Evolution of Jovian Decameter Wave Radiations Caused by Dusts from SL-9 Comet

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1. Introduction

Studies on the Jovian decameter wave radiations are thought rather established subject after a long period of observations since the discovery in 1955 (Burk and Franklin). A new movement was started in 1970's by Tohoku University Group (Oya et al) , intending to utilize the Jovian decameter radio waves as probe to investigate the activities in the Jovian magnetosphere, and Io- magnetosphere coupling considering that the decameter radio waves are reflecting all the activities in the Jovian plasma environment.

The event of Shoemaker-Levy 9 comet, in 1994, July, colliding with Jupiter had brought a new subject of study in this traditional current of studies on Jovian decameter wave radiations. The effect of the comet is mostly caused by associated dusts which were eventually spread into Jovian magnetosphere and had gradually fallen down to the Jovian ionosphere.

2. After Effect of SL-9 Collision

During the passage of the broken fragments of SL-9 comet there, already, appeared abnormal features of the decameter wave radiation, which were characterized by appearance of Non Io-B sources and also occurrence of extremely short pulsating bursts. Some times there were short persisting pulses, observed by an interferometer, which deviate from the theoretically predicted interferometer phase. Usually the component which deviates from the interferometer fringe phase is rejected as noise from different origin. The case of dust origin of radiation is, however, still considered from the same origin because of associated information. The abnormal emissions have been called as multi coherent emissions. These phenomena have been explained as cometary origin (Oya. et al, 1997). By tracing the new phenomena caused by cometary dusts in the Jovian magnetosphere after the collision event, it is shown that the effect had continued over 8 years until 2002, at least.

3. Depression of Decameter wave radiations

During monitoring observation of Jovian decameter station in Fukui University of technology, since 2001, evidence of depression of the Jovian decameter wave radiation becomes apparent ; i, e, the average occurrence frequency, in terms of event number per a week, varies as seven times, four times and once respectively in 2001, 2002, and periods from 2003 to 2004. Coinciding with this depression tendency of the occurrence frequency, the feature of bursts has also been varied. In the most of the cases features of bursts show weak train of pulses instead of regular long persisting L-bursts. It is well known that the occurrence frequency of Jovian decameter wave radiations varies with 12 year cycle due to the movement of Jovian poison; and minimum period coincides with condition of the low elevation when the direction of Jupiter also approaches to the Galactic center. From the stand point of this variation, the period from 2001 to 2006 coincides with maximum phase of occurrence period. We had already explained the phenomena as impeding effects of cometary dusts which gradually fallen down to the upper side of the ionosphere where effective source regions of the decameter wave radiations are located.

4. Recent Observation Results

The observations in 2006 have been made from the end of May to early August. The results show that there are still depression effects of decameter radio wave emissions. The average occurrence rate of the burst is approximately once a week. Further more, the burst feature show typical effects of decameter waves caused by cometary dusts.

Reference:

Oya H., M. Iizima, A. Morioka, and H. Murao, Extremely large enhancements of the Jovian decameter radio bursts caused by the magnetosphere-plasmasphere passage of Shoemaker-Levy 9 comet fragments - Evolution of Jovian decametric radiation feature into the state of intense decametric pulsar, J. Geomag. Geoelectr., 49, S49-S66, 1997.