City development adaptation towards heat wave event: A scenario study in Hong Kong

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This is a pilot study using the Weather Research and Forecasting (WRF) Model to evaluate and compare the meteorological impact (especially heat wave events in Hong Kong) due to an expansion of urban area and an increasing in building height respectively, with anthropogenic heating taken into account. As Hong Kong has a very high population density, with the addition of shortage of available land and expected further increase in population in the future, local policy-makers may consider developing at the country parks, or constructing taller buildings to support the expected increase of housing demand. Either decisions may bring impacts towards urban climate and consequently affecting quality of life, for instance change in urban heat island pattern and thermal comfort. Therefore, this pilot study will investigate the aforementioned phenomena, and may serve as a reference for policy-makers to make better decision in order to alleviate the potential health/heat risk.

The chosen simulation period is typical summer hot season in Hong Kong. Hong Kong is being influenced by the ridge of high pressure system during this period. In order to take anthropogenic heating and building influences into account, urban-WRF is configured to run with the Building Environment Parameterization and the Building Energy Model (BEP-BEM). There are three simulated scenarios, they are increased building height (30% higher) scenario, urban area expansion (30% more grids categorized as urban in Hong Kong) scenario and a control run for comparison. Comparisons of meteorological parameters, such as temperature, lower surface wind and heat index, will be discussed between the scenario runs and the control.

Keywords: WRF, urban climate, heat wave event, urban heat island, urbanization

A long term and quantitative reconstruction of flood history using the sediment of Lake Suigetsu and its methodology

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Observation of hazards is necessary for understanding the mechanism of their occurrence and forecasting their frequency and magnitude in the future. However, observation can only get the record back to the last 100 years at most. Because huge hazards occur with low frequency, observational and historical records could fail to obtain enough data of huge hazards. In this study, we tried to reconstruct the long term flood record based on the analysis of sedimentary record as a potential medium of hazards in the past exceeding the limit of observation. When a hazard such as flood or earthquake occurs, large amount of materials which are different from ordinary sediments are deposited in a sedimentary basin and preserved as an “event deposit (event layer)”. Thickness and accumulation rate of event layers could be used as a proxy for the magnitude of hazards. In this study, we used the sediment of Lake Suigetsu in Fukui prefecture and established a semi-quantitative method for reconstructing of heavy rainfall and flood events in central Japan based on correlation of observational record and sedimentary record. Correlation of sedimentary record and observational record is conducted based on high resolution age model constructed using the near surface sediment with annual lamination. In addition, flux of detrital material from the drainage area of Lake Suigetsu is reconstructed in the last 7000 years based on statistical analysis of major elemental composition. As a result, it is revealed that deposition and thickness of event layer represents the occurrence of flood event in this region and total amount of precipitation in each flood event. It is also revealed that flux of fine-grained detrital material from drainage area increases with the increase of frequency of heavy precipitation (>50mm/day). This methodology can be applied to other sedimentary basins to obtain the spatio-temporal variation of semi-quantitative record of flood events in geologic time scale.
Related to this presentation, identification of flood and earthquake in this study and correlation with local environmental change would be presented in M-IS 23 session, and correlation of the result of flood event in the late Holocene with regional climate change would be discussed in M-IS 06 session.

Keywords: Lake Suigetsu, varved sediment, flood, earthquake, Holocene

Effects of geomorphological properties on the surface failure occurred by a heavy rainfall in Hiroshima city in 2014 by using machine

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1. Introduction
Prediction methods for surface failure can be classified into heuristic, deterministic and statistical methods. Studies using statistical method have been increasing rapidly because of development of airborne-scanning LiDAR, remote sensing technology and machine-learning technique. This study examines geomorphological properties of surface failures occurred by a heavy rainfall in Hiroshima city in 2014 statistically by using Random Forest (RF) prediction model (Breiman , 2001).

