.19	0.20			-0.12	-0.10	
Pl-Mn	0.12		0.12	0.16	-0.21		-0.15	
Ne-U								-0.18
Ne-Sa	0.10							
Ne-Ra		-0.08	-0.13					-0.19
Ne-Jup		-0.07		0.15			-0.15	-0.19
Ne-Mr			-0.16		-0.08		-0.19	0.26
Ne-Ve	0.16		0.15	-0.09	-0.15		-0.12	
Ne-Mc	-0.20	-0.09	0.11			0.19	0.09	
Ne-Sun	-0.27	0.20		-0.16		0.20		0.23
Ne-Mn	0.10	-0.13	-0.12	0.18	-0.13			
Ur-Sa	-0.08							
Ur-Ra	0.11	0.11	0.18		0.19	0.23	-0.09	
Ur-Jup		-0.14	-0.17	-0.19	-0.12	-0.13	0.12	
Ur-Mr					-0.16	0.18	0.16	
Ur-Ve		-0.09	-0.09		0.11	-0.19		
Ur-Mc	-0.15				0.18	0.17	-0.14	0.11
Ur-Sun		0.19	-0.13					
Ur-Mn	0.16		-0.08		0.09	0.27	-0.17	

simulated results along with the actual earthquakes are shown in Figure 2 for these cases, and although not included in the figure due to space limitation, a similar trend exists for all 1672 data points for each model.

It must be noted that one of the limitations of these models is that they only apply over a narrow range of seven and higher earthquake magnitude. Therefore, all predicted values for earthquakes below magnitude seven are irrelevant and meaningless since they can be applicable for the entire lower range of earthquake magnitudes from zero to 6.9. The other important limitation to these models is that they are based on only 1672 data points (since earthquakes of magnitude seven and higher occur about a dozen time per year). Thus, for example, for the model of

Table - 1 - 410 Variable with Moon Model

Angle--->	9	10	11	12	13	14	15	16
Angle Pair								
Pl-Ne		0.21	0.09		-0.08			0.15
Pl-U	-0.09			0.11		0.18		
Pl-Sa	0.12		-0.13	0.12			0.16	
Pl-Ra	-0.19		-0.17	-0.33				
Pl-Jup			-0.21	0.08			-0.22	
Pl-Mr	-0.16		-0.17	-0.15		0.11	0.34	
Pl-Ve		-0.11				0.29	-0.35	
Pl-Mc			-0.09				-0.12	-0.23
Pl-Sun	-0.20			-0.12				0.16
Pl-Mn		-0.11				-0.17	0.14	0.18
Ne-U	0.20	0.18			0.19	0.11	0.11	
Ne-Sa		0.21						0.15
Ne-Ra								0.39
Ne-Jup					-0.19	0.10	0.19	
Ne-Mr				0.17	-0.10			
Ne-Ve					0.15	0.18	-0.10	-0.17
Ne-Mc	0.13			0.26	-0.08	0.10		0.18
Ne-Sun		-0.34						
Ne-Mn	0.14	0.14					0.09	
Ur-Sa		-0.13		0.12		0.18		-0.10
Ur-Ra		-0.13	-0.17			-0.16		
Ur-Jup	-0.17		-0.19		-0.23		0.17	
Ur-Mr							0.16	0.11
Ur-Ve	0.22	-0.11	-0.20	0.24			-0.14	0.15
Ur-Mc		0.09						-0.15
Ur-Sun	0.14		-0.09		-0.12	-0.16	-0.22	
Ur-Mn				0.14	0.20			-0.24

