論文 / 著書情報
Article / Book Information

題目(和文)	トンレサップ湖の洪水氾濫原における土砂動態
Title(English)	Sediment Dynamics in the Floodplain of Tonle Sap Lake
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Category(English)	Doctoral Thesis
種別(和文)	論文要旨
Type(English)	Summary

（博士課程）
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論 文 要 旨

THESIS SUMMARY

専攻： Department of	Civil Engineering 専攻	申請学位（専攻分野）： Academic Degree Requested	博士 (Engineering) Doctor of
学生氏名： Student's Name	Siev Sokly	指導教員（主）： Academic Supervisor(main)	Yoshimura Chihiro
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要旨（英文 800 語程度）
Thesis Summary（approx.800 English Words ）

Generally, resuspension is a dominant process of sediment dynamics in a stable shallow lake. However, resuspension might not be the dominant process in a shallow lake influenced by flood pulse because floodplain vegetation most likely plays as a significant role in lessening the intensity of resuspension and promoting sedimentation process. Little attention, however, has been paid to this type of lake because investigations of sediment dynamics have typically focused on relatively stable shallow lakes. Therefore, this research aimed to investigate the sediment dynamics in a large shallow lake and its floodplain characterized by flood pulse using field observation and modelling techniques. The targeted shallow lake was Tonle Sap Lake (TSL), the largest freshwater lake in Southeast Asia, located in Cambodia. This important study not only improved our understanding of sediment dynamics in shallow lake, but also contributed to the ecological and environmental management of ecosystems in such lakes driven by the flood pulse such as TSL.

A major objective in this research has been the investigation of sediment dynamics in a large shallow lake and its floodplain characterized by flood pulse using field observation. An extensive and seasonal sampling survey was conducted to measure total suspended solid (TSS) concentrations, sedimentation and resuspension rates in TSL and its 4 floodplain areas. As the results, TSS concentrations ranged from 1.3 to 751.8 mg/L during the sampling period (September 2016 to June 2017). The concentration was highest in March, followed by June, September, and December. The average resuspension rates were 116.6 ± 146.4 g/m^2/day, 178.2 ± 205.2 g/m^2/day, 215.4 ± 365.3 g/m^2/day, and 306.7 ± 369.6 g/m^2/day in grassland, shrub, flooded forest, and open water areas, respectively. These values corresponded to 81.2%, 72.8%, 59%, and 85.3% of the average gross sedimentation rates, respectively. This study, for the first time, conducts a quantitative measurement of resuspension rate contributing to not only the knowledge of sediment dynamics in TSL but also the large shallow lake studies around the globe. The measured resuspension rate was meaningful to explain the resuspension process and the reason why the sedimentation rate in TSL is very low, which is a substantial improvement in our knowledge from the previous studies. The study revealed that sedimentation process was dominant in the high water period (September-December) while resuspension process was dominant only in the low water period (March-June). In addition, floodplain vegetation reduced the resuspension of sediment (up to 26.3%) in water.

Another major objective of this research that stands out was the model application and improvement of a land scape evolution model (LEM). Most of LEMs considered only a simplification of vegetation growth of a grass surface, not a spatial variability of vegetation community. Therefore, this study aims to improve a landscape evolution model by integrating spatial variability of vegetation and to apply the integrated model for investigation of sediment dynamics. Boundary conditions (e.g. water discharge and sediment load) from surrounding tributaries of TSL and Tonle Sap River (TSR) were estimated using a physical process-based sediment model and semi distributed sediment model, respectively. The Nash-Sutcliffe Efficiency (NSE) of both models ranged from satisfactory to good performance for the discharge (NSE ranged 0.65-0.85) and sediment load (NSE ranged 0.44-0.79) which were good for the subsequent investigation. A landscape evolution model, Caesar-Lisflood (CL) model was successfully applied in TSL and TSR, having a good and acceptable simulation performance for the water level (NSE: 0.93) and suspended sediment concentration (R^2=0.73 in September), respectively. Moreover, the study integrated and tested the spatial variability of vegetation (e.g. grass, shrub and forest) in the model. As the result, compared to the single type of vegetation (e.g. CL-G, CL-S and CL-F cases), the integrated spatial variability vegetation CL model (CL-G-S-F case) showed spatial difference of flow velocity resulting in different erosion and sedimentation patterns in the floodplain vegetation areas. The simulated sedimentation rate of CL-G-S-F case also showed a relative fit with the observed data at Chhnok Tru area in each type vegetation zones (e.g., grass, shrub and forest). The improved CL model was also a useful tool for evaluating the impact of some scenarios (e.g. shift in water level and suspended sediment load of boundary conditions) and supporting environment management. Hence, the overall research title is deemed appropriate, as the study indeed has in various ways attempted to generate insight into some importance processes related to sediment dynamics in a large shallow lake influenced by flood pulse, mainly through an analysis of field observations and modelling techniques.

備考 ： 論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。
Note : Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).

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