Possibility of Volcanic Activity Measurement via Microwave and the Concrete Plan

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Microwave emission phenomena due to rock failure were experimentally found from 300MHz to 22GHz for the first time in the world. This fact suggests the microwave emission in association with volcanic activities. Microwave propagates straight, suffers from less noise than the low frequency of several MHz, and penetrates the ionosphere. Therefore, the microwave can be a beneficial tool to measure volcanic activity, and especially has an advantage to enable the measurement using a satellite. Also, the results may contribute to establish the monitoring technology of volcanic eruptions. Now, we are pursuing the research to measure the non-thermal microwave emission due to volcanic activity at Miyake-jima.

In this paper firstly, the ratio of the non-thermal microwave power to the thermal noise power from the receiver, namely S/N, will be given on the basis of microwave power obtained in rock crash experiments. The value is determined using the values of the distance from the observation antenna to Miyake-jima crater and the developed receiver characteristics. Next, the whole measurement system is explained including microwave receivers, data loggers, data transmission links, and a power system. Durability against weather and wind is important. Receiving frequencies were carefully selected to avoid interference. Lastly, significant observation data which were currently obtained are presented.