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RESEARCH ARTICLE

EFFECT OF INCREASE OF ANNUAL GLOBAL TEMPERATURE ON ANNUAL GLOBAL EARTHQUAKE OCCURENCES

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ABSTRACT

In this Paper an attempt is made to establish possible correlation between annual global temperature increase and annual global Earthquake occurrences. The Temperature and seismic data is of duration between 1973 and 2010. This paper introduces the statistical analysis of spearman rank correlation technique to find the relation between increase of Annual global temperature and the annual global Earthquake occurrences. The rise of temperature is causing glaciers to melt thus releasing pressure on the earth below. The earth in turn is possibly rebounding causing earthquakes to occur. The spearman rank correlation coefficient was found to by 0.8363. This further indicates that annual rise in global temperature and earthquake occurrences have strong positive correlation between them.

INTRODUCTION

Earthquakes are non linear, chaotic scale invariant phenomena. Many small earthquakes occur throughout any seismic zone demonstrating that the critical conditions for earthquake nucleation are satisfied anywhere. Apparently any small shock can grow into large event. Thus it is likely that earthquake has no preparatory stage. The phenomenon of increase of annual global temperature when combined with earthquake data offers a new way to evaluate seismic hazards. The change in solar activity, changes in earth's orbit, changes in the geomagnetic field, change in the green house effect and change in aerosols influence global temperature (1). Global warming is becoming very much hazardous to life. This is not only changing our world's climate and economy but, it is also causing direct and indirect changes on and within the surface of earth. It was found that abnormal increasing of global temperature is significantly associated with seismic deformation. This rise in temperature causes the glaciers to recede. These glaciers which on melting can cause the crust to relax and rebound. As wasting ice sheets and caps unload the solid earth, stresses released can both deform the earth surface(3) and decompress the earth's mantle(4). All over the world, the last 20 years data shows a noticeable increase in the number of earthquakes per year. (5) An increase of average annual mean surface temperature by $0.6^0c \pm 0.2^0c$ and a decrease of 10% of snow cover in northern hemisphere since late 1960s has been reported. (6) Increase of temperature is causing glaciers to melt thus releasing pressure on earth below which in turn possibly rebounds causing earthquakes. It has been also predicted that the Himalayan glaciers are still losing mass and will disappear within forty years causing drastic changes in river flow (8)

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MATERIALS AND METHODS

Selection of study area and study duration

All seismic zones of earth have been selected for this study because of abundant varied sized glaciers and active faults. The effect of temperature increase on earthquake occurrence has been studied from 1973 to 2010.

Temperature study

The Annual global average temperature data are obtained from NOAA (National oceanic and Atmospheric Administration) Website WWW.NOAA.gov. for the period of 1973 to 2010.

Seismic study

The Annual earth quake Occurrences data are obtained from http://neis .usgs.gov/neis/epic/epic global. html. In this dataset all earth quakes with magnitudes from 2 to 9 are considered.

METHOD

Spearman rank correlation technique

Correlation is a measure of association between two variables. The variables are not designated as dependent or independent.

In this paper we use spearman correction technique to find the possible correlation between increase of annual global temperature and Annual global earthquake occurrences. Spearman's rank correlation is a technique used to test the direction and the strength of the relationship between two variables. In other worlds it is a device to show whether any one set of numbers has an effect on another set of numbers. It uses the statistics Rs which falls between – 1 and +1

Procedure for using spearman's rank correlation

1. State the null hypothesis i.e., "There is no relationship between two sets of data".
2. Rank both sets of data from the highest to the lowest.
3. Subtract the two sets of ranks to get the difference "d"
4. Square the values of "d"
5. Add the squared Values of " d" a to get $\sum d^2$
6. Use the formula Rs (or) $P = 1 - \frac{6 \sum d2}{n(n^2-1)}$

Where n is the number of ranks you have.

7. If the Rs value.

… is -1 there is a perfect negative correlation.
… Falls between -1 and 0.5 there is strong negative correlation.
… Falls between -0.5 and 0, there is weak negative correlation.
… Is o there is no correlation.
… Falls between 0 and 0.5 there is weak positive correlation.
… Falls between 0.5 and 1 there is strong positive correlation.
… Is 1 there is perfect positive correlation between the two sets of data.

8. If Rs. Value is 0, State that null hypothesis is accepted. Otherwise, say it is rejected.

The spearman rank correlation coefficient is calculated for the temperature and seismic data and was found to be 0.8363.

Conclusion

This preliminary study conducted using spearman's Rank correlation technique to show the relation between Annual global increase of temperature and annual earthquake occurrences.

The spearman rank correlation coefficient was found to be 0.8363 which shows a strong positive correlation between temperature increase due to global warming and earthquake occurrences. This leads to infer that main factor for the increase of earthquake occurrences is the increase of temperature which is causing the glaciers to melt and there by releasing pressure on the earth. The earth in turn is possibly rebounding causing earthquakes.

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