2. Study area and Methods
Study area is Mt. Abu and Mt. Takamatsu in Hiroshima city. This study focused on surface failure in granite area to apply RF method. 5 m mesh digital elevation model (DEM) released by Geospatial Information Authority of Japan (GSI) was used. The DEM for study area was made in 2008. Thus we can analyze the terrain before the landslide in 2014. Map of 2014 landslide areas was published by GSI. Using DEM we calculated geomorphological properties such as slope angle, flow accumulation, topographical convergence Index (TCI), profile curvature, tangential curvature by GRASS GIS 7.0.1. Statistical analysis was carried out by R language 3.2.3.
This study defined three geomorphic units with different spacial scales; 1) failure head, 2) first-order basins and 3) large basins. Failure head is represented by the highest cell within each surface failure. In failure head scale, water lines were set to investigate geomorphological characteristics of water line. Neighbor of the failure head is defined as the following 5 cells; both the upper 2 cells and lower 2 cells from the failure head, and the failure head cell itself. First-order basins were extracted after making stream order map. This study sets the large basins whose outlets locate the foot of the mountains because to evaluate risk of sediment disaster at each outlets of valley is valuable for disaster prevention.
3. Results and Discussion
Failure heads are located within 125 m from the mountain ridge and at around the steepest slope point along each waterline. RF model suggested critical slope angles (32 to 39 degree) for occurring surface failure. When profile curvature changes concave shape to straight shape and tangential curvature changes straight or ridge shape to straight or valley shape from upper of failure heads to under of them, RF model classified the points as high potential of occurring failure.
RF model for first order basin has the highest miss classification rate among the three. This suggests that geomorphological differences between the failured and non-failured first order basins are relatively small. RF model suggested that lowest elevation of the basins was most important parameter for classification. When the lowest elevation of the first order basins is higher than 143 m., such basin is classified as failure basin, which tends to locate near the main ridge.
RF model applied for large basins suggested that failured large catchments have relatively higher value of TCI and flow accumulation. It means large basins which have long wetness duration on rainfall tend to failure. It is naturally conceivable that failure can occurred in large scale basins on a heavy rainfall. However, the suggestion by RF model is important for disaster prevention because it may strongly correlated to frequency of hit of debris flow.
This study focused surface failure in granite area. As geomorphological condition of surface failure is changeable by geology and region, the same statistical examine should be tried to other geological areas

and regions.

References

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Keywords: Landslide in Hiroshima, Surface failure, Machine learning

Research of fire effect from the distribution and composition of trees in a small park in Kanazawa City

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In the Great Kanto Earthquake and the Great Hanshin Awaji Earthquake, many victims were found due to earthquake fires. On the other hand, there was a report that the sunburn stoppage by the forest was observed in the green land, and there was a report that it was able to survive by doing evacuation to the green land, and after the Great Kanto Earthquake a lot of research on fire prevention effect by trees has been done. In recent years, it is said that parks and green spaces in urban areas become important when thinking about disaster prevention and disaster in active seismic activity.
Therefore, in this study, we tried three small parks in Kanazawa city, Ishikawa prefecture, and evaluated about prevention of spreading fire by trees in the park during earthquake fires, we propose improvement of safety.

In each park, tree species, tree height, distribution, structures in the park were investigated. Regarding fire prevention properties of plants, we divided them from existing research and estimation into summer season and winter season. For each park, estimates were made about the fire protection power in summer and winter, and the fire protection function of the park was evaluated.
Although it is very simple, we analyzed the safety of the park, assuming spreading of fire from the west for the two patterns of the current situation and the improvement plan for the spread fire simulation.

Fire prevention of each park is thought to exhibit fire resistance to some extent in the summer as for trees, but it is considered highly probable that the fire protection power in winter will be dangerous because many deciduous trees are seen. Also, the number of trees is not so large It can be said that fire spreading can not be adequately shielded, there is a danger. It is suggested that existing research is dangerous in terms of area.
Therefore, looking at the spreading simulation, it turned out that a certain degree of safety area can be secured in the park at present. However, when considering it as an evacuation site, it is impossible to secure a sufficient safety area and it can be said that it is a "dangerous evacuation place". In the improvement plan, it became possible to increase the safety area by increasing the forest zone around the park and inside.

It can not be said that each park has sufficient safety as an evacuation site, suggesting the possibility of danger especially in the winter. As an improvement plan, increase of green amount and change to evergreen tree may be considered. However, when considering the function as a park, there is a limit to increase the amount of green. Therefore, in order to improve the fire protection function of the park, in addition to improving the planting of the park, it is necessary to go along with urban planning such as incombustibility and flame retardation of surrounding buildings .

Current situation of Teacher training program for Disaster mitigation

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At the time of the Great East Japan Earthquake, 11th Mar 2011, it is also well known that the judgment and behavior of school teachers had a great influence on the safety of school children and students. Improvement of disaster prevention education and disaster prevention countermeasure at schools requires improvement of awareness and knowledge of disaster prevention by the teachers themselves. Meanwhile, at the educational situation in Japanese schools, the work of teachers is violent due to various tasks, and there are aspects that it is necessary to avoid excessive labor. Based on these circumstances, it can be pointed out that it is important to effectively conduct teacher training on disaster prevention education and disaster prevention countermeasure .
Therefore, in order to think about the way of teacher training on effective and practical disaster prevention, grasp the actual condition of teacher training held in each prefecture and extract and share effective cases, so that future disaster prevention I would like to think about the way of training. We conducted a questionnaire survey aiming at this for each prefectural board of education, so we will report on that.
In addition, we would like to consider what is the school teachers wants for the disaster prevention training on site based on the situation of the teacher training in Ishikawa Prefecture and Kanazawa city in which the authors are involved and the questionnaire results for the teachers who took the training.

Keywords: Teacher training program, Education for disaster mitigation, Disaster mitigation, Board of education, Questionnaire survay