Table - 1 - 410 Variable with Moon Model								
Angle--->	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Angle Pair								
Sa-Ra	-0.24			-0.10		0.12	0.12	-0.15
Sa-Jup	-0.07	0.15	0.17					
Sa-Mr	-0.36				-0.18		-0.35	
Sa-Ve	-0.11	-0.14	-0.17	0.30	0.08			-0.14
Sa-Mc	-0.14						0.18	
Sa-Sun	0.12	0.15		-0.18	0.10	-0.22		
Sa-Mn	0.15	0.08			0.13		-0.12	0.10
Ra-Jup	0.12	-0.08			0.09	-0.20		
Ra-Mr					-0.10			
Ra-Ve			-0.12	0.13	-0.09			
Ra-Mc	0.13	-0.12	0.10	0.19		-0.20	0.19	
Ra-Sun		-0.13		-0.16		-0.14	-0.20	
Ra-Mn	-0.07	0.14	-0.23			0.12		-0.10
Ju-Mr			-0.09		-0.19		-0.11	0.14
Ju-Ve				-0.09		0.25	0.16	0.27
Ju-Mc	0.13	0.14	0.11	-0.08				0.11
Ju-Sun	-0.19			-0.25	0.18	-0.14		-0.13
Ju-Mn	0.07	0.25	-0.15		-0.09	-0.20	0.11	
Mr-Ve	0.18	-0.10	0.12				0.17	
Mr-Mc		0.21	-0.20			-0.06	0.09	0.10
Mr-Sun					-0.17	0.07		
Mr-Mn		-0.23		-0.08	-0.08			-0.09
Ve-Mc	0.07	0.06	0.13			0.15	0.16	
Ve-Su	0.05		0.13			-0.15		-0.06
Vn-Mn			-0.10	-0.15		0.16		
Mc-Su			-0.07		0.07			
Mc-Mn	-0.26	0.15					-0.10	-0.20
Su-Mn				0.09	-0.08	0.26		0.09

410 variables, the ratio of data points to model variables is just above four, and for the one with 158-variable model it is about 11. Consequently, the R-square term, which is a measure of a model fit, varied with decreasing amount of variables from 0.51 to 0.25 indicating a fit not so perfect.

Using Greenwich noontime daily planetary positions, each model was then used to predict the earthquakes for the year 2011-2014. A summary of assumptions reflecting the limitations described above form the basis for the models and are listed as follows:

1. The predicted earthquakes of magnitude less than 7 are ignored

Table - 1 - 410 Variable with Moon Model								
Angle--->	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Angle Pair								
Sa-Ra	-0.14		-0.15		0.13	0.18		
Sa-Jup								
Sa-Mr	-0.21		-0.19					
Sa-Ve	-0.16				0.10	0.14		0.10
Sa-Mc		0.11	-0.18	0.14				-0.11
Sa-Sun			-0.17	-0.09	0.12	0.13		
Sa-Mn	0.18	-0.09	-0.12					-0.21
Ra-Jup			0.15	-0.10	0.15	0.20	-0.14	
Ra-Mr		-0.14	0.27	0.19		-0.09	0.10	
Ra-Ve	0.16	0.20		0.31	-0.11		0.26	0.34
Ra-Mc		0.17		0.22		0.12		
Ra-Sun	0.16	0.14	-0.12					-0.14
Ra-Mn						0.09		0.25
Ju-Mr			0.26	-0.10	-0.17	-0.17		0.12
Ju-Ve	-0.12		-0.16	0.16	-0.08		-0.28	
Ju-Mc	-0.22	0.15		-0.21				-0.09
Ju-Sun	-0.25			0.11	0.15		-0.08	
Ju-Mn	0.12		0.12	0.19			-0.19	
Mr-Ve	-0.17		-0.10		-0.16	0.12	-0.07	
Mr-Mc				-0.21	-0.14	-0.21		0.22
Mr-Sun		0.12	0.20		-0.07			-0.20
Mr-Mn	0.19	-0.20	-0.12	-0.12				-0.16
Ve-Mc	0.10	0.14		0.18	-0.08	-0.06		-0.12
Ve-Su	-0.06	0.08		-0.07				
Vn-Mn	-0.11	-0.17	-0.17			0.08		
Mc-Su		-0.07		0.09				
Mc-Mn	-0.17		-0.15	-0.14	0.16	0.08		
Su-Mn		-0.14	0.15			0.14		

since the model is based on the earthquake data set of magnitude 7 and higher. Thus, the prediction dates of an earthquake of magnitude less than 7 also apply for the dates when earthquake did not occur.

