A08

Influence of Gates Closure on the Flood Inundation Scale of July 2018 in Oe Town

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INTRODUCTION

The period spanning the end of June until mid of July 2018 has been punctuated by extraordinary downpours in the southwestern part of Japan. This yielded to several damages as the adverse consequences of the generated floods and mudflows in the concerned area. The citizens of Oe city were not spared from these floods. In the city's history, several floods have been recorded and they were mostly triggered by the overflow of the Yura River bending along the city.

Although High embankments were constructed in order to contain the adverse flow of the Yura River, the flood of July 2018, as witnessed by Oe inhabitants, was not due to the main river as usual, but from the inland accumulated flow from the tributaries. The rapid increase of the water level in the main channel in comparison to its inland tributaries flow reached a critical point so that the gates closure became crucial in order to resolve the backwater effect and avoid water intrusion from the main channel.

In this study, we comprehensively investigate the pluvial inundation due to accumulated water logging and utilize numerical simulation to reproduce the inundation by considering different pattern of the gates operation and we confront the resulted flood extension and intensity to the observed data recorded from a field survey.

METHODOLOGY

A 1D rainfall-runoff model combining several lumped hillslopes has been used for the mountainous area while a 2D shallow water equation with unstructured mesh has been applied for the downstream area, setting of the inundation (**Fig. 1**).

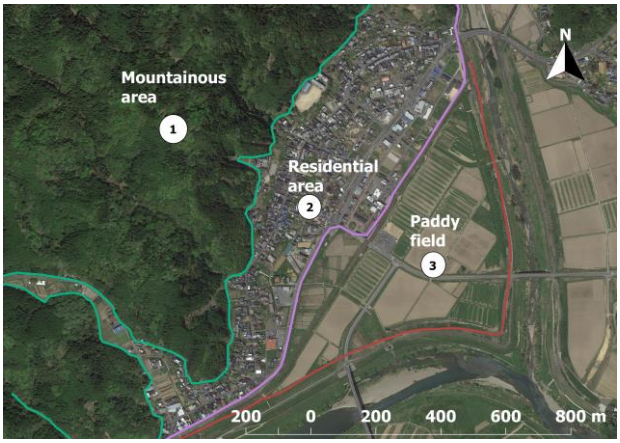

Fig. 1: Oe city, holistic land use distribution

To suitably set the downstream boundary condition of the inundated area to reflect the real scenario of July 2018, the most likely timing of gates closure has been traced back using observed water level time series of Yura river in conjunction with the simulated water level variation at the gate of Tadewara river with a fully open gate throughout the simulation time. The intersection of these two curves allow to estimate the corresponding time.

RESULTS AND DISCUSSIONS

(1) Case 1: Open gates

This case shows that the rainfall of July 2018 wouldn't be a triggering rainfall for inundation if the water level in Yura river didn't rise significantly to threaten its tributaries of backwater effect.

The residential area is quasi not inundated (**Fig. 2**). This simulation also confirms that the gates were certainly closed at one moment to induce the accumulation of water inland.

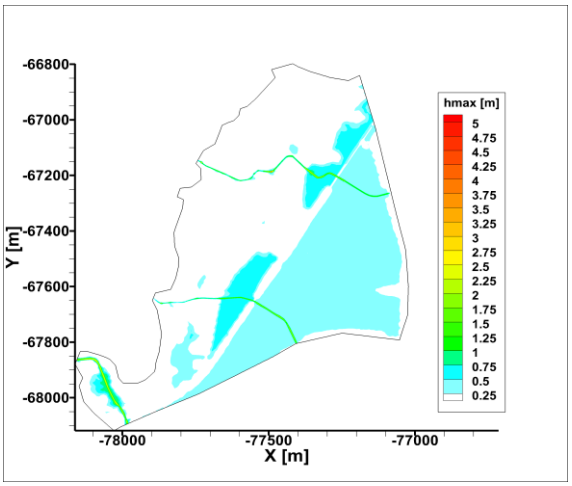

Fig. 2: Maximum water depth case 1

(2) Case 2: Open then closed gates

The time series of the water level in Yura river and the simulated at the gate of Tadewara river from case (1) is plotted to capture the time of closure.

