[JJ] Evening Poster | M (Multidisciplinary and Interdisciplinary) | M-IS Intersection

[M-IS09]Electromagnetic phenomena associated with seismic and volcanic activities

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This session deals with reviews and contributions on the recent studies of electromagnetic (EM) phenomena associated with earthquakes and volcanic eruptions. One of the main targets of the session is to clarify the mechanism of seismo-EM emission and Lithosphere-Atmosphere-Ionosphere (LAI) coupling.

[MIS09-P02]Detection and application of ultra-small earthquake preceding major earthquake

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1. Introduction

We have reported that the so-called micro-crack is one of the meaningful anomalies for the short- term predictions of the earthquake. The phenomena are found to have several hundred Hz and are supposed to occur in rupture zone about a week before. Quantitative analyses prove that the characteristic properties are reasonably explained by the theoretical formalism of elasto-electromagnetic fields (e.g., Pride, 1994) induced by rupture of elastic substance filled with liquid media as earth crust. At present we have been studying very small seismic events preceding major earthquake to detect arrival time of the P- wave for the earthquake early warning information. These events have duration length of some 1s with strength of some 1 gal. Originally, we suspect the phenomena have some relation with the micro-crack assumed as prospective anomalies for earthquake prediction.

2. Data Analysis

We used 120 earthquakes occurred very near to the evaluation points with epicentral distance of less than 15km including 30 sample earthquakes related with the Kumamoto Earthquake in 2016. It is found that almost all large earthquakes with magnitude range (3.5-7.3) are accompanied with the ultra-micro-earthquake(UME) of the duration of some 1s (0,6-1.1) and strength of 1 gal (0.7-1.9). Further analysis showed that UME are composed of two groups, one is clearly separated with the main phase, and other relate to the main phase. The separated events are assumed to be small foreshock, and the connected ones to be the seismic activity just preceding the P phase which was studied extensively after 1990s (e.g., Umeda, 1990; Iio,1992; Oonaka and Matsuura 2002).

3. Cocluding Remarks

The clear difference of duration time of the so-called micro-crack and that of ultra-micro events suggest that the two small events are of different nature. Even a small time before the arrival of dominant seismic phase is crucial from the point of earthquake early warning. On the other hand, separated events (UME) can provide more than 10 seconds to take preparatory actions. Further researches are needed to use the small events to be practically applied.