2. As pointed out earlier, in order to determine the degree of two sets of models, with-Moon and the without-Moon were developed. The determination of the angles used for each pair of planets was based on the top 16 most frequently occurred angles for earthquakes of seven and higher magnitude during 1900-2009. Thus for each pair of planets, a unique set of 16 angles were used in the models.

3. One half of degree orb is applied for all angles. As described earlier and illustrated in figure 1, where an example of Neptune-Saturn is used. Thus for that pair the most frequent occurred angle was 152 degrees occurring 30 times during 1900-2009 period for seven and higher magnitude earthquakes. In this case with one half degree orb, for the 152 degree, the applicable range is 151.5 – 152.5 degrees.
4. Since the predictions (or simulations) were computed on a daily basis corresponding to Greenwich noon, prediction is assumed to apply for the entire date (12 AM to the next 12 AM of Greenwich Time).

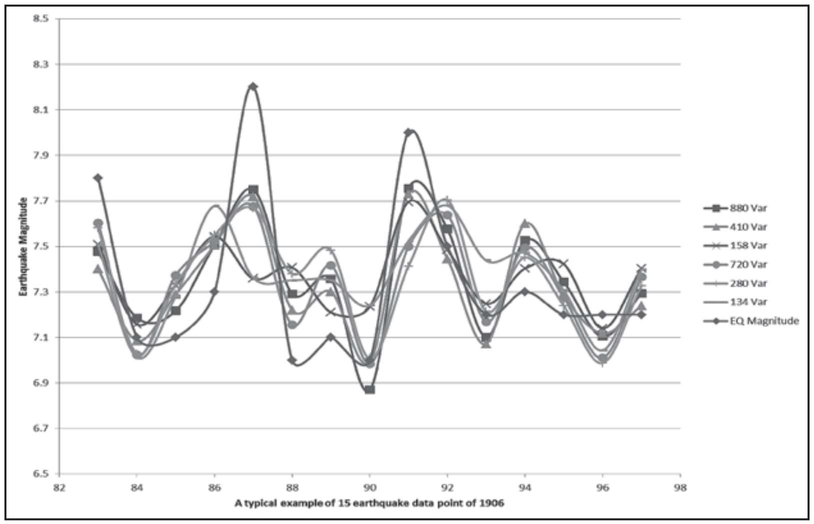


Figure -2: Regressed six cases and the corresponding actual earthquake values of seven and higher

5 The minimum number of angles required to meet the criteria of realizing the earthquake of magnitude seven or higher must be higher than the daily average number of angles for that year.

6 The model cases thus obtained when applied to the daily Greenwich Noon geocentric planetary longitude of January 2011 - August 2014 for earthquake predictions, the predicted resulted seem to overestimate the actual earthquakes about by the amount of their corresponding root mean square errors. Therefore, the predictions were corrected with the lower end of the root mean square errors which ranged from 0.28 to 0.33.

7 Out of the six model cases only two, 410-variable with Moon and 720-variable without Moon model cases, were selected as they seem to correlate well with the actual data. In other words, the prediction dates are based on the simulated results provided by these two model cases.

Results and Conclusions

The Model III which is based on the top 16 most frequently occurred angles for each pair of planetary angle with six different cases was employed for prediction since January 2011. The predicted dates and the corresponding actual dates on which earthquakes occurred are shown in Figure 3 for 410 and 720-variable cases and are summarized in Table-2 for January 2011 – August 2014 period.

Figure-3 shows that out of the four earthquakes of magnitude 7 and higher that occurred in January 2011, the 720-variable case model accurately predicts all of them while the 410-variable case model predicts only one of them. Please note that the model picks 16 days in January 2011 for the earthquake of magnitude 7 or higher. The previous model (Model II) of 12 degree multiple picked 8 days for that month but predicted only one earthquake out of four.

