

## Research Trends and Results

# Relations between Sediment Disasters that Caused Serious Damage and the Precipitation System - For strengthening warning and evacuation system -

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### 1. Introduction

The Basic Guidelines for Preventing Sediment-related Disasters (Article 3 of the Sediment Disaster Prevention Law) strongly recommend municipalities to use the sediment disaster warning information (Article 27 of the same Law) for making decisions on whether to issue evacuation orders or not when a sediment disaster is expected to occur. For such information, however, since threshold values are often set to a lower level in order to avoid so-called "third strike looking," there are many "swings and misses" as a relationship of trade-off. Consequently, there are not a few cases where announcement of such information does not lead to issuance of evacuation orders, so it is hard to say that such information is functioning effectively as disaster prevention information.

Considering such situation, it is urgently needed to evaluate appropriately the occurrence likelihood of sediment disaster and reduce "swing and miss." Therefore, this study analyzed relations between sediment-related disasters that caused serious damage and the precipitation systems that caused such disasters in reviewing such a method of evaluating sediment disaster risk.

### 2. Precipitation system in the event of sediment disaster

We examined the conditions of precipitation systems in the event of sediment-related disasters ("serious disasters") for 17 cases where damage to five or more persons or houses (complete collapse) except deep-seated landslides in the last ten years.

The table below shows the damage classifications with focus on the formation of precipitation systems (band-shaped heavy rainfall<sup>1)</sup>. The figure shows the status of precipitation in the 2014 Hiroshima Disaster as a typical example of disasters caused by the formation of band-shaped heavy rainfall ("disaster caused by band-shaped heavy rainfall").

The Table shows that the number of disasters caused by band-shaped heavy rainfall is 2.4 times other disasters, and human and house damages per disaster is 3.1 and 1.9 times other disasters, respectively, which suggests that many of serious disasters are caused by band-shaped heavy rainfall with increase in damage. In addition, human damage per damaged house is 1.6 times greater than other disasters. This suggests that pre-evacuation is difficult in case of disaster caused by band-shaped heavy

rainfall as compared with other disasters (e.g. typhoon). It was therefore found that assessment of the extent of probability for formation of band-shaped heavy rainfall is important in order to reduce human damage by appropriate encouragement of evacuation to residents.

### 3. Conclusion

Sediment Disaster Warning Information is announced after conducting risk assessment with forecast values of precipitation. However, it is pointed out that accuracy of forecast values will decline according to increase in rainfall intensity.<sup>2)</sup> Accordingly, the Meteorological Agency is considering the evaluation of probability of formation of band-shaped heavy rainfall based on the information on environmental field.<sup>1)</sup> Since the risk of sediment-related disaster may also be evaluated more accurately by adding the weather indicators that show the environment field where band-shaped heavy rainfall are likely to be formed to the present precipitation indicators, we intend to continue the study.

Table: Human and house damages by serious disasters

Formation of Band-shaped Heavy Rainfall	Number of subject precipitation cases	Total human damage	Total house damage	Human damage per case	House damage per case	Human damage per damaged house
① Formed	12	188	513	15.7	42.8	0.37
② Not formed	5	25	111	5.0	22.2	0.23
①/②	2.4	7.5	4.6	3.1	1.9	1.6

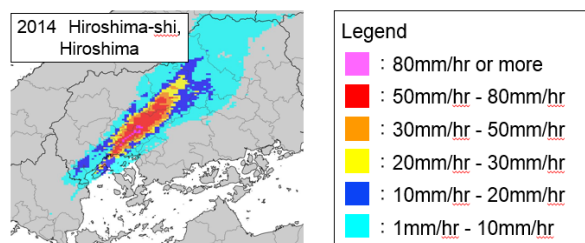


Figure: Typical example of linear precipitation system (2014 Hiroshima Disaster)

### [Reference]

- 1) Forecast Division, Meteorological Agency: Fiscal 2014 Forecasting Technique Training Textbook, 2015
- 2) The Japan Society of Civil Engineers and the Japanese Geotechnical Society: Investigation Report by the 2014 Hiroshima Heavy Rain Disaster Joint Emergency Investigation Team, 2014