A Study on Automatic Identification of Linear Precipitation System etc. for Sediment Disaster Warning and Evacuation

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1. Introduction

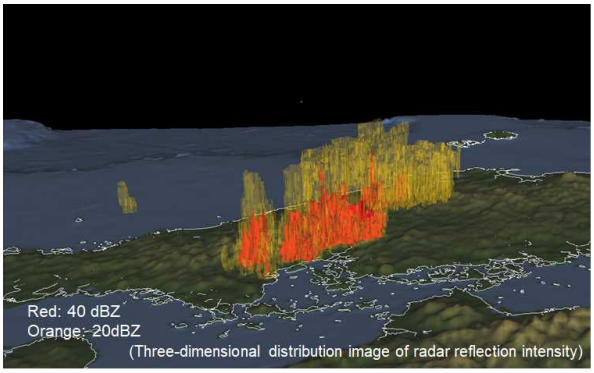
In the recent years, sediment disasters caused by torrential rain due to linear precipitation system, etc. have frequently occurred in Japan, including the 2017 Northern Kyushu Heavy Rain and the 2014 Hiroshima Heavy Rain. Once a back building type of linear precipitation system, etc. is formed, cumulonimbus clouds generated at the windward successively flow in and heavy rain area remains over several hours, which often causes enormous damage. In addition, it is difficult at present to predict accurately th amount, location, and time of such heavy rains based on numerical weather prediction unlike rainfalls by typhoon, etc.

Then, in order to provide information quickly to the personnel in charge of disaster prevention, we studied the method of identifying linear precipitation system, etc. and developed a system that enables automatic identification on real time. This paper introduces the outline of this activity.

2. Content of study

Using the Meteorological Agency's two-dimensional analyzed precipitation data, we studied the algorithm and built a prototype system for identifying linear precipitation system from weather indicators (occurrence potential of local heavy rain) representing rainfall intensity, shape of heavy rain area, wind direction, and atmospheric instability, etc. We applied this system to the 2014 Hiroshima Heavy Rain, 2017 Northern Kyushu Heavy Rain, and 2018 Western Japan Heavy Rain and it was mostly possible to detect generation of linear precipitation system before occurrence of a large-scale sediment disaster.

Additionally, as the result of analyzing continuity of linear precipitation system in the 2016 Hiroshima Heavy Rain by identifying the developmental stage of cumulonimbus clouds particularly at the windward from those constituting linear precipitation system, using three-dimensional observation data based on the MLIT's X band MP radar, it was found that a more hazardous stagnant linear precipitation system can be identified (See Fig.).



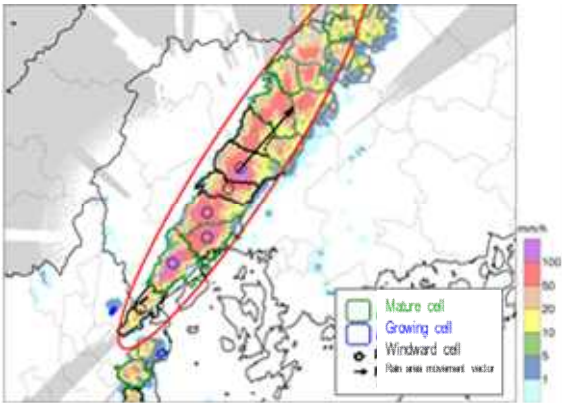


Fig. Identification of linear precipitation system using three-dimensional data (X-MP)

3. Future schedule

Demonstration experiment of this system is being conducted by Regional Development Bureaus across the country and sediment disaster departments of prefectures etc. from a viewpoint of sediment disaster risk assessment and the system is going to be improved for easier use by disaster prevention personnel. For upgrading of the linear precipitation system identification method using three-dimensional radar observation data, we intend to consider utilization of higher precise phased array radar (MP-PAWR), etc.