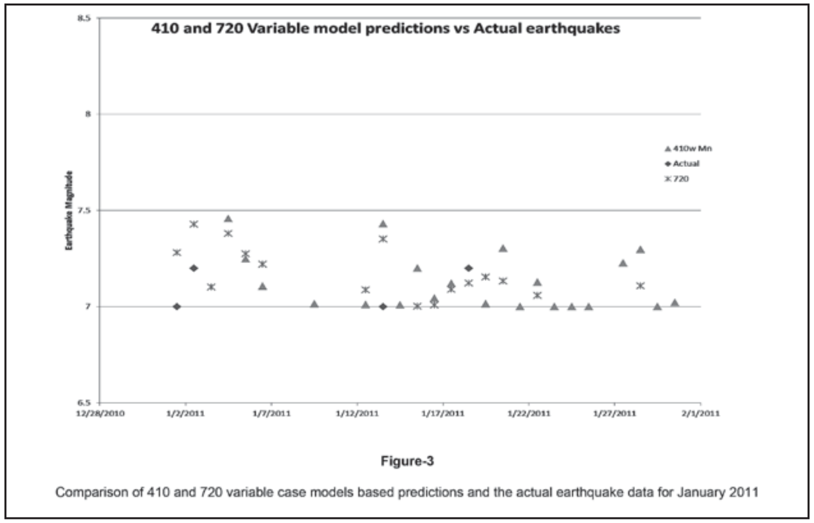


Figure-3: Comparison of 410 and 720 variable case models based predictions and the actual earthquake data for January

Table 2

2011	Model II		Model III
Months	Prediction Dates	Actual Dates	Prediction Dates
Jan-11	1, 5-6, 10, 12, 14, 20, and 22	1 (7), 2(7.2), 13 (7), 18 (7.2)	1-6, 12-13, 15-20, 22, 28
Feb-11	6, 13-14, 16-18, 20-21 and 23-25	None	1, 6, 8, 14, 16-18, 21-22
Mar-11	1, 3, 5, 8, 21-24 and 29-30	9 (7.3), 11(9) Japan	1, 6-8, 11-12, 15, 17-18, 21 and 26
Apr-11	1, 3-5, 8, 11-12, 14-17, 21-22, and 28-29	7 (7.1)	7-9, 14, 25-26
May-11	5, 7, 10-12, 17-18, 20, 22, 24-26 and 28-29	None	1, 3-6, 10, 12, 20-21
Jun-11	10, 13, 15, 19, and 25-30	24 (7.3)	4-7, 10-13, 16, 24, 25, 27
Jul-11	1-2, 12, 14-15, 17, 22, 25 and 29	6 (7.6), 10 (7)	4-7, 10, 13, 15, 19, 21-22, 28 and 31
Aug-11	1, 10-11, 14-16, 18, 20-23 and 29	20 (7.2), 24 (7)	7, 9, 15, 23-25, 27, 29-30
Sep-11	3, 6-8, 14-17 and 26-30	3 (7), 15 (7.3)	3, 14-15, 18-19, 24, 28,
Oct-11	7, 10, 12, 16-18, 22-23 and 26-29	21(7.6), 23(7.3)	11, 14-15, 21, 24 and 31
Nov-11	1, 3-4, 8, 10-11, 14-16, and 23-25	None	6, 10, 14-16, 21-25 and 27
Dec-11	2-6, 8, 11, 19, 26 and 29	14(7.3)	1, 5, 13-16, 18, 21, 23-26 and 31

