

**The Physics Behind
Yellow Stone Volcano
Eruption**

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Abstract

The physics behind any super volcano eruption is explained in this paper. It is to be noted that the physics behind the eruption is only explained here not the exact time of eruption. There exists a method called **time series prediction** in computer science algorithms and using modern day computers, one can predict the exact time of eruption provided the site earthquake/temperature/eruption history and *which is beyond the scope of this paper*. The spin velocity of earth at the equator is nowhere derived in the literature, but it is a measured quantity due to the spacecraft industry. In this paper, the spin velocity of earth at the equator is **derived for the first time**. The earth spin axis is tilted by 23.5° due to which we are having seasons. The tilted axis is not fixed or stationary. It precesses and makes a cone as viewed from north or south pole with a period of 26500 years. This precession is due to multi-body gravitational interaction in solar system which can be solved only numerically using modern day computers. *Nutation* is not considered in this paper. *The precession of earth is **opposite** to the spin of of earth*, due to which the earth **decelerates**. The deceleration is not a continuous function of time. It decelerates once in 26500 years. This deceleration causes energy to be accumulated beneath earth crust. **An exact figure of how much energy the yellow stone volcano will erupt is given in joules**. This accumulated energy erupts once in 26500 years and we call it as super volcano eruption. In the context of this paper it is yellow stone volcano located in USA. But geologists are claiming that a super volcano erupts only once in around 8 lakh years without proper scientific reasoning. Already due to global warming the yellow stone volcano had become active. The eruption can be prevented if we start producing food items like wheat, rice, apple etc. in factories. If we do that, farmlands can be planted with trees and hence a 2° centigrade reduction in temperature will prevent any volcano eruption. In order to produce crop items in factory, we need surplus of electric energy. This is possible if and only **CERN** achieves nuclear fusion reactions on a grand scale and also global scientist should come forward to work on pico-electronics to produce crops in factories. Otherwise it is going to be an apocalypse or doomsday/judgment day.

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I. INTRODUCTION

The physics behind any super volcano eruption is explained in this paper. As of now geologists are claiming that a super volcano erupts once in approximately 8 lakh years. It is not so. **The earth spins in one direction and the earth precesses in the opposite direction**, which causes a deceleration in earth spin. The precession velocity is one in ten millionth of earth spin velocity and hence very small. But this small amount of precession velocity accumulates and the energy accumulated will erupt once in 26500 years. This period (26500 years = $(T = 8.321 \times 10^{11} \text{seconds})$) is the earth precession period opposite to the spin axis. In section II, the earth spin velocity at equator is calculated for the first time in literature which is so far a measured quantity. In section III the earth precession velocity and deceleration is calculated. In section IV, the amount of accumulated energy (which will erupt due to yellow stone volcano in this case) and the ΔV imparted on earth due to the eruption is calculated. Section V concludes this paper.

II. THE EARTH SPIN VELOCITY CALCULATION

The polar radius and the equatorial radius of the earth are different and hence the earth spins. The following equations provide the detail of earth spin velocity which is nothing but the difference between the polar velocity and the equatorial velocity.

$$v_{polar} = \sqrt{\frac{G_N M_E}{R_{polar}}} \quad (1)$$

$$v_{equatorial} = \sqrt{\frac{G_N M_E}{R_{equatorial}}} \quad (2)$$

$$v_{spin} = v_{polar} - v_{equatorial} \quad (3)$$

From the above set of equations it is found that the earth spin velocity at the equator is $452m/s$. **This spin velocity is no where derived in literature, but it is a measured quantity due to the era of spacecraft industry.**

III. THE EARTH PRECESSION VELOCITY AND DECELERATION

The earth precesses opposite to the earth spin. The precession period is 26500 years. For all calculations the earth mean radius is used. The mean radius is $R_{mean} =$

$\frac{R_{polar}+R_{equatorial}}{2}$. The following equation provides the earth precession velocity which is opposite to the earth spin velocity which causes the earth to decelerate.

$$v_{precession} = \frac{2 * \pi * R_{mean}}{26500 * 3.14 * 10^7} = 4.82 * 10^{-5} \quad (4)$$

Form the above equation it is found that the precession velocity of earth is $4.82 * 10^{-5} m/s$ which is around one in 10 millionth of the earth spin velocity. The following equation provides the deceleration of earth due to the opposite sign of spin and precession.

$$a_{deceleration} = \frac{v_{spin} - v_{precession}}{26500 * 3.14 * 10^7} \quad (5)$$

The deceleration is found to be $5.43 * 10^{-10} m/s^2$.

IV. ENERGY ACCUMULATED AND THE ΔV IMPARTED ON EARTH DUE TO ERUPTION

The following equation provides the force due to deceleration.

$$F_{deceleration} = -M_E * a_{deceleration} \quad (6)$$

The -ve sign indicates the opposite nature of earth spin and precession. The numerical value of force is found to be $3.244 * 10^{15}$ newtons. Due to the above force, the energy accumulated is given by the following equation.

$$E_{accumulated} = 2 * \pi * R_{mean} * F_{deceleration} \quad (7)$$

The numerical value of energy accumulated is found to be $1.3 * 10^{23}$ Joules. This energy is much greater than the total electricity consumption of earth since the industrial revolution. From the energy accumulated the difference in velocity imparted on earth when a super volcano erupts is found by the following equation.

$$\Delta V = \sqrt{\frac{2 * E_{accumulated}}{M_E}} \quad (8)$$

The ΔV imparted on earth is found to be $0.21 m/s$, which is a huge number. The latitude of yellow stone national park is 44.428° and cosine of 44.428° is 0.714131. Therefore the spin velocity at yellow stone national park is $322.78 m/s$. When this much ($0.21 m/s$) change in spin velocity occurs at that latitude, definitely an earthquake will occur which will devastate the entire planet.

V. CONCLUSION

The following points conclude this paper.

1. The spin velocity of earth at equator is derived for the first time in literature otherwise it is a measured quantity.
2. From the energy accumulated (1.3×10^{23} Joules), if a super volcano erupts, a massive earthquake will occur due to which all buildings will collapse in the entire world. So far nobody has given the exact figure of how much yellow stone volcano eruption will produce heat in joules.
3. So due to the precession period of earth, every 26500 years one super volcano will erupt.
4. There is a possibility of earth magnetic field reversal.
5. The volcano eruption also triggers an ice age. Due to the ice age, many lives will become extinct.
6. It is worth monitoring yellow stone volcano which is located in the USA.
7. **There is a possibility for preventing the eruption of yellow stone volcano by manufacturing food items (like wheat, grapes, rice, apple, mango etc.) in factories. If we do that ecosystem will not be disturbed by planting more trees which will cool the earth to the pre-industrialization era, which is opposite to the warming and the energy accumulated is heat. *In order to achieve that we need surplus of electric energy. It is possible only when CERN achieves nuclear fusion reaction on a grand scale.***
8. *There is a method called time series prediction under the data mining technique of computer algorithms. Using those algorithms one can exactly predict when the yellow stone volcano will erupt using the past earthquake/temperature history of yellow stone volcano.*