

# Utilization of Ensemble Forecast Precipitation in Special Disaster Prevention Operation in Dams

(Study period: FY2016 to FY2018)

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keywords: special disaster prevention operation, ensemble forecast precipitation

## 1. Introduction

A possibility of increase in the scale of heavy rain is indicated as a result of climate changes, and importance of demonstrating the ability of existing disaster prevention facilities more efficiently is suggested as a countermeasure. The MLIT has therefore decided to accelerate the development, utilization, etc. of social capital with high stock effect leading to productivity improvement of whole society, and selected "Dam renovation -- Early improvement of water utilization and flood control ability to support local economy" as one of "Productivity Revolution Projects." As one of the measures to achieve this theme, dam operation with utilization of forecast precipitation is mentioned.

Here, since forecast precipitation always accompanies an error, small or large, it is important to consider the width of forecast. As dam operation considering the width of forecast, there has been a method using the recoverable water level table in prior discharge operation. This method adopts a case where the forecast precipitation was the most different from actual precipitation in the dam basin and determines the reserve volume of the dam at that time as prior discharge volume considering for secure recovery of water use capacity after flood. Meanwhile, as means to express the width of forecast, attraction has been paid in recent years to "ensemble forecast precipitation" (multiple forecast precipitations outputted from forecast calculation under multiple initial / boundary conditions) and NILIM has also been considering utilization of ensemble forecast precipitation for prior discharge operation. <sup>1)</sup> This paper introduces a new approach to using ensemble forecast precipitation with focus on special operation for disaster prevention.

## 2. Decision making method for special disaster prevention operation using ensemble forecast precipitation

Special disaster prevention operation means to further increase reserve volume and utilize reservoir capacity more effectively in order to reduce damage in the downstream of the dam. In decision making for special disaster prevention operation, it is necessary to determine the extent of reducing discharge volume, and as decision elements, we devised two indicators --- "Whether dam

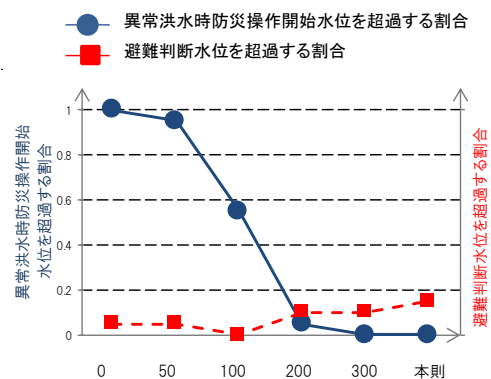


Fig. 1 Relationship between discharge volume and each indicator

reservoir level exceeds the water level to start disaster prevention operation in case of an extraordinary flood" and "Whether the level exceeds the normal water level in the downstream river". Using ensemble forecast precipitation, relationship between discharge volume of the dam and the above-mentioned indicators and data can be organized as shown Figure 1.

As an example for use of the Figure, when considering decrease of the downstream water level to the extent possible without implementing disaster prevention operation in case of an extraordinary flood, discharge volume of 300m<sup>3</sup>/s, at which the "ratio of exceeding the evacuation decision level" is the smallest when the "ratio of exceeding the level to start disaster prevention operation in case of an extraordinary flood" is zero. Thus, expression of the indicators as decision standard for special disaster prevention operation as a ratio converted from ensemble forecast precipitation is expected to reduce the burden of dam administrators in decision making and contribute to effective / efficient operation. Based on the study ever made on prior discharge operation and special disaster prevention operation, we are going to verify applicability as a decision-making support system for a series of dam operations from before to after flood.

## References

1) KUDO Shun, KAWASAKI Masaki, "Possibility of Application of Ensemble Rainfall Forecast to Preliminary Dam Release", Civil Engineering Journal, Vol. 59, No.12, pp. 38-41, 2017.