2012	Model II		Model III
Months	Prediction Dates	Actual Dates	Prediction Dates
Jan-12	3, 6-7, 9-10, 12-13, 15, 19, 21-23, 28 and 31	10(7.2)	1, 5, 27 and 30
Feb-12	3, 12-17, 23 and 27-29	2 (7.1)	2, 9-10, 14, 17-18, 22-23 and 27
Mar-12	3-5, 11-12, 14-15, 17, 19 and 28	20(7.4), 25(7.1)	1, 7-8, 13,15-16, 18, 20-21, 26, 28-31
Apr-12	2-4, 6, 7, 11, 15 and 26-28	11(8.6), 12(7)	21-22 and 26-27
May-12	2, 5, 14-17, 20, 22 and 27-30	None	1, 5 and 19-20
Jun-12	7, 9-10, 13, 15, 18 and 23	None	7, 21-22 and 28-29
Jul-12	4-6, 8-9, 17-18, 20-28 and 31	None	2, 10-12, 19, 21, 23-24 and 26
Aug-12	2-3, 6, 8-10, 22, 24 and 30	14(7.7), 27(7.3), 31(7.6)	9-12, 20-23 and 27-29
Sep-12	1-2, 5-7, 9, 12, 17, 21, 23, 26-27 and 29	5(7.6), 30(7.3)	11, 14-16, 19, 27, 30
Oct-12	5, 8-14, 23, 26-28, 30-31	28(7.8)	1-6, 9, 12-13, 16-17, 19-22, 24-26, 28 and 30
Nov-12	4, 11-12, 16-17, 25 and 27-28	7(7.4)	2-5, 7, 16, 22, 24 and 30
Dec-12	8, 10, 12-14, 17-18, 21-22 and 28-31	7(7.3), 10(7.1)	1, 7, 13, 20, 23 and 25-27

2013	Model II		Model III
Months	Prediction Dates	Actual Dates	Prediction Dates
Jan-13	1, 3-4, 7, 21-22, 24, 26-31	5(7.5)	1, 3-5, 8, 13-15 and 22-25
Feb-13	1-2, 4-8, 13, 18, 25	6(8), 8(7.1)	2, 6, 10-13, 15, 18 and 25-28
Mar-13	3-5, 7, 10, 13, 16, 18, 25, 28-29	None	1, 7, 10-13, 16-19, 21 and 30-31
Apr-13	5, 12, 15, 27-29	6(7), 16(7.7), 19(7.2)	5, 8-9, 13-14, 16, 20-21, 25-28 and 30
May-13	6-7, 11-13, 18, 20-22, 26-27, 29, 31	23(7.4), 24(8.3)	1-2, 4, 6-7, 12, 16-18, 20, 23-24 and 29-30
Jun-13	1-3, 7-8, 11, 13-17, 21, 23, 26-27 and 29	None	1, 3, 14, 16, 19, 22-24, 27 and 30
Jul-13	1-2, 10-11, 16, 20-23, 26 and 28-29	7(7.3), 15(7.3)	1, 4-5, 7-8, 12-13, 15, 17-19 and 23
Aug-13	10, 13-14, 16-18, 24, 27 and 29	30(7)	1-6, 10, 12, 14, 18, 22 and 29-30
Sep-13	2, 7, 12, 16, 18-22, 24-27, 29-30	24(7.7), 25(7.1)	2, 8, 15, 18, 21, 23 and 26-28,
Oct-13	2-3, 6, 10, 14-15, 19-20 and 27	15(7.1), 25(7.1)	1, 3, 6-8, 10-13, 16-19, 22, 26, 28 and 30-31
Nov-13	1-2, 7, 13, 19, 22, 24 and 28-30	17(7.7), 25(7)	3, 7-9, 11-13, 15-18, 23 and 25-28
Dec-13	1, 10-17, 20, 26-27, 29 and 31	None	6, 14, 16-17, 20-22, 25-26 and 28-29

2014	Model II		Model III
Months	Prediction Dates	Actual Dates	Prediction Dates
Jan-14	1-2, 5, 7-8, 10-11, 13, 16-18, 23-24 and 30	None	4, 19, 24 and 27-28
Feb-14	6-7, 9-10, 14-15, 23-24 and 28	None	6, 18-19 and 24
Mar-14	3, 5, 11, 13, 18-20, 22-26, 28 and 30-31	None	1, 3-5, 8-10, 12-17, 19-28 and 30-31
Apr-14	2-3, 5, 7, 14-18, 22, 26 and 30	1(8.2), 3(7.7), 11(7.1), 12(7.6), 13(7.4), 18(7.2), 19(7.5)	1-3, 7-13, 15, 17-18, 20-21, 26-27 and 30
May-14	1-3, 6, 11, 14, 19, 21-22 and 24-26	None	1, 5, 7-8, 10-15, 17-18, 24, 26 and 31
Jun-14	7-9, 14, 22-27 and 29	23(7.9)	6-7, 19, 21, 23 and 25-26
Jul-14	4, 10-13, 17, 22, 24-25, 28, 30	None	1, 8, 10, 13-20, 22-23, 25 and 28
Aug-14	1, 3-4, 8-11, 18, 25-26	None	2, 12, 24-25 and 27-28