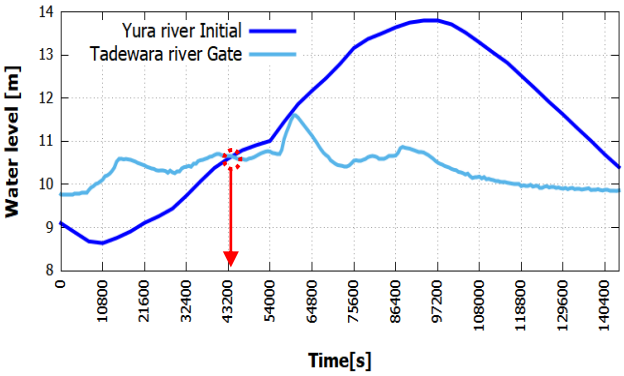

Fig. 3: Estimation of the time of gates closure

This yields to an estimated time of 12 hours counted from the beginning of simulation. Gates are thus considered being open during the first 12 hours and closed afterwards until the end of simulation.

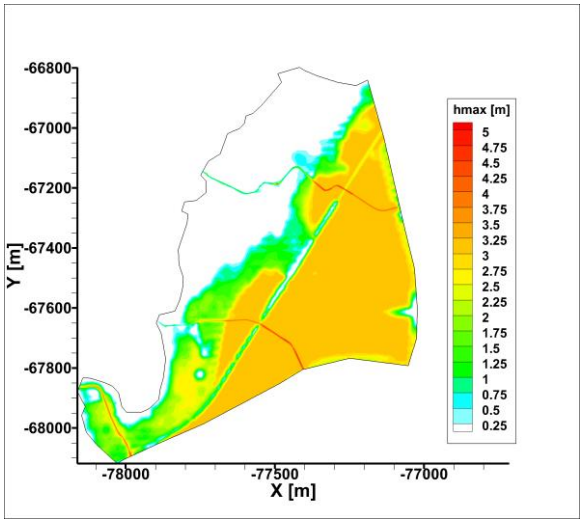

Fig. 4: Maximum water depth Case 2

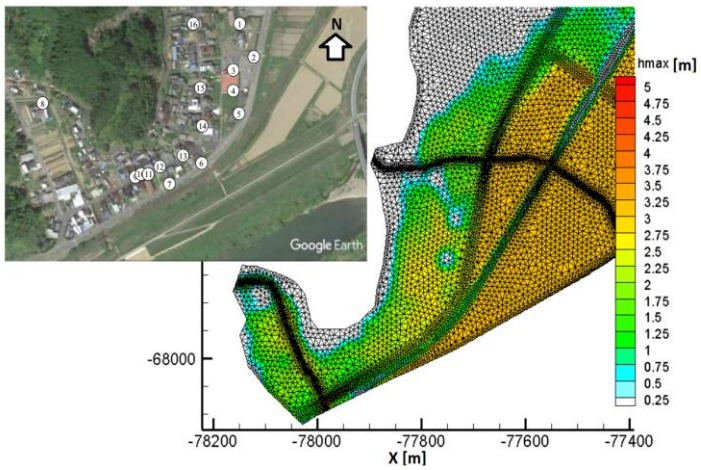

Fig. 5: Comparison with observed data

The results have therefore been confronted to the flood marks recorded from several points during the field survey.

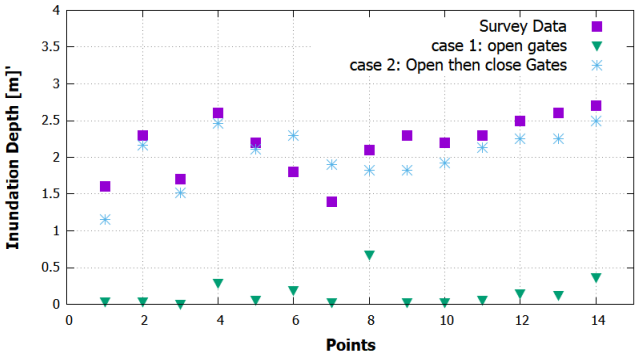

Fig. 6: Data comparison Case 1, Case 2 and survey

Although a small underestimation of the water depth, the case (2) well reproduced the inundation scale and depth and presented an acceptable agreement with the observed data.

CONCLUSION

This study showed the importance of a good assessment of the gates closure timing for a reliable reproduction of the inundation flow when the inland discharge is cut off from the main river to avoid water intrusion. Two cases were conducted with open gates and the combination of open and close gates. The results showed that the case with open and close gates was close to the observed data despite a small underestimation. A coming study on the optimal pumping is expected to serve as a mitigating measure to such pluvial inundation.