

NUCLEAR EXPLOSION FOR PREVENTING COLLISION BETWEEN THE EARTH AND CELESTIAL BODIES

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It crops up frequently that two celestial bodies collide in the outer space. The meteorite craters on the surfaces of the Moon, Jupiter, Mars are evidences. There are about 78 extant great craters on the surface of the earth. One of the most famous of them is in Arizona state of the United States. This crater is about 1240 m in diameter, 170 m in depth and its periphery is 40 m over the ground. According to the investigation, the crater was formed in a collision by an iron meteorite that had a diameter of 60 m, a weight of 100 kt and traveled at a velocity of 20 km/s. The famous Tunguska meteorite event happened in the morning on June 30, 1908 in Siberia. A big fire ball brighter than the sun appeared in the sky. The shock wave destroyed the forest on a area of several hundred square kilometers and the sound of explosion could be heard within 1000 km.

The geophysical observation stations all over The world measured this unusual seismic wave and strong shock wave in the air. By inference, it might be caused by a small comet with a diameter of 70m. The collision between SL-9 comet and Jupiter occurred during July 17-22, 1994 was a spectacular event. Mr. and Mrs. Shoemaker and D. Levy discovered SL-9 comet on March 23, 1993 at Mount Palomar Observatory in the United States and brought it to attention of astronomers all over the world.

According to the calculations by astronomers, it was confirmed on August 1993 that:

1. The SL-9 comet had been moving around Jupiter at least since 1970.
2. SL-9 was 4300km far from Jupiter within the Roche's limit on July 8, 1992 and was broken to more than twenty pieces by tidal force of Jupiter. It traveled through the apastron on August, 1993.
3. The pieces of SL-9 would collide the Jupiter on July
4. Before breaking out, SL-9 comet was about 10km in diameter, less than 0.8 g/cm in density, about 400 billion tons in weight.

The astronomical observations were agree with the prediction. A view of collision between celestial bodies was unfolded before mankind's eyes and a warning was given once again. Beginning at about 20 o'clock (Greenwich astronomical time) July 16, 1994, 21 cometic nuclear fragments of the comet SL-9 impacted the Jupiter, at the speed of 60km/s. The impact lasted until July 22.

According to the geological materials, there were serious animal extinction's on the earth during recent several hundred million years, for example, mammoths extincted two million years ago and dinosaurs extincted suddenly sixty five million years ago.

The micrometeoroids in the outer space do not bring obvious disasters to the earth because its small masses. The micrometeoroids weighed as light as 10^{-16} g can be detected now. Observation materials showed that the weight of meteors that are brighter than that of tenth magnitude was amount to 2000 t and the total weight of all meteors that fall to the earth every year was amount to 2000 kt. All of these have not made obvious disasters to the earth. The greatest threat against the earth is from comets and asteroids.

Asteroids are moving around the sun along elliptic orbits. There are about 0.5 million asteroids discovered with a total mass of 2.110^{21} kg, four ten thousandths of the earth. Most asteroids are moving between the orbit of Jupiter and that of Mars with the exception of a few of them. For example. Apollo (№.1862) asteroid penetrates into the orbit of Venus, Ecalus (№.1566) asteroid penetrates into that of Mercury and it was only 6 million kilometers near the earth in 1968. It was estimator that asteroids bigger than 0.95km in diameter may collide the earth once every 4 million years.

Comets move around the sun. Their orbits may be ellipses, parabolas or hyperbolas. They weigh 10 Gt. to 10Pt. In the 1970 s, the orbits of more than 600 comets had been calculated, 49 per cent of them are parabolas, 40 per cent of them are ellipses and 10 per cent are hyperbolas. The perturbation forces of the planets can change the orbits of comets. Planets can make periodic comets(ellipse orbits) flyaway from the sun, they can also make a comet with parabola or hyperbola orbit change into ellipse orbit even became its own satellite. It is called capture and SL-9 comet was captured by Jupiter and became its satellite. On the basis of the orbital characteristics of asteroids and comets, some of their orbits may intersect the orbit of the earth on certain conditions and serious consequences will not be impossible. Scientists all over the world are conducting researches to find ways avoiding these kinds of things. More attentions should be paid to find out the collision celestial body as soon as possible and calculate its orbit accurately. In 1994, by the impact of the comet SL-9 on the Jupiter, the congress of USA was