Earthquake Predictions since January 2011 of magnitude 7 or higher

The Table 2 lists the prediction dates for Model II and Model III and the actual dates on which the earthquakes of magnitude 7 or higher occurred for the period starting from January 2011 through August 2014. The first two columns in Table–2 list months and the prediction dates for Model II for the corresponding months. The next column lists the dates on which earthquakes occurred with magnitude shown in the parentheses. If the prediction date matches the actual date, the prediction date is highlighted in red in the prediction column. The last column in Table-2 lists the prediction dates for Model III. Again, if the prediction date matches the actual date, the prediction date in this column is highlighted in red.

As shown in Table-2, the overall monthly predicted dates ranged between 8 to 12 days for both Model II and III with monthly average predicted dates were slightly less for the Model III. In other words the model rules out, on average, between 18 to 22 days every month.

Table-3

Model II						
Year	P days	No. of Hits	Actual No. of earthquakes	P days/Total	Total days	Probability Binomial
2011	136	5	17	0.373	365	0.8201
2012	138	5	15	0.377	366	0.7254
2013	136	5	17	0.373	365	0.8201
Jan-Aug 2014	94	3	8	0.387	243	0.6565
Overall	504	18	57	0.376	1339	0.8607

The Table-3 summarizes the results for earthquakes of magnitude 7 or higher for Model II. The annual binomial probability calculations are shown for the period January 2011 through August 2014. As shown in the first two columns, for year 2011 through 2013 there were 136, 138 and 136 predicted dates respectively; and for Jan 2014 -Aug 2014 period there were 94 predicted dates. The number of successful predicted dates and the actual number of dates on which the earthquake occurred are listed in the successive columns. The last column shows the calculated probability. Thus, for year 2012 there were 15 earthquakes of magnitude 7 or higher, and the model II by picking 138 days out of 366 correctly predicted 5 earthquakes. The probability of that prediction according binomial probability distribution is 72 percent. The overall probability of prediction for the entire period from January 2011 – August 2014 is 86 percent.

Table-4

Model III						
Year	P days	No. of Hits	Actual No. of earthquakes	P days/Total	Total days	Probability Binomial
2011	121	14	17	0.332	365	0.000043477
2012	102	7	15	0.279	366	0.094495221
2013	153	10	17	0.419	365	0.122174386
Jan-Sept 2014	95	7	8	0.391	243	0.007346586
Overall	471	38	57	0.352	1339	0.000001299

Similarly the Table-4 summarizes the results for the earthquakes of magnitude 7 or higher for Model III. The first two columns in Table-4, the years and the corresponding number of predicted dates are listed. In the next two columns the number of successful predicted dates and the number of earthquakes occurred are shown. The last column lists the calculated probability. Thus, for year 2012 there were 15 earthquakes of magnitude 7 or higher, and the model III by picking 102 days out of 366 correctly predicted 7 earthquakes. The probability of that prediction according binomial probability distribution is 9.4 percent. The overall probability of prediction for the entire period from January 2011 – August 2014 is 0.00013 percent, showing a significant improvement over the model II.

While the actual prediction dates amounts to about 36 percent for the both models, the Model III predictions seem to predict more precisely. The narrowing of the prediction dates-window for each month since 2011 was accomplished by combining the prediction results of the regressed model case of 410 variable with-Moon and 720 variable without-Moon model case.

Clearly, for the model to be applied for earthquakes of magnitude 7 and higher to predict over a narrower range of days would require further improvement and therefore, more research work is warranted. In addition, further research is necessary regarding the locations of earthquakes.

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