MODELING OF BANGKOK BASIN FOR EARTHQUAKE RESPONSE ANALYSIS

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1. INTRODUCTION

Bangkok Metropolitan Area (BMA) is the center of economic and social of Thailand with population more than 10 million people. Many buildings and infrastructures have been built over the last few decades in order to serving country growth and development. Even though Bangkok is located at a remote distance from seismic sources, a recent seismic study show that Bangkok is at risk from damaging ground motion induced by distant and large earthquakes. The risk is primarily caused by the thick soft surficial deposits in Bangkok to amplify earthquake ground motions about several times. Although this amplification ratio has not yet been verified and there is clearly a need for a systematic, comparative analysis of the recorded ground motions in BMA from past and future earthquakes. In order to prevent the unrecoverable damage to the buildings in BMA by seismic hazard, effective and precise earthquake analysis is necessary and urged to be taken with respect to BMA and its surrounding area.

2. METHODOLOGY

2.1 Method for modeling

In this study, including the area of BMA, its surrounding area and coastline are involved in the subsurface modeling and the seismic response characteristics. The data source adopted for modeling is from borehole data used to identify the aquifer layers in the Bangkok Plain (N. Phien-wej, 2006). The grid scale of layer depth will be estimated by Kriging method, which is one of the most commonly utilized geostatistical methods. The geological subsurface model is highly depending on the relationship between each drilling data, which satisfies the characteristic of trend function introduced by universal kriging method.

2.2 Method for seismic simulation

Finite Difference Method is capable of being stably and efficiently implemented within the formed planar topography boundary. The model is discretised in staggered grid which defines the stress components and velocity of wave propagation from each other within the model. Wave propagation and elastic vibration of the modeling media are expressed by Momentum conservation equations and stress-strain relations (Kiyono et al., 2006).

3. MODEL OF BMA SUBSURFACE

The the model range shown by yellow area in Fig. 1, which decided upon the contour of Chao Phraya basin, inhabitant's density and the locations of boring data. The dark orange surface shows the bottom shape of sedimentary basin, the maximum depth is 2000m; the minimum depth is zero which means the land surface (Fig.2). The coordinates where the maximum depth 2000m locates at longitude 100.5° and latitude 13.55°, where is roughly the southernmost of BMA near the coastline.

4. EARTHQUAKE RESPONSE OF BANGKOK BASIN

We conducted a simple calculation for the point source of which hypocenter is 4 km depth (Fig. 3). On the west boundary of the basin. A, B, C, D represent the observatories in different locations within BMA. Fig. 4 (a) shows the velocity time histories in Up-down direction. Fig.4 (b) and (c) express those in North South and East West direction, respectively.

Keywords: Bangkok Metropolitan Area (BMA), Subsurface model, Kriging method, Earthquake simulation, FDM
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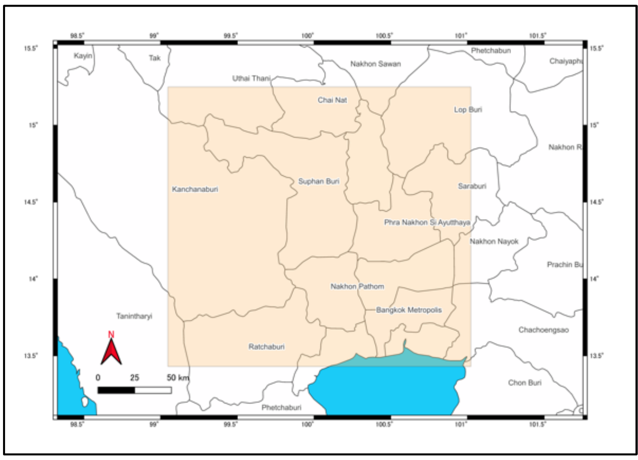


Figure 1: Model range

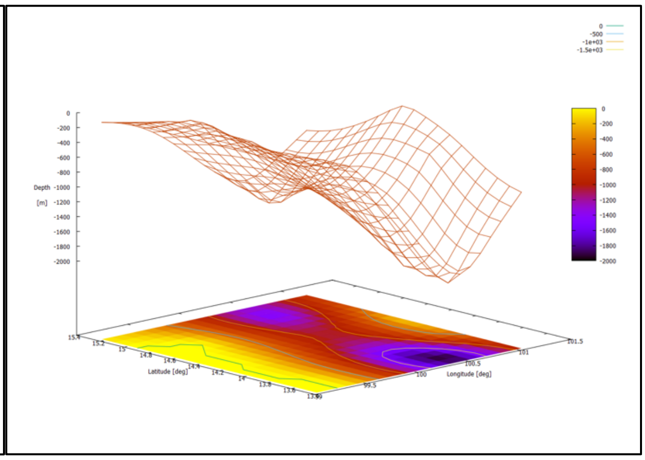


Figure 2: Subsurface model

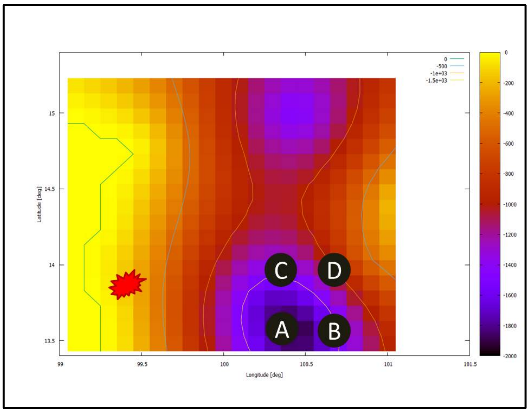
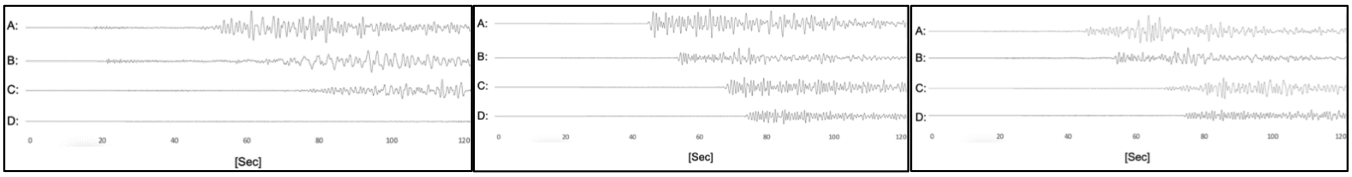


Figure 3: Epicenter and observatories



(a) (b) (c)

Figure 4: Velocity Time histories

5. CONCLUSIONS

The estimated maximum depth of Basin is located on the coastline of the south side of BMA. The second deepest location of the basin is between Chainat province and BMA area. Similar to real case, in this study, the earthquake is assumed to occur at 4 km depth in the bedrock of the west side of the model coordinate. The coastline of BMA region has the maximum vibration amplitude in both horizontal and vertical direction. For the horizontal direction as East West and North South, the site which locates at the surface of basin with maximum depth has largest maximum vibration amplitude.

ACKNOWLEDGEMENT

Authors appreciate Dr. Kitaoka, (Kansai U), Prof. Ono (Tottori U), Dr. Bhuddarak (Cheng mai U), Dr. Panon (Mahidol U), Dr. Furukawa (Kyoto U) for their strong supports on data collection of Bangkok basin. This work was supported by SPIRITS program of Kyoto University.

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