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Thesis outline

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 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. An extensive and seasonal sampling survey was conducted to measure total suspended solid (TSS) concentrations, sedimentation and resuspension rates in TSL and its four 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 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). Floodplain vegetation reduced the resuspension of sediment (up to 26.3%) in water. In addition, a landscape evolution model, Caesar-Lisflood (CL) model, was successfully applied in TSL, 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 also successfully 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 CL model (e.g. CL-G, CL-S and CL-F cases), the integrated spatial variability vegetation CL model (CL-G-S-F case) showed the 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 reasonable 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 and supporting environment management. Hence, the study has attempted in various ways 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.