別紙第１号様式

博　士　論　文　の　要　旨

専攻名　システム創成科学専攻

氏　名（本籍）　ARTHUR HARRIS THAMBAS
（インドネシア）　印

博士論文題名
（外国語の場合は，和訳を付記する。）

INUNDATION RISK ANALYSIS OF THE STORM SURGE AND FLOOD FOR THE ARIAKE SEA COASTAL DISASTER MANAGEMENT

（有明海沿岸域における災害危機管理のための高潮・洪水の浸水リスク解析）

The storm surge and flood was occurred in Kyushu island in the past such as Typhoon Pat 1985 river flooding by torrential rain caused inundation in the coastal area of the Ariake Sea. The Ariake Sea has the largest tidal range in Japan, i.e., 6 m at the bay head. This sea area is about 1,700 km^2 wide with about 96 km long of the bay axis, 18 km of the average width, 20 m of the average depth. It faces on 4 prefectures i.e., Nagasaki, Saga, Fukuoka and Kumamoto. Most of the plains in Saga Prefecture are adjacent to the Ariake Sea. It is mainly lowland area with an unusually small slope, so once the sea water enters into these areas it will immediately create large inundated area despite the fact that these areas are being used for agricultural, offices, residential, industrial, airport and etc.

In this dissertation, the storm surge by the past main typhoon and flood are studied to analyze in the case that both disasters simultaneously occur and to know the conditions of the water level causing the inundation in the coastal area of the Ariake Sea and Saga lowland. This study also considers the inundation risk in the coastal area, especially on the buildings or houses and public facilities by evaluating of future disaster management.

This dissertation consists of eight chapters. In the Chapter 1, introduction, the background of this research, study area and objectives of this research are explained. This chapter also contains layout of this dissertation.

In Chapter 2, literature review, the theory and references used in this study are presented. 1-D and 2-D hydrodynamic models and disasters like typhoon, storm surge, flood or high discharge are explained with the previous research related to this research as reference.

In Chapter 3, a summary of the coastal area of Sea and Saga lowland are presented with descriptions of history of this areas, disasters occurred in this area and the problem in the present state of this area.

In the chapter 4, the storm surge by Typhoon Pat is analyzed, with has occurred in the Ariake Sea on August to September 1985. This study utilizes 2-D hydrodynamic model and 7 transects are considered to measure water level's distribution in Shiroishi, Higashiyoka, Rokkaku estuary, Kase estuary, Chikugo estuary, Saga airport and Ohamma. In the simulation results, there is no occurrence where the water level's exceeding the elevation of existing coastal dyke. It becomes apparent that no seawater inundation happens in the coastal area of the Ariake Sea in the case of only the Typhoon Pat storm surge.

In Chapter 5, the flood by torrential rain occurred in July 2012 in Chikugo river and its branches are studied. The 1-D numerical model is used for this simulation with the information of cross-section data and the network of the Chikugo River and its branches. The discharge data at the upstream of Chikugo River and Jyobaru River and the water level data at the downstream of Chikugo River and Hayatsue River are used for input data at the boundary. The discharge data of Chikugo river obtained from Senoshita station and discharge data of Jyobaru River obtained from Hidekibashi station are given by the time series format of discharge. The water level data obtained from the tide data near the estuaries of Chikugo and Hayatsue Rivers. The simulation result shows no water level exceeding the existing dyke along Chikugo River in the study area.

In Chapter 6, a coupled simulation of 1-D and 2-D numerical models analyzed. In the simulation's results, the Ariake Sea coastal area and the saga lowland were inundated while the storm surge by Typhoon Pat and flood in July 2012 occurred together. Because the river levees are firstly considered against the flood from the upstream plus the sea tide, the additional storm surge affects the increasing water level in the river and is causing the catastrophic results in this case.

In Chapter 7, the storm surge and flood are analyzed with assumption that both disasters simultaneously occurred in the coastal area of the Ariake Sea and Saga lowland for the future coastal disaster management. This study utilized 2-D numerical model with GIS model analysis for the inundation risk affecting on the buildings and public facilities. The simulation's results the water overflow the both sides' levees in the Chikugo River causing the inundation in the surrounding area. The GIS model analysis indicates high risk of inundation in the Ariake Sea coastal area and Saga lowland, i.e. more than 96,000 buildings or houses and 245 public facilities are inundated. For the disaster management of flood and storm surge in the coastal area of Ariake Sea and Saga lowland, it is recommended to implement the disaster management system based on flood disaster management cycle by mitigation, awareness, response and recovery.

In Chapter 8, the conclusion and recommendation are presented based on the obtained results. The coastal area of Ariake Sea and Saga lowland are vulnerable against the inundation due to the simultaneous occurrence of the storm surge and river flood. If only storm surge or high discharge based on the past disaster occurs in the Ariake Sea coastal area, the possibility that the water exceeds the elevation of existing coastal dyke and the dyke along the rivers in the study area is low. For the further analysis of the storm surge, the effects of wind speed distribution and the waves should be considered additionally.