E117-P007 **Room: Poster Session Hall** **Time: May 22**

Precursor electron spikes under the radiation belt associated with earthquakes

Naoki Masuyama[1]; Makoto Hareyama[2]; Nobuyuki Hasebe[1]; Kunitomo Sakurai[1]; Satoshi Kodaira[1]; Masatsugu Akiyama[3]; Kazumori Hama[3]

[1] Waseda Univ; [2] Sci. and Eng., Waseda Univ.; [3] USEF

The electron flux in the earth magnetosphere is forced to vary by various external actions as magnetic storm or electron precipitation from the inner radiation belt. Electron narrow spikes, often observed in L less than 2, are considered as results of electron precipitation from inner radiation belt, which is caused through a cyclotron resonance of trapped electron with very low frequency radio waves (hereafter, referred to VLF). These waves are usually identified as those of whistler mode which are mainly originated from thunder lightning, and artificial emissions from VLF stations. Aleksandrin et al. (2003) suggested that narrow spikes were observed during several hours onset of strong earthquakes; L-shells of electron spikes as observed and epicenter of earthquakes are practically the same. This report describes correlations between electron spikes and earthquake, obtained by the Japanese satellite, SERVIS-1∗.

The satellite, SERVIS-1, was in orbit at the altitude of 1000 km and its inclination of 99.5 degrees during the period from November, 2003 to October, 2005. The orbit was of sun-synchronous in the dawn-dusk plane as 6-18 hours in MLT. The data obtained for energy bin between 3.4 and 6.6 MeV were analyzed in investigating narrow spikes. During the observed period, very strong earthquakes such as Sumatra and Niigata earthquake occurred.

In order to eliminate electron spikes around L ˜1.6 caused by VLF stations, this analysis only electron spikes observed at L less than 1.3. Many spikes except for South Atlantic Anomaly concentrated in the area covering south-east Asia were observed many earthquakes, in which these spikes over south-east Asia were analyzed to find if earthquakes with the epicenter were located in the region at L less than 2 with its magnitude of more than 5. The corresponding conditions between electron spikes and earthquakes are as follows.

(1) Flux of spikes was enhanced more than 2 sigma when compared with static flux.

(2) The time interval between the detected time of electron spikes and onset time earthquake was within 24 hours.

Under these conditions, a tendency that electron spikes were observed before several hours from onset of earthquakes. Moreover, it become clear newly that these precursor spikes distributed with in D less than 35, where D is length from epicenter defined as D = (eqlon-splon)2¬+(eqlat-splat)2 where eqlon and eqlat denote longitude and latitude of epicenter, and also splon and splat as longitude and latitude of the observed point of electron spikes. So, the additional condition to detect precursor event is set as follows,

(3) Electron spikes were observed within D less than 30 from the epicenter.

Under these three conditions, we were able to make clear specifically the enhancement of occurrence of precursor electron spikes with about 4 sigma as shown in the figure which indicates detected number of spikes with time interval, eqT - sqT, between onset time of earthquakes (eqT) and detected time of spikes (spT). However, these precursor spikes have no correlation of depth and magnitude of epicenter, but detect precursor spike for Sumatra earthquake was not detected. The number ratios of precursor spikes over onset of earthquakes and precursor spikes over detected spikes are less than 10 percent and less than 50 percent, respectively.

∗The Space Environment Reliability Verification Integrated System (SERVIS) is being developed by the Institute for Unmanned Space Experiment Free Flyer (USEF) under the contract with the New Energy and Industrial Technology Development Organization (NEDO).