urged to ratify “A space–warning program”, which estimated to take 25 years to search out the asteroids whose diameters are more than 1 kilometer and which will imperil the earth. In the meanwhile, the most dangerous asteroids would be researched to understand their geometry, surface structures, elements etc., so that the data obtained can be consulted, when the countermeasures would be taken. Precisely predicting the moving laws of the near–earth asteroids and comets is only the prelude of the means for humankind preventing them from impacting on the earth. The means of truly defending humankind from threatening is mainly dependent on the advanced current astronomical technology and the nuclear explosion technology. It is shown by the initiative computation that for the asteroid whose diameter is near 100 m impacting on the earth, the effect on the biosphere corresponds to the effect produced by the explosion of the megaton nuclear bomb. Humankind has the ability to defend themselves from destroy now. The paper published by V.A. Symonenko, O.N. Shubin et al. in January 1992 presented the possibility about the nuclear explosion technology preventing the near–earth asteroid from impacting on the earth. For example, if a megaton nuclear bomb is exploded on 100 m diameter near–earth asteroid, that will be shattered into the pieces which have no danger to the earth. By some arrangement, the multi–impact of the nuclear explosion on the near–earth asteroid can change its moving orbit to make it not to impact on the earth.

SL–9 comet has been moving around Jupiter at least since 1970. Its period of revolution was about two years. It had moved over ten cycles around Jupiter before it was discovered on March, 1993. After discovery, it lasted one year and four months till it collided Jupiter. If this kind of thing happens on the earth, we will discover the collision body sooner and have more time for technical preparation.

The development of the astronomical science and technology has shown its extraordinary ability to people. Using the astronomical technology, the people had been seat to the Moon and returned to the earth, and humankind had also launched the pilotless space vehicles to the giant planets (such as the Mars, the Venus and the Mercury) to research them. If the rocket technology is used to carry the nuclear bomb to the near–earth asteroid and comet to explode the nuclear bomb, the asteroid and comet will be shattered or their orbits be changed, so the asteroid and comet's threatening humankind can be prevented. The technology is so complex that it involves astronomy, astronomical, astrophysics, nuclear–explosion dynamics and ecological environment science etc. For the utilizable parts of these subjects, some belong to national secrets, some cannot be finished by a single nation, it is a great research program of the international cooperation. The nations that have these abilities are America, Russia, China, England, France, etc. Doing this research subject needs abundant funds and the funds are needed to be raised in the world.

To carry the nuclear bomb to the near–earth asteroid and let it explode there, there are three methods. First, when the nuclear bomb hits and penetrates into the asteroid , the nuclear explosion will shatter the asteroid into pieces. Second, when the rocket softly lands on the surface of the asteroid and explode the bomb, it will change the orbit of the body. The third method of the nuclear explosion near by the asteroid can also be taken. Experts on nuclear weapons should investigate which method is more effective.

In order to solve the problem about the disaster of humankind produced by the near–earth asteroid impacting on the earth probably, it is needed that:

- The near–earth asteroid should be researched in astronom and astrophysics. Scientists should timely calculat its orbit, research and monitor the changing trend of it's orbit when the asteroid close up the earth.
- By mean of international cooperation, the space vehicle should be used to carry the nuclear bomb to the near–earth asteroid to shatter the asteroid or to change its orbit, making the asteroid to avoid impacting on the earth
- The space vehicle and the rocket technique should be researched that are suited to carry the nuclear bomb to the near–earth asteroid and to land on it or suited to make the nuclear bomb to hit the asteroid directly. The technique of “the precise hitting” should be researched particularly.
- The suitable style of nuclear explosion should be researched to find the effective way to change the orbit of dangereous asteriod or to shatter the celestial body.

Because many technical problems are involved with the national secrets, the relevant security regulations and safeguards should be made for the countries who will join in the international cooperation.

In a word, the problem mentioned above is one of the most important problems utilizing the nuclear bombs in a peaceful method, as mentioned at the start of the paper, it should be taken seriously in the world.